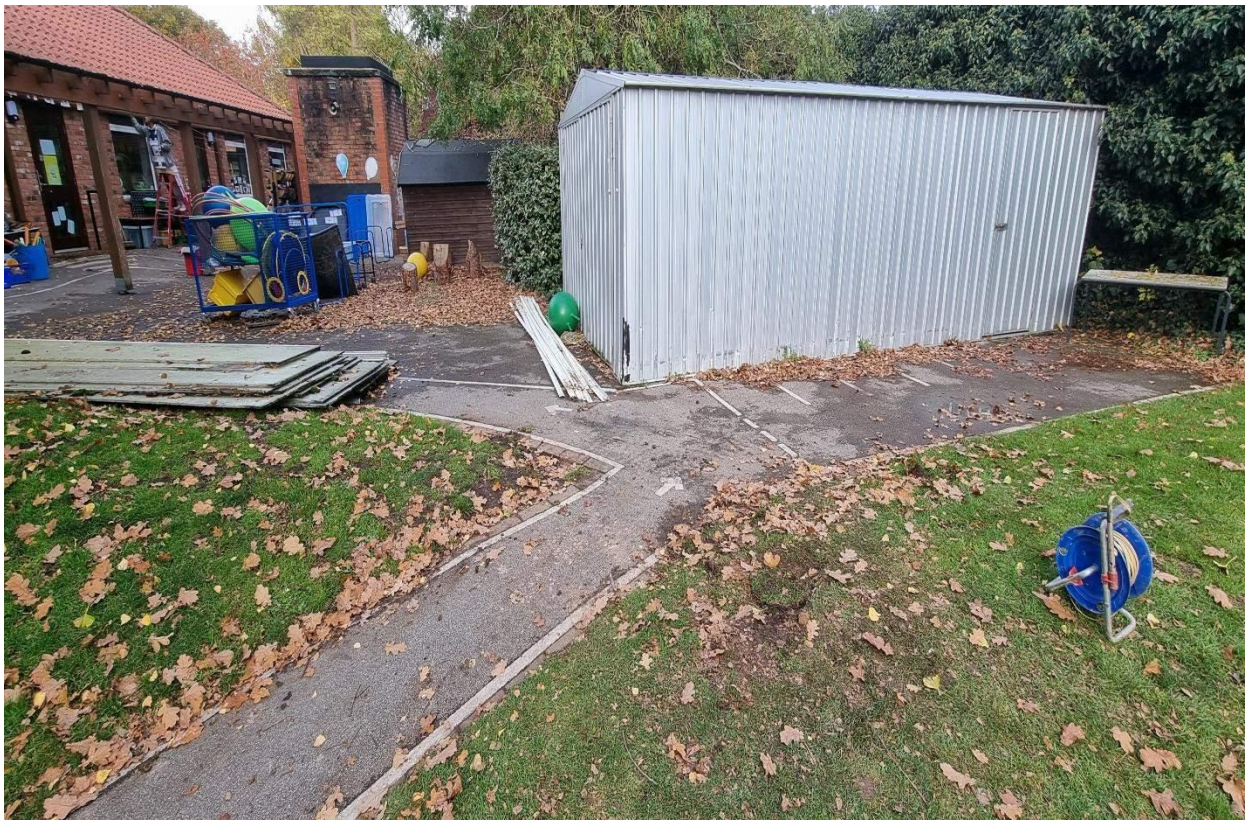


William Stukeley Primary School, Holbeach, Spalding, Lincolnshire, PE12 7HG

Interpretative Ground Investigation Report

Report on behalf of:
Lindum Group Ltd.

November 2022

FINAL REPORT

R22126/R001

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Project William Stukeley Primary School, Holbeach, Spalding, Lincolnshire, PE12 7HG

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EXECUTIVE SUMMARY

Purpose of This Report	Interpretative Ground Investigation Report
Client	Report on behalf of Lindum Group Ltd.
Site	William Stukeley Primary School, Holbeach, Spalding, Lincolnshire
Site Location	The site is located within the town of Holbeach, Lincolnshire, approximately 275m south-west of the town centre, and 10km east of Spalding. The postcode for the site is PE12 7HG, and the approximate National Grid Reference is 535650, 324785.
Current Land Use & Description	The site is irregular in shape, and occupies an area of approximately 1.857 hectares (18,570m^2), however the majority of the proposed development works are to be undertaken on a smaller subsection of the site situated to the east of the existing school complex. At the time of the investigation, the centre of the site was occupied by the existing William Stukeley Primary School campus, comprising a series of intersecting linear single storey buildings of brick construction possessing a sloping tiled roof set around two small courtyards. Adjacent the complex to the south and west were areas of tarmacadam hardstanding which served as vehicle parking areas, access infrastructure, and hard playground areas respectively. The southern and western sections of the site were occupied by sports pitches with a managed grass substrate and a smaller multi-sports pitch with a hardstanding surface. The area east of the main building comprised a number of outdoor play areas locally underlain by wooden decking and soft landscaping. The individual outdoor play areas were connected to the main area of hardstanding to the west, and to each other by footpaths of tarmacadam construction. The north of the site was occupied by a large area of open recreational parkland, which it is understood is open to the public. This area is separated from the main school campus by a series of approximately 2-3m tall metal mesh fences.
Proposed Development	Current proposals for redevelopment of the site are understood to involve multiple phases of construction, with the objective of extending the existing school complex. Phase 1 will comprise two new classroom extensions to be constructed along the eastern and south-eastern elevations of the existing structure. Phase two will involve the extension of the existing school hall, effectively 'filling in' the space between the eastern Phase 1 extension, and existing structure to the south-east. Phase 3 will comprise a further extension of the south-eastern section of the existing structure involving the construction of three new classrooms and ancillaries. In addition, a new vehicular access road may be constructed along the western and southern peripheries of the site as part of the proposed development.
Ground Investigation Overview	An intrusive ground investigation was undertaken at the site between the 24th and 25th October 2022 involving the excavation of four (4No.) Window Sample boreholes to depths of between 4.0m and 5.0m bgl, two (2No.) machine excavated trial pits, situated toward the western periphery of the site and extended to depths of between 1.5m and 1.6m bgl to enable infiltration testing, and three (3No.) hand excavated Trial Pits progressed adjacent the existing school complex to depths of between 0.25m and 0.40m bgl.
Findings of the Ground Investigation	<u>Hardstanding</u> Hardstanding was recorded at the surface in one of the excavations (excluding foundation inspection pits) undertaken during the investigation. Borehole WS1, situated to the south of the existing school building within the proposed footprint of the southern Phase 1 extension, recorded Tarmacadam between 0.0m and 0.05m bgl. <u>Topsoil</u> Topsoil was encountered at the surface in two locations (SA1 and SA2), excavated toward the western periphery of the site, and recorded to depths of 0.32m and 0.2m bgl respectively. This material was described as dark brown slightly sandy Silt. <u>Made Ground</u> Made Ground was encountered below the hardstanding in WS1, below the topsoil in SA2, and at the surface in WS2, WS3 and WS4 as one of 5No. sub-types; • Light grey/dark grey Sand and Gravel • Soft brown slightly sandy Silt. • Orange slightly gravelly Sand • Brown silty to very silty slightly gravelly, locally cobbly Sand

	• Dark brown, locally dark reddish brown, slightly sandy to sandy slightly gravelly, locally slightly cobbly Silt Tidal Flat Deposits An alternating sequence of predominantly cohesive and granular strata consistent with Tidal Flat Deposits was encountered below the Made Ground and/or Topsoil in each of the excavations. The cohesive component of this sequence was typically described as soft to firm brown/light brown/orangish brown/reddish dark brown locally and variably slightly sandy to very sandy SILT. The granular subtype was generally recorded as brown/dark grey/light brown slightly silty to very silty SAND. Visual/Olfactory Evidence of Contamination No visual or olfactory evidence of contamination (including organic/hydrocarbon staining or odours) was identified in any of the excavations undertaken as part of the investigation. Groundwater Groundwater strikes were encountered during the fieldwork phase in each of the excavations (excluding foundation inspection pits) undertaken during the site investigation, at depths of between 1.4m and 2.3m bgl. Four weekly groundwater monitoring visits were undertaken following completion of the fieldwork, and a period of well stabilisation. During each visit, the standpipes were found to be dry, and the well base significantly shallower than the original install depth (2.18m bgl in WS1 and 2.28m bgl in WS2), potentially indicative of rapid silt ingress. Existing Foundations The foundations of the existing building were found to comprise concrete footings encountered at depths of between 0.25m and 0.27m bgl, and extending to a proven depth of 0.47m bgl.
Contamination Testing	Soils Five samples were taken from the various Made Ground subtypes encountered, and four were obtained from the Tidal Flat Deposits to enable laboratory chemical analysis. The analysis results were screened against Grange GeoConsulting Ltd GAC screening values for a 'Public Open Space (Resi)' end use scenario as part of an assessment of potential risks associated with contamination.
Contamination Results	**Soil Contamination** Laboratory chemical analysis results have identified localised contamination in soils underlying the site. One sample, taken from Made Ground in WS2 (0.0m to 0.4m bgl) proved individual PAH species (benzo(b)fluoranthene, benzo(a)pyrene, and dibenz(a,h)anthracene at concentrations exceeding relevant GACs for a Public Open Space (Resi) end use scenario, taking into consideration the appropriate SOM content. None of the remaining samples, including those taken from Made Ground across the site recorded any inorganic or organic determinands at concentrations which exceeded adopted GACs **Waste Acceptance Testing (WAC)** A programme of WAC testing was undertaken as part of the investigation. The subsequent results indicated that arisings generated from the Made Ground and Tidal Flat Deposits tested are likely to qualify as 'inert' for purposes of waste disposal. It may be possible to retain excavated arisings at the site, depending on material source, and providing these activities are undertaken in accordance with the CL:aire Definition of Waste Code of Practice (DoWCoP) or equivalent, and current Waste Management Regulations.
Recommended Further works/ Remediation	A risk assessment was subsequently carried out in order to examine and evaluate plausible contaminant linkages.

	Based on the findings of the intrusive investigation it was considered that, following redevelopment, a Low risk of harm to human health receptors would remain as a result of contamination present within soils at the site. The risk to controlled waters resulting from contamination at the site following redevelopment was also considered Low. This level of risk is contingent on appropriate steps being followed during the demolition and construction phases. Based on the findings of the CSM/Risk Assessment the following measures are recommended as part of proposed redevelopment of the site. • It is recommended that during any groundworks/ remedial works in impacted materials, appropriately licenced contractors should be appointed, PPE/RPE should be worn as necessary by groundworkers, and a safe system of work is established prior to commencement. • The risk levels identified are contingent on the presence of low-permeability hardstanding in the area around WS2. Should development proposals change, resulting in a change of substrate in this area, it may be necessary to amend the risk assessment and/or undertake remedial works. • It is recommended that consideration be given, should site preparation/earthworks be required to prepare the substrate around WS2 for development (Phase 3) to the removal and off site disposal of Made Ground (recorded to approximately 0.4m bgl) in this area, in order to remove any future development constraints that might arise. • It is also recommended given the findings of the investigation that the site construction/earthworks contractor remain vigilant regarding the presence of unexpected contamination issues which may be discovered during the programme. Should any such unexpected contamination be identified, a suitably qualified environmental consultant should be contacted in order to appropriately assess the issue. • It will be important, during any earthworks in the area surrounding WS2 to control the release of dust, which may otherwise have the potential to impact off site receptors. • Based on the presence of organic contaminants within the Made Ground, it may be necessary to use protected pipework for potable water supplies to the development, particularly where pipework is proposed in the areas around WS2. The local water supplier should be contacted for further details
Geotechnical Testing	A range of in-situ, laboratory and chemical testing for geotechnical purposes have been undertaken as part of the ground investigation. The results of these tests have been presented in this report and used to facilitate preliminary geotechnical design. Made Ground will not be suitable as a foundation stratum due to its inherent variability and risk of intolerable differential settlement. The natural Tidal Flat Deposits exhibited consistently low SPT values to depths exceeding 4m bgl. Due to its low inherent strength, the near surface Tidal Flat Deposits are considered unlikely to be suitable as a founding stratum for the proposed development using strip or trench fill foundations. It is therefore recommended that an alternative foundation option is adopted at the site with respect to the proposed development. The proposed extensions may be founded on a system of ground beams spanning onto piles taken down into the deeper Tidal Flat Deposits, which exhibited increased geotechnical strength, or alternatively to solid strata from the West Walton Formation, which was not encountered during the excavation. Should it be necessary to found on the bedrock, additional investigation works are likely to be necessary in order to identify and prove the geotechnical suitability of this unit. A variety of pile types may be used, including driven, bored, and continuous flight auger (CFA) piles, subject to constraints on noise and vibration. Because of the various advantages and limitations of each pile type, and the cost implications, advice should be sought from specialist piling contractors to determine the most suitable and cost-effective type.

	Alternatively ground treatment (e.g. vibro displacement) may be an option, subject to environmental and noise/vibration constraints Floor slabs should be constructed as suspended where Made Ground is greater than 600mm thickness, or foundations are located within the zone of influence of a (new planted) tree. Ground floor slabs may be constructed as ground bearing providing foundations are not within the zone of influence of a tree, where the floor slabs overlie natural materials, or where a piled solution has been adopted. Based on guidelines provided in BRE Special Digest 1, the Tidal Flat Deposits at the site may be classified as Design Sulphate Class DS-1 and ACEC Class AC-1s Based on the findings of the investigation, groundwater may be encountered within shallow excavations at the site, at an approximate depth of between 1.4m and 2.3m bgl. Whilst it is considered that the geological units encountered are unlikely to be significantly permeable, it is considered possible that excavations below the groundwater levels encountered are likely to experience pooling/ponding. Excavations are likely to act as a sump, potentially requiring dewatering

This Executive Summary forms part of Grange GeoConsulting Ltd report number R22126/001 (Issue 1) and should not be used as a separate document.

1.0 INTRODUCTION

1.1 Terms of Reference

Grange GeoConsulting Limited was commissioned by Lindum Group Ltd. to undertake a ground investigation in support of the proposed development work at an existing Primary School facility located within the town of Holbeach, Lincolnshire, approximately 275m south-west of the town centre, and 10km east of Spalding. The postcode for the site is PE12 7HG, and the approximate National Grid Reference is 535650, 324785. A Site Location Plan (Drawing R22126-DWG1) is presented in Appendix A.

The site is irregular in shape, and occupies an area of approximately 1.857 hectares (18,570m^2), however the majority of the proposed development works are to be undertaken on a smaller subsection of the site situated to the east of the existing school complex.

At the time of the investigation, the centre of the site was occupied by the existing William Stukeley Primary School campus, comprising a series of intersecting linear single storey buildings of brick construction possessing a sloping tiled roof set around two small courtyards. Adjacent the complex to the south and west were areas of tarmacadam hardstanding which serve as vehicle parking areas, access infrastructure, and hard playground areas respectively. The southern and western sections of the site were occupied by sports pitches with a managed grass substrate and a smaller multi-sports pitch with a hardstanding surface.

A small external single storey building of brick construction was noted to the west of the main campus. This structure appeared to be significantly older than the main school complex. The western elevation of this structure opened onto an area of hard and soft landscaping enclosed by a large brick wall. The historic purpose of this building and enclosed landscaping area is unknown, however it is considered possible that a historic walled garden, or stables/paddock may have been present in this location. At the time of the investigation the area was being used as a sports/physical education facility.

The area east of the main building comprised a number of outdoor play areas locally underlain by wooden decking and soft landscaping. Several small sheds were identified in this area, which were presumably used to house outdoor play or landscape maintenance equipment. The individual outdoor play areas were connected to the main area of hardstanding to the west, and to each other by footpaths of tarmacadam construction.

A small semi-permanent wooden structure was identified toward the south-east of the site. Anecdotal evidence obtained from a Phase 1 Desk Study produced for the site in January 2022 by Delta Simons Ltd. indicates that this structure is used as an outdoor classroom for ecology and arts education, however at the time of the investigation, this building appeared disused.

The north of the site was occupied by a large area of open recreational parkland, which it is understood is open to the public. This area is separated from the main school campus by a series of approximately 2-3m tall metal mesh fences. A tarmacadam access road ran north to south through the western periphery of the parkland area, allowing vehicular access to the school campus from Spalding Road to the north.

Numerous mature and semi-mature trees were noted throughout the northern parkland area, along the eastern and southern peripheries of the site, and along the threshold between the paved area south of the main building and the southern grassed sports pitches.

The areas surrounding the site to the east, south and west of the site were predominantly residential in character. North-east and north-west of the site, situated along Spalding Road were small commercial premises, inclusive of a Petrol Filling Station and Vehicle Repair Garage.

Current proposals for redevelopment of the site are understood to involve multiple phases of construction, with the objective of extending the existing school complex. Phase 1 will comprise two new classroom extensions, with footprints of approximately 58m^2 and 72m^2 respectively, to be constructed along the eastern and south-eastern elevations of the existing structure. Phase two will involve the extension of the existing school hall, effectively 'filling in' the space between the eastern Phase 1 extension, and existing structure to the south-east. The area of the Phase 2 extension is understood to be approximately 88m^2. Phase 3 will comprise a further extension of the south-eastern section of the existing structure, occupying an area of approximately 267m^2, and involving the construction of three new classrooms and ancillaries.

It is understood that the proposed extensions will be constructed in a similar style (brick, with sloping tiled roof) to that of the existing complex, however at the time of reporting, no specific loadings had been provided. It is understood that a number of mature trees, situated to the east and south-east of the main school building, are to be removed in order to facilitate the development.

In addition, a new vehicular access road may be constructed along the western and southern peripheries of the site as part of the proposed development. To support this construction, consideration is being given to the creation of a new soakaway drainage system adjacent the western site boundary.

Copies of drawings produced by Kier Construction, showing the proposed phases of construction have been included in Appendix A.

This report summarises the findings of an Intrusive Ground Investigation that was undertaken at the site in October 2022, by Grange GeoConsulting Ltd.

Authorisation to proceed with this report was given by Lindum Group Ltd. in October 2022.

This report was written with the benefit of a Phase 1 Desk Study produced in January 2022 by Delta Simons Ltd, which should be read in conjunction with this report. The Phase 1 was undertaken with the objective of establishing the historical, environmental, geotechnical, hydrological, and hydrogeological setting of the site, and included a preliminary risk assessment with respect to the proposed development. The risk assessment did not identify any plausible contaminant linkages considered likely to represent a significant contaminative risk to the development, and no further investigative work was considered necessary, however at the request of Lindum Group Ltd, the current investigation scope, which was primarily undertaken for purposes of geotechnical design, included a geo-environmental appraisal based on empirical data.

1.2 Objectives

The overall objective of the work undertaken was to carry out a ground investigation and assessment of the site:

- to assess the environmental quality of the underlying soils and their potential to adversely impact on site end users and the wider environment;
- to provide geotechnical information to enable preliminary foundation design;
- to provide information regarding the foundations of the existing school complex;
- to assess the drainage characteristics of soils toward the western periphery of the site in support of a possible new soakaway drainage structure; and
- to assess any potential ground gas issues associated with the development.

1.3 Scope of Works

The scope of works, as outlined in the Grange GeoConsulting Ltd proposals submitted to Lindum Group Ltd. on the 5th August 2022 are summarised below.

- Dynamic (window) sampling in 4No. locations to depths of between 4.0m and 5.0m bgl (or refusal) to enable the inspection of soils encountered, and the collection of soil samples;
- In-situ geotechnical testing (SPTs) to be undertaken to assess the density of the underlying ground to support geotechnical design;
- The hand excavation of 3No. inspection pits against elevations of the existing school building in order to examine existing foundation construction and to establish (where possible) the founding stratum in each location;
- The installation of 2No. groundwater/ground gas monitoring standpipes (WS1 and WS4);
- Mechanical excavation of 2No. trial pits to depths of 1.5m and 1.6m bgl respectively (depth at which groundwater was encountered in this location) in order to enable soakaway testing in general accordance with BRE guidance document 365.
- Ground gas monitoring on 4No. occasions following standpipe installation and well stabilisation.
- Laboratory chemical (contamination) and geotechnical analysis of soils; and
- Collation of the findings within an interpretative report.

1.4 Provided Information

The following has been provided to Grange GeoConsulting Ltd by the Client, Lindum Group Ltd. for use in the preparation of this report:

- Proposed Development Layout (GA Plan) for Phase 1 (Option A) produced by Kier Construction. (Drawing Ref. WSP69-DBS-00-00-DR-A-1200 Rev. P02) dated January 2022.
- Proposed Development Layout (GA Plan) for Phase 2 produced by Kier Construction. (Drawing Ref. WSP69-DBS-00-00-D-A-1202 Rev. P02) dated January 2022.
- Proposed Development Layout (GA Plan) for Phase 3 produced by Kier Construction. (Drawing Ref. WSP69-DBS-00-00-D-A-1203 Rev. P02) dated January 2022.
- Preliminary Geo-Environmental Risk Assessment (Phase 1 Desk Study)- William Stukeley C of E Primary School, Spalding Road, Holbeach (Report Ref. 18-1108.03) dated 7th January 2022.

1.5 Limitations

This report is based upon information obtained from third party sources, together with observations and data obtained during the recent ground investigation. Any third-party data provided has been accepted at face value and has not been independently verified. Grange GeoConsulting Ltd can therefore give no warranty, representation, or assurance as to the accuracy or completeness of such information.

The spacing of excavations, and the sampling and analysis undertaken is considered to have provided a reasonable level of certainty concerning the ground conditions. However, it is important to recognise that contamination can be both widespread and relatively localised, depending upon its source and nature. No investigation, however comprehensive, can be expected to determine the nature and extent of all contamination that could be present, and there will always be an element of uncertainty. The potential for currently undetected contamination to be present must therefore be considered not only in the risk assessment presented within this report, but also in consideration of future development activities, i.e. health and safety planning and risk management.

This report has been prepared for the sole internal use and reliance of the Client, Lindum Group Ltd. and shall not be relied upon by other parties without the express written authority of Grange GeoConsulting Ltd. If an unauthorised third party comes into possession of this report, they then rely on it at their own risk.

2.0 GROUND INVESTIGATION

2.1 Investigation Rationale

The ground investigation rationale, summarised in Table 2.1 is based on the requirements of the Client, outlined in information/correspondence provided to Grange GeoConsulting Limited.

Table 2.1: Investigation Rationale

Exploratory Holes	Purpose
Window sample boreholes (WS1 to WS4 inclusive) excavated to between 4.0m and 5.0m below ground level (bgl).	• Enable logging of the soils encountered and assess ground conditions at the site. • Carry out in-situ penetration testing (SPTs) to assess the density of the ground within the window sample boreholes. • Enable the installation of groundwater/ground gas monitoring standpipes. • Allow the collection of soil samples for chemical (contamination) and geotechnical testing. • WS1 was excavated within the proposed footprint of the southern Phase 1 extension. • WS2 and WS3 were excavated within the proposed footprint of the Phase 3 extension. • WS4 was excavated within the proposed footprint of the Phase 2 extension, and represented ground conditions in the adjacent eastern Phase 1 extension.
Hand Excavated Trial Pits (TP1 to TP3 inclusive) progressed to between 0.25m and 0.47m bgl.	• Enable logging of the soils encountered. • Examine the structural characteristics of the existing school foundations, and where possible to identify and describe the founding stratum. • TP1 was excavated at the proposed threshold between the existing structure and the southern Phase 1 extension. • TP2 was excavated at the proposed threshold between the existing structure and the Phase 3 extension. • TP3 was excavated at the proposed threshold between the existing structure and the Phase 2 extension.
Machine excavated Trial Pits (SA1 and SA2) undertaken to depths of between 1.5m and 1.6m bgl.	• Enable logging of the soils encountered. • Enable soakaway testing to be carried out in general accordance with BRE 365. • SA1 and SA2 were undertaken toward the northern and southern extents of the proposed soakaway drainage feature, respectively.

2.2 Site Works

The fieldwork phase of the ground investigation was undertaken on the 24th and 25th October 2022. A selection of photographs taken during the investigation are presented in Appendix B.

The approximate positions of the excavations were surveyed using a tape measure, with distances measured from landmarks present on site. The locations are shown in the Site Investigation Plan (Drawing R22126-DWG2) provided in Appendix A. The works undertaken are summarised in Table 2.2. The exploratory hole logs, including details of the ground conditions encountered, water strikes, any visual or olfactory evidence of contamination, and in-situ testing are presented in Appendix C.

Table 2.2: Summary of Site Works

Exploratory Holes	Depth (m bgl)	In-situ testing	Observations
WS1	5.0m bgl	SPTs undertaken at 1m intervals throughout the excavation. Low SPTs at 1.2m, 3m and 4m. Low to Moderate SPT at 2m and Moderate to High SPT at 5m bgl. No SPT refusals (N>50) noted.	Hand pit excavated to 1.2m bgl due to potential services. Groundwater strike encountered at 2.3m bgl. No visual or olfactory evidence of contamination noted. Borehole collapsed to 2.4m bgl on completion of drilling. Standpipe installed to 3.0m bgl. Response zone between 1.0m and 3.0m bgl.
WS2	4.0m bgl	SPTs undertaken at 1m intervals throughout the excavation. Low SPTs at 1.2m, 2m and 3m bgl, Low to Moderate SPT at 4m. No SPT refusals (N>50) noted.	Hand pit excavated to 1.2m bgl due to potential services. Groundwater strike encountered at 1.4m bgl. No visual or olfactory evidence of contamination noted. Borehole collapsed to 2.08m bgl on completion of drilling. Excavation was backfilled with bentonite and arisings.
WS3	4.0m bgl (SPT to 5.0m bgl)	SPTs undertaken at 1m intervals throughout the excavation. Additional SPT undertaken at 5.0m, below borehole excavation depth. Low SPTs at 1.2m, 2m, 3m and 4m bgl, Low to Moderate SPT at 5m. No SPT refusals (N>50) noted.	Hand pit excavated to 1.2m bgl due to potential services. Groundwater strike encountered at 1.6m bgl. No visual or olfactory evidence of contamination noted. Borehole collapsed to 2.08m bgl on completion of drilling. Excavation was backfilled with bentonite and arisings.
WS4	5.0m bgl	SPTs undertaken at 1m intervals throughout the excavation. Low SPTs at 1.2m, 2m, 3m and 4m. Low to Moderate SPT at 2m and Moderate to High SPT at 5m bgl. No SPT refusals (N>50) noted.	Hand pit excavated to 1.2m bgl due to potential services. Groundwater strike encountered at 1.8m bgl. No visual or olfactory evidence of contamination noted. Borehole collapsed to 2.7m bgl on completion of drilling. Standpipe installed to 2.7m bgl. Response zone between 1.0m and 2.7m bgl.
TP1	0.27m bgl	None	Hand excavated. Trial Pit was stable. No visual or olfactory evidence of contamination. Excavation was backfilled with arisings.
TP2	0.25m bgl	None	Hand excavated. Trial Pit was stable. No visual or olfactory evidence of contamination. Excavation was backfilled with arisings.
TP3	0.47m bgl	None	Hand excavated. Trial Pit was stable. No visual or olfactory evidence of contamination. Excavation was backfilled with arisings.
SA1	1.5m bgl	Infiltration (Soakaway) Testing undertaken on completion.	Mechanically excavated. Groundwater strike encountered at 1.5m bgl. Trial Pit was stable.

Exploratory Holes	Depth (m bgl)	In-situ testing	Observations
			No visual or olfactory evidence of contamination. Excavation was backfilled with arisings.
SA2	1.6m bgl	Infiltration (Soakaway) Testing undertaken on completion.	Mechanically excavated. Groundwater strike encountered at 1.6m bgl. Trial Pit was stable. No visual or olfactory evidence of contamination. Excavation was backfilled with arisings.

2.3 Ground Conditions

Geological mapping published by the British Geological Survey (BGS) for the area indicates the site to be underlain by superficial Tidal Flat Deposits, of quaternary age. Tidal flat deposits are deposited on land in an intertidal zone that is alternately covered and uncovered by the rise and fall of the tide. They typically comprise soft silty clays, with layers of sand, gravel, and peat.

The BGS record the superficial deposits to overlie solid geology (bedrock) from the West Walton Formation of Jurassic age. Strata from the West Walton formation generally consist of calcareous mudstone, silty mudstone and/or siltstone deposits, with subordinate fine-grained sandstones and argillaceous limestone (cementstone) or siltstone nodules.

No faults are recorded locally by the BGS.

The ground conditions encountered are shown in full on the logs presented in Appendix C and summarised below in Table 2.3. The observed ground conditions were in general accordance with the published geological records. Made Ground was encountered during the investigation at thicknesses of between 0.4m and 1.35m.

Table 2.3: Strata Encountered

Stratum Description	Depth to Top (m bgl)	Depth to Base (m bgl)	Thickness (m)
Hardstanding (Tarmacadam) (WS1)	0.0m bgl (Ground Level)	0.05m bgl	0.05m
Topsoil Topsoil was encountered at the surface in two locations (SA1 and SA2). This material was described as dark brown slightly sandy Silt.	0.0m bgl (Ground Level)	0.2m to 0.32m bgl	0.2m to 0.32m

Stratum Description	Depth to Top (m bgl)	Depth to Base (m bgl)	Thickness (m)
Made Ground Made Ground was encountered below the hardstanding in WS1, below the topsoil in SA2, and at the surface in WS2, WS3 and WS4 as one of 5No. sub-types; • Light grey/dark grey Sand and Gravel • Soft brown slightly sandy Silt. • Orange slightly gravelly Sand • Brown silty to very silty slightly gravelly, locally cobbly Sand • Dark brown, locally dark reddish brown, slightly sandy to sandy slightly gravelly, locally slightly cobbly Silt	0.0m (Ground Level) to 0.2m bgl	0.4m to 1.35m bgl	0.4m to 1.3m
Tidal Flat Deposits A sequence of predominantly granular and cohesive strata encountered in each of the excavations, typically recorded as: • Soft to firm brown/light brown/orangish brown/reddish dark brown locally and variably slightly sandy to very sandy SILT, or; • Brown/dark grey/light brown slightly silty to very silty SAND.	0.32m to 1.35m bgl	1.5m to 5.0m bgl (base unproven)	0.8m to 4.2m (thickness unproven)

2.3.1 Hardstanding

Hardstanding was recorded at the surface in one of the excavations (excluding foundation inspection pits- See Section 2.7) undertaken during the investigation. Borehole WS1, situated to the south of the existing school building within the proposed footprint of the southern Phase 1 extension, recorded Tarmacadam between 0.0m and 0.05m bgl.

2.3.2 Topsoil

Topsoil was encountered at the surface in two locations (SA1 and SA2), excavated toward the western periphery of the site, and recorded to depths of 0.32m and 0.2m bgl respectively. This material was described as dark brown slightly sandy Silt. The sand component was in both cases described as fine. The topsoil in SA1 was considered to potentially represent part of a naturally derived weathered sequence associated with the Tidal Flat Deposits (see 2.3.4). In SA2, the topsoil was underlain by Made Ground, indicating that the material may have placed at the surface during earthworks.

2.3.3 Made Ground

Made Ground was encountered below the hardstanding in WS1, below a layer of topsoil in SA2, and at the surface in WS2, WS3 and WS4. The thickness of the Made Ground varied between 0.4m and 1.3m.

Five principal made ground sub-types were identified during the works. A summary of these types and their distribution is presented below.

- Light grey/dark grey Sand and Gravel. The sand was fine to coarse. The gravel component was described as fine to coarse, angular to rounded of flint, dolerite, sandstone, quartz, and limestone. This subtype was encountered in WS1 below the hardstanding at a depth of 0.05m bgl, and recorded to a depth of 0.35m bgl. It is considered likely that material comprised a sub-base for the overlying Tarmacadam surface.

- Soft brown slightly sandy Silt. The sand was fine. This material was recorded in WS1 between 0.35m and 0.8m bgl, and appeared similar in composition to the Tidal Flat Deposits recorded at depth (See Section 2.3.4). A geotextile membrane was identified at 0.5m bgl. It is considered possible that this horizon comprised reworked natural material, potentially reinforced using a membrane.

- Orange slightly gravelly Sand. The sand was described as fine to medium. The gravel was occasional, fine, rounded of feldspar. This subtype was recorded in WS1 between 0.8m and 1.35m bgl. Occasional plastic fragments were identified within this horizon.

- Brown silty to very silty slightly gravelly, locally cobbly Sand. The sand was fine. Gravel was fine to coarse, subangular to angular of concrete, sandstone, and rare coal. Cobbles comprised subangular to angular concrete. This subtype was recorded in WS2 between 0.0m (ground level) and 0.4m bgl, and in WS3 between 0.0m (ground level) and 0.8m bgl.

- Dark brown, locally dark reddish brown, slightly sandy to sandy slightly gravelly, locally slightly cobbly Silt. The sand was fine. Gravel was fine to coarse, subangular to subrounded of concrete, sandstone, brick, feldspar, and quartz. Recorded in WS4 between 0.0m (ground level) and 0.8m bgl, and in SA2 between 0.2m and 0.8m bgl.

The composition and depth/thickness of Made Ground encountered across the site appeared highly variable.

2.3.4 Tidal Flat Deposits

An alternating sequence of predominantly cohesive and granular strata consistent with Tidal Flat Deposits was encountered below the Made Ground and/or Topsoil in each of the excavations.

The cohesive component of this sequence was typically described as soft to firm brown/light brown/orangish brown/reddish dark brown locally and variably slightly sandy to very sandy SILT. The sand (where present) was fine. This material was recorded in WS2 between 0.4m and 2.8m bgl, in WS3 between 0.8m and 2.3m bgl, in WS4 between 0.8m and 3.65m bgl, in SA1 between 0.32m and 1.5m bgl, and in SA2 between 0.8m and 1.6m bgl.

The granular subtype was generally recorded as brown/dark grey/light brown slightly silty to very silty SAND, and was encountered in WS1 between 1.35m and 5.0m bgl, in WS2 between 2.8m and 4.0m bgl, in WS3 between 2.3m and 4.0m bgl, and in WS4 between 3.65m and 5.0m bgl. The sand was described as fine.

Whilst the lateral and vertical distribution of these units varied significantly across the site, in general, where both granular and cohesive deposits were encountered in a single excavation, the former was typically recorded at the base of the sequence.

No consolidated material (rockhead) was encountered during the investigation.

2.3.5 Excavation Stability

Instability was noted in each of the borehole excavations (WS1 to WS4 inclusive) undertaken during the investigation. Collapses were recorded in each on completion of drilling to depths of between 2.08m and 2.7m bgl. The depth of instability appeared to be weakly correlated with the depth at which groundwater was encountered. Both mechanically excavated Trial Pits (SA1 and SA2) were terminated at or above the level of groundwater, and remained stable.

2.4 Visual and Olfactory Evidence of Contamination

No visual or olfactory evidence of contamination (including organic/hydrocarbon staining or odours) was identified in any of the excavations undertaken as part of the investigation.

2.5 Groundwater Strikes

Groundwater strikes were encountered during the fieldwork phase in each of the excavations (excluding foundation inspection pits) undertaken during the site investigation. A summary of groundwater strikes is included on Table 2.2, summarised below in Table 2.4, and provided along with observations on the borehole logs presented as Appendix C.

Table 2.4: Groundwater Strike Summary

Excavation Location	Depth of Water Strike (mBGL)
WS1	2.3m bgl
WS2	1.4m bgl
WS3	1.6m bgl
WS4	1.8m bgl
SA1	1.5m bgl
SA2	1.6m bgl

Four weekly groundwater monitoring visits were undertaken following completion of the fieldwork, and a period of well stabilisation. The visits were carried out between the 2nd November and 23rd November 2022. During each visit, the standpipes were found to be dry, and the well base significantly shallower than the original install depth (2.18m bgl in WS1 and 2.28m bgl in WS2), potentially indicative of rapid silt ingress. The groundwater monitoring certificates are included in Appendix D.

2.6 In-situ Testing

2.6.1 Standard Penetration Tests

Standard Penetrations Tests (SPTs) were undertaken during the advancement of the window sample boreholes. The SPT (N values) results are presented in Table 2.5.

Table 2.5: SPT Results (N values)

Window Sample Boreholes	Depth SPT undertaken (m)	SPT (N values) recorded
WS1	1.2m bgl	3
	2.0m bgl	11
	3.0m bgl	7
	4.0m bgl	8
	5.0m bgl	39
WS2	1.2m bgl	10
	2.0m bgl	8
	3.0m bgl	8
	4.0m bgl	14
WS3	1.2m bgl	8
	2.0m bgl	8
	3.0m bgl	3
	4.0m bgl	3
	5.0m bgl (beyond borehole excavation depth)	14
WS4	1.2m bgl	4
	2.0m bgl	7
	3.0m bgl	3
	4.0m bgl	3
	5.0m bgl	32

Table 2.6 summarises the findings of the SPT testing undertaken, presented by depth.

Table 2.6: SPT Results

Depth (m below ground level)	Minimum Recorded SPT 'N' Value	Maximum Recorded SPT 'N' Value	Mean Average SPT 'N' Value
1.2m	3	10	6.3
2.0m	7	11	8.5
3.0m	3	8	5.3
4.0m	3	14	7
5.0m	14	39	28.3

Table 2.7 summarises the findings of the SPT testing undertaken, presented by geological unit (see section 2.3).

Table 2.7: SPT Results

Strata Type	No. of Tests	Minimum Recorded SPT 'N' Value	Maximum Recorded SPT 'N' Value	Mean Average SPT 'N' Value*
Made Ground	1	3	3	3
Tidal Flat Deposits (Cohesive Component)	7	3	10	6.9
Tidal Flat Deposits (Granular Component)	11	3	39	12.9

2.7 Foundation Trial Pits

Three trial pits were excavated on the 25th October 2022 against the existing school building within the proposed footprints of the southern Phase 1 extension (TP1), the Phase 3 extension (TP2), and the Phase 2 extension (TP3). Each of the excavations were advanced using hand-techniques. The excavation locations were set out on site by Grange GeoConsulting Ltd. A plan of the excavation locations is included in Appendix A.

The soil profile and other significant features were recorded as each exploratory hole was progressed.

Excavations were progressed to the base of the exposed footing, and/or maximum depth achievable by hand excavation, and where necessary extended by a manual probe in order to determine foundation dimensions. Reinstatement constraints limited the size of the inspection pits, which in turn resulted in access limitations with respect to foundations. Overall the programme did identify the likely foundation option previously selected for the existing structure. Logs were produced showing the size, depth, and configuration of the exposed foundations. Relative measurements of foundation depths were taken from adjacent ground levels.

Sketch drawings and photographs showing the findings of the exercise are included in Appendix E. A summary is provided below by location.

2.7.1 TP1 (Southern Phase 1 Extension)

The external brick wall in this location extended approximately 270mm below the adjacent ground level, terminating on a footing of concrete construction. The concrete foundation extended horizontally for a distance of at least 380mm, which was the full extent of the opening through the existing hardstanding made to facilitate the inspection pit. Due to restrictions associated with reinstatement, the break in the hardstanding (380mm) could not be further extended, and the excavation was terminated.

Tarmacadam hardstanding was encountered at the surface in TP1, and recorded to a depth of 0.015m bgl. This substrate was underlain by a sub-base material described as Light yellowish brown slightly sandy to sandy Gravel. The sand was fine to coarse. Gravel was fine

to coarse, subangular to angular of limestone. This material was recorded to the top of the concrete footing. A geotextile membrane was encountered between the concrete footing and the overlying sub-base material.

2.7.2 TP2 (Phase 3 Extension)

The external brick wall extended approximately 250mm below the adjacent ground level, terminating on a footing of concrete construction. The concrete foundation extended horizontally for a distance of 350mm, which was found to be the lateral extent of the footing. Due to restrictions associated with reinstatement, the break in the hardstanding opened to facilitate the excavation could not be further extended, therefore whilst the lateral extent of the excavation was established, it was not possible to extend the pit downward to determine foundation depth.

Tarmacadam hardstanding was encountered at the surface and recorded to a depth of 0.11m bgl. The hardstanding was underlain by a sub-base material described as light yellowish brown slightly sandy to sandy Gravel. The sand was fine to coarse. Gravel was fine to coarse, subangular to angular of limestone. This material was recorded to the top of the concrete footing. A geotextile membrane was encountered between the concrete footing and the overlying sub-base material.

2.7.3 TP3 (Phase 2 Extension)

The external brick wall in this location extended vertically to an approximate depth of 270mm below the adjacent ground level, terminating on a footing of concrete construction. The concrete foundation extended horizontally for a distance of 300mm, before continuing vertically to a depth of 0.47m bgl, at which point a probe was pushed under the concrete, confirming the base of the footing.

The inspection pit proved tarmacadam hardstanding at the surface, extending to a depth of approximately 0.14m bgl. This substrate was underlain by a sub-base material described as light yellowish brown slightly sandy to sandy Gravel, recorded to the base of the inspection pit at 0.4m bgl. The sand was fine to coarse. Gravel was fine to coarse, subangular to angular of limestone. Due to the access constraints associated with the maximum lateral extent of the inspection pit, and the orientation of the excavation, it was not possible to extend the excavation beyond 0.4m bgl. The base of the foundation was confirmed using a metal probe extended through the pit base.

2.7.4 Summary

Based on the size and limited thickness (200mm) of the concrete foundation identified in TP3, the similarity with the partial exposures achieved in TP1 and TP2, and the generally poor geotechnical performance of the near surface Tidal Flat Deposits proven across the site, it is considered likely that the inspection pits encountered a concrete ring beam, potentially indicating the use of piled foundations in constructing the original school building.

3.0 CHEMICAL (CONTAMINATION ANALYSIS) LABORATORY TESTING

3.1 Sampling Strategy

The following soil samples were taken by Grange GeoConsulting Ltd on the 24th October 2022:

- 5 No. soil samples from the various Made Ground sub-types for chemical and waste acceptance criteria (WAC) analysis; and
- 4 No. soil sample taken from the Tidal Flat Deposits for chemical and waste acceptance criteria (WAC) analysis.

Samples were taken, stored, and transported in general accordance with the British Standard 10175: 2011 Code of Practice for Investigation of Potentially Contaminated sites, and transported by courier to I2 Analytical Services; a UKAS accredited laboratory.

Copies of the analysis Certificates are included in Appendix G.

3.2 Laboratory Analyses Undertaken

A broad suite of analysis was undertaken on the samples obtained, which included the following determinands:

Soils

Arsenic (As), Cadmium (Cd), Hexavalent and Total Chromium (Cr III and VI), Copper (Cu), Lead (Pb), Inorganic Mercury (Hg), Nickel (Ni), Selenium (Se), Vanadium (V), Zinc (Zn), Total Cyanide, pH, Organic Matter, Asbestos Screen, speciated and Total Poly-Aromatic Hydrocarbons (PAH), BTEX, Methyl Tert-butyl Ether (MTBE), Speciated Total Petroleum Hydrocarbons (TPH) analysed using CWG Methodology.

In addition to the tests described above, one sample from the Made Ground, and two samples taken from the Tidal Flat Deposits were scheduled for full (inert) WAC analysis suite.

4.0 CONTAMINATION RISK ASSESSMENT CRITERIA

A risk-based approach is used for the assessment of contamination. This requires identification of a contaminant source, a receptor, and a realistic pathway via which the contaminant may reach the receptor. The key receptors considered in this assessment are human health (future site users (including primary school pupils and ground workers) and controlled waters (groundwater and surface waters).

The Risk Assessment is a two-stage process. The first stage is to perform a Generic Quantitative Risk Assessment (GQRA) - the soil test results have been compared against the relevant Generic Assessment Criteria (GAC). In the absence of a complete regulatory set of screening values, derived using the CLEA Framework, Grange GeoConsulting Limited GAC screening values have been utilised and are based on the following:

- Category 4 Screening Levels (C4SLs) published by DEFRA;
- The 2014 Land Quality Management (LQM) / Chartered Institute of Environmental Health (CIEH) Suitable for Use Levels for Human Health Risk Assessment (S4ULs); and
- Guidance values produced by the Environmental Industries Commission (EIC), the Association of Geotechnical and Geoenvironmental Specialists (AGS), and Contaminated Land: Application in Real Environments (CL:AIRE) in December 2009.

The second stage of the Risk Assessment process is Risk Evaluation, which comprises an authoritative review of the findings with other pertinent information in cases where GAC are exceeded, to consider if exceedance may be acceptable in the context of the site.

4.1 Human Health

This is a Tier 2 assessment, using GAC soil screening values, and involves generic human health risk assessment for the following CLEA scenario:

Public Open Space (Residential)- This end use is defined as land 'in close proximity to residential housing'. The critical receptor is modelled as a 3- to 9-year-old female child. No consumption of homegrown produce is assumed. Exposure is likely to be short term (occupational/school attendance), as contrasted with more significant exposure durations associated with residential use.

Whilst residential use is not proposed for the site, the exposure characteristics associated with the above scenario (in particular the age of receptors, and use by playing children) is considered most representative.

The chemical (contamination analysis) testing results have been screened against Grange GeoConsulting Ltd GAC screening values (provided in Appendix F) to carry out an assessment of potential risks associated with contamination at the site. Justification for the criteria adopted for this Risk Assessment is given in Appendix F. In the case where all the samples tested for a given substance were below the GAC, no further consideration is necessary for that substance.

Contaminant concentrations recorded during chemical analysis have been directly compared with GACs as a worst-case scenario.

The mean average Soil Organic Matter Content (SOM) has been calculated for each of the of the units sampled. GACs for organic contaminants have been based on a representative SOM, derived from the mean organic matter content recorded during laboratory analysis. Table 4.1 presents the average SOM content for each geological unit, and the subsequent adopted soil organic matter content for GAC comparison.

Table 4.1: Soil Organic Matter Content for GAC Comparison

Stratum	Mean average of recorded SOM values (%)	Adopted GAC SOM (%)
Made Ground	2.0%	2.5%
Tidal Flat Deposits	1.1%	1.1%

5.0 CONTAMINATION ANALYSIS TESTING RESULTS AND RISK ASSESSMENT

5.1 Soil Analysis Results

5.1.1 Inorganic Contaminants (including Metals and Metalloids)

None of the metal/semi-metal or inorganic contaminants tested were considered to be significantly elevated, or recorded at concentrations which exceeded GACs for a Public Open Space (Resi) end-use scenario in any of the samples tested.

5.1.2 Total Petroleum Hydrocarbons (TPHs)

Whilst traces of aliphatic and aromatic hydrocarbons within the C10-C35 range were identified in a sample taken from WS2 at a depth of 0.0m-0.40m bgl and WS4 at 0.1m to 0.4m bgl, none of the individual carbon bands analysed during the Ground Investigation exceeded the adopted Generic Assessment Criteria.

5.1.3 Polycyclic Aromatic Hydrocarbons (PAHs)

One sample, taken from Made Ground in WS2 (0.0m to 0.4m bgl) proved individual PAH species at concentrations slightly exceeding relevant GACs for a Public Open Space (Resi) end use scenario, taking into consideration the appropriate SOM content. These exceedances are presented in Table 5.1.

Table 5.1: PAH Exceedances

Borehole Location	Sample Depth (m bgl)	Stratum	Determinand	Recorded Concentration (mg/kg)	GAC (mg/kg)
WS2	0.0m to 0.40m	Made Ground	Benzo(b)fluoranthene	14	7.1
			Benzo(a)pyrene	11	5.7
			Dibenz(a,h)anthracene	1.6	0.57

5.1.4 Asbestos

The concentration of asbestos within each of the samples analysed during the site investigation was found to be below qualitative (microscopy) laboratory levels of detection (<0.001%).

5.1.5 BTEX and MTBE

None of the individual compounds collectively referred to as BTEX, or MTBE were recorded at concentrations of in excess of laboratory levels of detection within the sample tested.

5.2 Waste Acceptance Testing

Samples were taken from the Made Ground and Tidal Flat Deposits for the purpose of Waste Acceptance Criteria (WAC) testing. The results are presented in Table 5.2 and the certificates included in Appendix G.

Table 5.2: Waste Acceptance Criteria Testing

Borehole Location	Stratum	Sample Depth	WAC Classification
WS1	Made Ground	1.2m to 1.3m bgl	Inert
WS3	Tidal Flat Deposits	1.0m to 1.2m bgl	Inert
WS4	Tidal Flat Deposits	1.5m to 1.6m bgl	Inert

The chemical testing results indicate that the Made Ground and Tidal Flat Deposits tested are likely to qualify as ‘inert’ for purposes of waste disposal.

It is recommended that the off-site disposal of the materials is discussed with the waste haulage contractor and the landfill provider or soil treatment facility to ensure that materials are disposed of appropriately and in line with duty of care and standard good practice.

6.0 RISK ASSESSMENT

A Conceptual Site Model represents the possible relationships between potential contaminant sources, pathways, and receptors in line with the Statutory Guidance to Part 2a of the Environmental Protection Act 1990. Plausible contaminant sources, pathways, and receptors have been identified and assessed based on the findings of the Phase 2 Ground Investigation, and the Phase 1 Desk Study/PRA undertaken in January 2022 by Delta Simons.

6.1 Sources

Laboratory chemical analysis results have identified localised contamination in soils underlying the site.

One sample, taken from Made Ground in WS2 (0.0m to 0.4m bgl) proved individual PAH species (benzo(b)fluoranthene, benzo(a)pyrene, and dibenz(a,h)anthracene at concentrations exceeding relevant GACs for a Public Open Space (Resi) end use scenario, taking into consideration the appropriate SOM content.

None of the remaining samples, including those taken from Made Ground across the site recorded any inorganic or organic determinands at concentrations which exceeded adopted GACs.

It should be noted that the current investigation has been restricted to the areas associated with proposed development works. A wider assessment of the remainder of the school complex is beyond the current scope.

6.2 Receptors

Potential receptors identified with respect to the site include the following:

- Site end users (future site users/visitors, and neighbours)
- Groundworkers (construction, demolition, and future maintenance workers)
- Third Parties During Construction (Adjacent Residential Properties)
- Building materials (buried concrete and underground services)
- Controlled waters: Groundwater (underlying Tidal Flat Deposits and West Walton Formation (Unproductive)), Surface Waters (surface water feature (pond) located 50m south-east of the site).

The Environment Agency have classified the Tidal Flat Deposits and solid strata from the West Walton Formation which underlie the site as Unproductive units. Unproductive strata are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow. Based on this information, the sensitivity of the underlying aquifer unit is considered low.

The closest identified surface water receptor is a small pond located approximately 50m south-east of the site. Whilst located in close proximity, the presence of low permeability deposits

underlying the site is considered likely to significantly attenuate the migration of contaminants toward this receptor. On this basis the off-site watercourse appears to be largely hydraulically isolated from the site.

6.3 Pathways

Potential pathways identified for the site include the following:

- Direct human (dermal) contact
- Inhalation (dust)
- Inhalation (gases and vapours)
- Direct contact with aggressive ground conditions
- Leaching and migration via underlying soils

6.4 Conceptual Site Model and Risk Assessment

A Conceptual Site Model (Table 6.2) has been produced which presents a list of plausible contaminant linkages based on information obtained during the site investigation, and an evaluation of these linkages in accordance with the guidance provided in Environment Agency (2021) Land Contamination Risk Management. (LCRM).

6.4.1 Summary of Potential Contaminant Linkages

Table 6.2 lists the plausible contaminant linkages identified for the site. These are considered as potentially unacceptable risks in in accordance with the guidance provided in Environment Agency (2020) Land Contamination Risk Management. (LCRM). Linkages have been assessed in general accordance with guidance provided in the CIRIA Report C552 (Rudland *et al* 2001) but with the addition of a ‘no linkage’ category as detailed in Table 6.1.

It should be noted that whilst the risk assessment process undertaken in this report may identify potential risks to groundworkers (construction and future maintenance workers), consideration of occupational health and safety issues is predominantly beyond the scope of this report and should be considered separately in the Construction Phase Health and Safety Plan.

Table 6.1: Risk Assessment Process

	Consequence			
Probability	**Severe**	**Medium**	**Mild**	**Minor**
High Likelihood	Very high risk	High risk	Moderate risk	Low risk
Likely	High risk	Moderate risk	Low risk	Very low risk
Low Likelihood	Moderate risk	Low risk	Low risk	Very low risk
Unlikely	Low risk	Very low risk	Very low risk	Very low risk
No Linkage	No risk			

Table 6.2: Conceptual Site Model - Source Pathway Receptor Contaminant Linkages

Source(s)	Possible Pathway(s)	Receptor(s)	Probability	Consequence	Risk	Comments
On Site: Contaminated Made Ground Hotspot PAH contamination identified within the Made Ground around WS2.	Direct human contact (dermal) Inhalation (dust and vapours).	Site end users (future site users, visitors) Adjacent Third Party Receptors During Construction (Neighbouring residential properties), Groundworkers Building materials/utilities	Low Likelihood	Medium	Low	A localised hotspot of PAH contamination has been identified within the Made ground around WS2. The contamination is present within near surface material in an area which following redevelopment will be overlain by hardstanding (proposed Phase 3 extension footprint). The contaminant concentrations recorded marginally exceeded the adopted GACs, and is therefore considered relatively minor. Exposure with respect to human health receptors is likely to be limited to short term, occupation use and school attendance. The presence of proposed hardstanding (footprint of the Phase 3 extension) is considered likely to limit the likelihood that human health pathways may become established. Contaminants encountered (PAHs) are not considered significantly volatile, and are unlikely to result in the release of organic vapours. Construction workers may come into direct contact with contamination present. It is assumed that good working practices including the use of appropriate PPE, regular hand washing, and other hygiene techniques will be adopted which would reduce the likelihood of long-term exposure. The generation of dust during the construction phase is considered possible, with the potential to impact site workers and adjacent/off-site human health receptors (neighbouring residential properties).

Source(s)	Possible Pathway(s)	Receptor(s)	Probability	Consequence	Risk	Comments
On Site: Contaminated Made Ground Hotspot PAH contamination identified within the Made Ground around WS2.	Infiltration, leaching and migration via groundwater and permeable soils	Controlled waters: Tidal Flat Deposits, West Walton Formation (Unproductive), Surface Water Feature (Pond) located approximately 50m south-east of the site.	Low Likelihood	Medium	Low	A localised hotspot of PAH contamination has been identified within the Made ground around WS2. The contaminant concentrations recorded marginally exceeded the adopted GACs, and is therefore considered relatively minor. The contamination is present within near surface material in an area which following redevelopment will be overlain by hardstanding (proposed Phase 3 extension footprint). The presence of proposed hardstanding (footprint of the Phase 3 extension) is considered likely to limit the potential for infiltration and vertical and lateral migration of contaminants following redevelopment. The underlying Tidal Flat Deposits and solid strata from the West Walton Formation have been classified as Unproductive by the EA, and are considered unlikely to be significantly transmissive, based on the findings of the investigation. The closest identified surface water receptor is a pond located approximately 50m south-east of the site. The presence of geological units possessing limited permeability/transmissivity characteristics underlying the site is likely to significantly attenuate the migration of contaminants toward this receptor.

6.5 Residual Risks

The Conceptual Site Model has enabled the examination of possible sources, pathways and receptors which were identified during the intrusive ground investigation, and the evaluation of plausible contaminant linkages considered to represent a potential risk following redevelopment of the site.

Based on the magnitude of harm and the likelihood of a pollutant pathway being established, and the findings of the intrusive investigation it is considered that following redevelopment (in accordance with current proposals), a **Low** risk of harm to human health receptors will remain following redevelopment as a result of contamination present within soils at the site.

The risk to controlled waters resulting from contamination at the site following redevelopment is considered **Low**.

This level of risk is contingent on appropriate steps being followed during the demolition and construction phases. These steps are presented in Section 7.0.

7.0 FURTHER RECOMMENDATIONS (CONTAMINATION)

Based on the findings of the CSM/Risk Assessment the following measures are recommended as part of proposed redevelopment of the site:

- It is recommended that during any groundworks/ remedial works in impacted materials, appropriately licenced contractors should be appointed, PPE/RPE should be worn as necessary by groundworkers, and a safe system of work is established prior to commencement.

- The risk levels identified are contingent on the presence of low-permeability hardstanding in the area around WS2. Should development proposals change, resulting in a change of substrate in this area, it may be necessary to amend the risk assessment and/or undertake remedial works.

- It is recommended that consideration be given, should site preparation/earthworks be required to prepare the substrate around WS2 for development (Phase 3) to the removal and off site disposal of Made Ground (recorded to approximately 0.4m bgl) in this area, in order to remove any future development constraints that might arise.
- It is also recommended given the findings of the investigation that the site construction/earthworks contractor remain vigilant regarding the presence of unexpected contamination issues which may be discovered during the programme. Should any such unexpected contamination be identified, a suitably qualified environmental consultant should be contacted in order to appropriately assess the issue.
- It will be important, during any earthworks in the area surrounding WS2 to control the release of dust, which may otherwise have the potential to impact off site receptors.
- Re-use and/or disposal of site won materials/arisings should be undertaken in accordance with current waste management guidance/regulations.
- Based on the presence of organic contaminants within the Made Ground, it may be necessary to use protected pipework for potable water supplies to the development, particularly where pipework is proposed in the areas around WS2. The local water supplier should be contacted for further details. The results provided as part of this report may be sufficient to confirm this requirement, however it may be necessary to undertake supplemental testing depending on the requirements of the utility provider.

Assuming these recommendations are implemented, it is anticipated that the risk to controlled water and human health receptors may be reduced to **Low**.

Further to the WAC testing described in Section 5.2, arisings generated from the Made Ground and Tidal Flat Deposits are considered likely to be classified as ‘Inert’ for purposes of disposal, subject to further testing.

It may be possible to retain excavated arisings at the site, depending on the material type, and providing these activities are undertaken in accordance with the CL:aire Definition of Waste Code of Practice (DoWCoP) or equivalent, and current Waste Management Regulations.

8.0 GEOTECHINCAL LABORATORY TESTING

8.1 Sampling Strategy

The following soil samples were taken by Grange GeoConsulting Ltd on 24th October 2022 for the purpose of geotechnical testing (excluding samples scheduled for pH testing as part of the chemical analysis programme).

- 8 No. samples from the granular component of the Tidal Flat Deposits.
- 8 No. samples from the cohesive component of the Tidal Flat Deposits.

Samples were taken, stored, and transported in general accordance with the British Standard 10175: 2011 Code of Practice for Investigation of Potentially Contaminated sites, and transported by courier to I2 Analytical Services; a UKAS accredited laboratory.

8.2 Laboratory Analyses Undertaken

Laboratory analysis has been undertaken to assess the density of the underlying ground, and to inform foundation design for the proposed development. The following analyses were undertaken:

- Natural moisture content testing;
- pH testing (as part of chemical suite);
- 6 No. Atterberg limit/Plasticity Index Tests;
- 6 No. Particle Size Distribution Tests; and
- 4 No. Chemical tests for aggressive ground indicators (including water soluble sulphate)

9.0 GEOTECHNICAL TESTING RESULTS

The results of the geotechnical testing programme are summarised in the following section of the report, enabling preliminary geotechnical/foundation design for the proposed development.

9.1 pH

Table 9.1 shows the ranges of pH which were recorded in samples taken from the various units identified on site. Copies of the analysis certificates are included in Appendix H.

Table 9.1: pH test results

Stratum	Min. pH Value Recorded	Max. pH Value Recorded
Made Ground	7.8	8.5
Tidal Flat Deposits	7.9	8.2

9.2 Natural Moisture Content

The natural moisture content of the geotechnical samples taken are presented by geological unit in Table 9.2. The analysis certificates are presented in Appendix H.

Table 9.2: Moisture content test results

Stratum	No. of Tests	Min. Recorded Natural Moisture Content (%)	Max. Recorded Natural Moisture Content (%)
Tidal Flat Deposits (Granular Component)	1	31	31
Tidal Flat Deposits (Cohesive Component)	5	20	34

9.3 Atterberg Testing/Plasticity Index

The volume change potential as described in NHBC Standards 2021 (Chapter 4.2) with respect to building near trees have been determined from the results of plasticity index tests on samples of cohesive soils taken during the investigation. The findings are summarised in Table 9.3.

Table 9.3: Volume Change Potential

Stratum	No. Tests	Modified Plasticity Index (%)	Plasticity Designation	Volume Change Potential
Tidal Flat Deposits (Granular Component)	1	7%	Medium	Low
Tidal Flat Deposits (Cohesive Component)	5	6% to 13%	Low to Medium	Low

9.4 Particle Size Distribution

Particle Size Distribution (PSD) tests were undertaken on samples obtained during the investigation, representative of the geological units encountered. The findings of these tests are summarised in Table 9.4 and presented in full in Appendix H.

Table 9.4: Particle Size Distribution Tests

Borehole Location	Stratum	Sample Depth and Location (m bgl)	Sample Proportions (dry mass %)
WS1	Tidal Flat Deposits (Granular Component)	4.2m to 4.5m bgl.	0% Gravel 70% Sand 30% Fines (<0.063mm)
WS2	Tidal Flat Deposits (Cohesive Component)	0.8m to 1.0m bgl.	0% Gravel 17% Sand 83% Fines (<0.063mm)
WS2	Tidal Flat Deposits (Granular Component)	2.8m to 4.0m bgl.	0% Gravel 57% Sand 43% Fines (<0.063mm)
WS3	Tidal Flat Deposits (Cohesive Component)	1.2m to 2.0m bgl.	0% Gravel 40% Sand 60% Fines (<0.063mm)
WS3	Tidal Flat Deposits (Granular Component)	2.5m to 4.0m bgl.	0% Gravel 62% Sand 38% Fines (<0.063mm)
WS3	Tidal Flat Deposits (Granular Component)	3.7m to 4.5m bgl.	0% Gravel 69% Sand 31% Fines (<0.063mm)

9.5 Aggressive Ground

The results of the chemical analysis undertaken with respect to aggressive ground indicators are presented in Table 9.5.

Table 9.5: Aggressive Ground Testing.

Stratum	No. of Tests	Total Sulphate as SO4 (%)		Water Soluble Sulphate as SO4 (g/l)		Total Sulphur (%)	
		Min	Max	Min	Max	Min	Max
Tidal Flat Deposits	4	0.019	0.037	0.0074	0.077	0.01	0.055

In accordance with BRE (Special Digest 1), the Design Sulphate (DS) classification and the Aggressive Chemical Environment for Concrete (ACEC) classification have been calculated with respect to the Tidal Flat Deposits as DS-1 AC-1s. This classification assumes static, and brownfield conditions.

10.0 INFILTRATION TESTING

Following the excavation of Trial Pits toward the western periphery of the site (SA1 and SA2), infiltration (soakaway) testing was undertaken within each in general accordance with the guidance established in BRE Guidance Document 365 (2016). The results of soakaway testing are summarised in Table 10.1. The results sheets are presented in Appendix I.

Table 10.1: Infiltration Test Results

Stratum	Trial Pit No.	Depth	Infiltration Rate (m/s)		
			Test 1	Test 2	Test 3
Tidal Flat Deposits (Cohesive Component)	SA1	1.5m bgl.	Unable to Calculate		
Tidal Flat Deposits (Cohesive Component)	SA2	1.6m bgl	Unable to Calculate		

Neither of the soakaway tests undertaken at the site recorded sufficient infiltration (reduction in recorded water levels to 75% of initial fill level) to enable a permeability calculation. As a result, and given the poor drainage characteristics encountered in this location, the implementation of soakaway drainage across the western section of the site is not considered viable.

Further advice should be sought from a suitably qualified drainage engineer.

11.0 GEOTECHNICAL INTERPRETATION AND RECOMMENDATIONS

11.1 Foundations

Current proposals for redevelopment of the site are understood to involve multiple phases of construction, with the objective of extending the existing school complex. Phase 1 will comprise two new classroom extensions to be constructed along the eastern and south-eastern elevations of the existing structure. Phase two will involve the extension of the existing school hall, effectively 'filling in' the space between the eastern Phase 1 extension, and existing structure to the south-east. Phase 3 will comprise a further extension of the south-eastern section of the existing structure, involving the construction of three new classrooms and ancillaries. At the time of the investigation proposed building loads had not been provided.

The exploratory holes encountered Made Ground or Topsoil to a depth of between 0.4m and 1.35m bgl, overlying an alternating sequence of predominantly granular and cohesive Tidal Flat Deposits to a maximum recorded depth of 5.0m.

Made Ground will not be suitable as a foundation stratum due to its inherent variability and risk of intolerable differential settlement. The natural Tidal Flat Deposits exhibited consistently low SPT values to depths exceeding 4m bgl.

Due to its low inherent strength, the near surface Tidal Flat Deposits are considered unlikely to be suitable as a founding stratum for the proposed development using strip or trench fill foundations.

It is therefore recommended that an alternative foundation option is adopted at the site with respect to the proposed development. The following sections will discuss potential alternative foundation options.

It should be noted that where extensions are proposed, foundation design should be sympathetic with the construction characteristics of the existing structure. Foundation pits excavated against the existing school structure identified the presence of shallow concrete footings potentially indicative of a ring beam structure (See section 2.7). On this basis it is considered possible that the existing structure was constructed using piled foundations.

11.1.1 Piled Foundations

The proposed extensions may be founded on a system of ground beams spanning onto piles taken down into the deeper Tidal Flat Deposits, which exhibited increased geotechnical strength, or alternatively to solid strata from the West Walton Formation, which was not encountered during the excavation. Should it be necessary to found on the bedrock, additional investigation works are likely to be necessary in order to identify and prove the geotechnical suitability of this unit.

A variety of pile types may be used, including driven, bored, and continuous flight auger (CFA) piles, subject to constraints on noise and vibration.

Because of the various advantages and limitations of each pile type, and the cost implications, advice should be sought from specialist piling contractors to determine the most suitable and

cost-effective type. They should also be able to give recommended pile diameters and depths and likely pile capacities, with guaranteed performance. It is recommended a pile test be carried out to confirm pile capacities. In assessing the pile capacities, contractors should make an allowance for the effects of negative skin friction.

For piled foundations floor slabs should be designed as suspended.

There may be differential settlement between piled structures and the surrounding ground level. Provision should therefore be made to make up ground levels at threshold positions, loading bays, vehicle access doorways, etc. Alternatively, these materials should be removed and replaced in a controlled manner by suitable existing materials or imported engineered fill.

11.1.2 Ground Improvement

Alternatively ground treatment (e.g. vibro displacement) may be an option, subject to environmental and noise/vibration constraints.

Vibro systems can be used to treat granular deposits, fills, made ground and soft clays/silts. Once the treatment has been carried out, spread foundations may be adopted across the site, and designed to the proposed loadings. Providing that any imported fill material between the top of the columns and the underside of the floor slab is placed in a controlled manner, floor slabs may be ground bearing.

It is essential the advice of an experienced specialist contractor is sought, and positive assurances should be sought from an experienced specialist contractor that the proprietary system proposed is capable of providing the required working loads in the ground conditions encountered, with a guarantee on maximum settlement for both footings and floor slabs.

11.1.3 Ground Floor Slabs

Floor slabs should be constructed as suspended where Made Ground is greater than 600mm thickness, or foundations are located within the zone of influence of a (new planted) tree.

Ground floor slabs may be constructed as ground bearing providing foundations are not within the zone of influence of a tree, where the floor slabs overlie natural materials, or where a piled solution has been adopted. Where Made Ground is predominantly granular in nature and less than 1.2m thick, ground bearing slabs may be suitable provided the Made Ground is compacted with a heavy vibrating roller and any soft spots removed and replace by granular fill.

11.2 Groundwater

Based on the findings of the investigation, groundwater may be encountered within shallow excavations at the site, at an approximate depth of between 1.4m and 2.3m bgl. Whilst it is considered that the geological units encountered are unlikely to be significantly permeable, it is considered possible that excavations below the groundwater levels encountered are likely to experience pooling/ponding. Excavations are likely to act as a sump, potentially requiring dewatering.

It should also be noted that during the investigation, Tidal Flat Deposits (both predominantly cohesive and granular components) present below the level of groundwater were prone to collapse on removal of confinement. This should be taken into consideration when planning any excavation work.

11.3 Buried Concrete

Based on guidelines provided in BRE Special Digest 1, the Tidal Flat Deposits at the site may be classified as Design Sulfate Class DS-1 and ACEC Class AC-1s.

This equates to a Designated Concrete Class DC-1 for a 50year design life (see BS 8500-1 for details).

12.0 GROUND GAS MONITORING

A programme of weekly ground gas monitoring was undertaken at the site between the 2nd and 23rd November 2022 in order to characterise conditions within each of the standpipes installed during the investigation.

The gas monitoring certificates are included in Appendix D, and the results are summarised in Table 12.1.

Table 12.1. Ground Gas Monitoring Results 2nd to 23rd November 2022

Exploratory Hole	Max CH_4 Conc. (%vol)	Max CO_2 Conc. (%vol)	Min O_2 Conc. (% vol)	Max Flow Rate (l/hr)	Atmospheric Pressure (mb)
WS1	<0.1	1.4	18.1	<0.1	992 to 1008
WS4	<0.1	2.5	16.6	0.1	992 to 1008

Methane was not recorded above limits of detection within any of the boreholes during the monitoring visit. The highest carbon dioxide concentration recorded was 2.5%, and the minimum oxygen concentration recorded was 16.6%. Recorded gas flow rates were consistently at or below instrument levels of detection (0.1l/hr).

Based on the guidance in BS 8485:2015+A1:2019, a preliminary calculation of the hazardous gas flow rate (Q_{hg}) has been undertaken based on the maximum concentration of a hazardous gas observed on site, which in this instance was carbon dioxide, as methane concentrations were below levels of detection. For the purpose of this calculation, the flow rate was taken as 0.1l/hr, which was the LOD for the instrument used during monitoring. The preliminary Q_{hg} estimate is provided below:

Q_{hg} = 0.1 x (2.5/100) = 0.0047 l/hr

The findings of the site investigation would suggest a worst case Q_{hg} of 0.0025 l/hr for the site, which would indicate that Characteristic Situation 1-'Very Low Risk' (CS1) would be an appropriate classification with regard to new developments.

Details provided by the client about the proposed development suggest that the buildings would be of 'Type B' (as per Table 3 of the BS8485). On this basis (CS1 designation, and building Type B) the gas protection score for the site would therefore be '0' in accordance with Table 4 of the guidance document.

According to BS8485:2015, this designation would not require specific mitigation measures.

13.0 CONCLUSIONS AND RECOMMENDATIONS

13.1 Ground Conditions and Groundwater

An intrusive ground investigation was undertaken at the site between the 24th and 25th October 2022 involving the excavation of four (4No.) Window Sample boreholes to depths of between 4.0m and 5.0m bgl, two (2No.) machine excavated trial pits, situated toward the western periphery of the site and extended to depths of between 1.5m and 1.6m bgl to enable infiltration testing, and three (3No.) hand excavated Trial Pits progressed adjacent the existing school complex to depths of between 0.25m and 0.40m bgl.

Hardstanding was recorded at the surface in one of the excavations (excluding foundation inspection pits) undertaken during the investigation. Borehole WS1, situated to the south of the existing school building within the proposed footprint of the southern Phase 1 extension, recorded Tarmacadam between 0.0m and 0.05m bgl.

Topsoil was encountered at the surface in two locations (SA1 and SA2), excavated toward the western periphery of the site, and recorded to depths of 0.32m and 0.2m bgl respectively. This material was described as dark brown slightly sandy Silt.

Made Ground was encountered below the hardstanding in WS1, below the topsoil in SA2, and at the surface in WS2, WS3 and WS4 as one of following 5No. sub-types, and recorded to depths of between 0.4m and 1.35m bgl.

- Light grey/dark grey Sand and Gravel. The sand was fine to coarse. The gravel component was described as fine to coarse, angular to rounded of flint, dolerite, sandstone, quartz, and limestone.

- Soft brown slightly sandy Silt. The sand was fine. This material was recorded in WS1 between 0.35m and 0.8m bgl, and appeared similar in composition to the Tidal Flat Deposits recorded at depth.

- Orange slightly gravelly Sand. The sand was described as fine to medium. The gravel was occasional, fine, rounded of feldspar. Occasional plastic fragments were identified within this horizon.

- Brown silty to very silty slightly gravelly, locally cobbly Sand. The sand was fine. Gravel was fine to coarse, subangular to angular of concrete, sandstone, and rare coal. Cobbles comprised subangular to angular concrete.

- Dark brown, locally dark reddish brown, slightly sandy to sandy slightly gravelly, locally slightly cobbly Silt. The sand was fine. Gravel was fine to coarse, subangular to subrounded of concrete, sandstone, brick, feldspar, and quartz.

An alternating sequence of predominantly cohesive and granular strata consistent with Tidal Flat Deposits was encountered below the Made Ground and/or Topsoil in each of the excavations.

The cohesive component of this sequence was typically described as soft to firm brown/light brown/orangish brown/reddish dark brown locally and variably slightly sandy to very sandy SILT. The sand (where present) was fine.

The granular subtype was generally recorded as brown/dark grey/light brown slightly silty to very silty SAND. The sand was described as fine.

No visual or olfactory evidence of contamination (including organic/hydrocarbon staining or odours) was identified in any of the excavations undertaken as part of the investigation.

Groundwater strikes were encountered during the fieldwork phase in each of the excavations (excluding foundation inspection pits) undertaken during the site investigation, at depths of between 1.4m and 2.3m bgl.

Four weekly groundwater monitoring visits were undertaken following completion of the fieldwork, and a period of well stabilisation. During each visit, the standpipes were found to be dry, and the well base significantly shallower than the original install depth (2.18m bgl in WS1 and 2.28m bgl in WS2), potentially indicative of rapid silt ingress.

The foundations of the existing building were found to comprise concrete footings encountered at depths of between 0.25m and 0.27m bgl, and extending to a proven depth of 0.47m bgl.

13.2 Soil Contamination

Laboratory chemical analysis results have identified localised contamination in soils underlying the site.

One sample, taken from Made Ground in WS2 (0.0m to 0.4m bgl) proved individual PAH species (benzo(b)fluoranthene, benzo(a)pyrene, and dibenz(a,h)anthracene at concentrations exceeding relevant GACs for a Public Open Space (Resi) end use scenario, taking into consideration the appropriate SOM content.

None of the remaining samples, including those taken from Made Ground across the site recorded any inorganic or organic determinands at concentrations which exceeded adopted GACs.

13.3 Further Recommendations (Contamination)

Based on the findings of the CSM/Risk Assessment the following measures are recommended as part of proposed redevelopment of the site. If adopted, it is considered that risk to the proposed development from contamination at the site will be ‘Low’:

- It is recommended that during any groundworks/ remedial works in impacted materials, appropriately licenced contractors should be appointed, PPE/RPE should be worn as necessary by groundworkers, and a safe system of work is established prior to commencement.

- The risk levels identified are contingent on the presence of low-permeability hardstanding in the area around WS2. Should development proposals change,

resulting in a change of substrate in this area, it may be necessary to amend the risk assessment and/or undertake remedial works.

- It is recommended that consideration be given, should site preparation/earthworks be required to prepare the substrate around WS2 for development (Phase 3) to the removal and off site disposal of Made Ground (recorded to approximately 0.4m bgl) in this area, in order to remove any future development constraints that might arise.
- It is also recommended given the findings of the investigation that the site construction/earthworks contractor remain vigilant regarding the presence of unexpected contamination issues which may be discovered during the programme. Should any such unexpected contamination be identified, a suitably qualified environmental consultant should be contacted in order to appropriately assess the issue.
- It will be important, during any earthworks in the area surrounding WS2 to control the release of dust, which may otherwise have the potential to impact off site receptors.
- Re-use and/or disposal of site won materials/arisings should be undertaken in accordance with current waste management guidance/regulations.
- Based on the presence of organic contaminants within the Made Ground, it may be necessary to use protected pipework for potable water supplies to the development, particularly where pipework is proposed in the areas around WS2. The local water supplier should be contacted for further details.

Further to the WAC testing described in Section 5.2, arisings generated from the Made Ground and Tidal Flat Deposits are considered likely to be classified as ‘Inert’ for purposes of disposal, subject to further testing.

It may be possible to retain excavated arisings at the site, depending on the material type, and providing these activities are undertaken in accordance with the CL:aire Definition of Waste Code of Practice (DoWCoP) or equivalent, and current Waste Management Regulations

14.0 REFERENCES

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APPENDICES

Appendix A DRAWINGS

Appendix B GROUND INVESTIGATION PHOTOGRAPHS

Appendix C EXPLORATORY HOLE LOGS

Appendix D GROUND GAS/GROUNDWATER MONITORING CERTIFICATES

Appendix E FOUNDATION SKETCH PLANS AND PHOTOGRAPHS

Appendix F GRANGE GEOCONSULTING LTD METHODOLOGY

Appendix G CHEMICAL ANALYSIS RESULTS

Appendix H GEOTECHNICAL TESTING RESULTS

Appendix I INFILTRATION (SOAKAWAY) TESTING RESULTS

Appendix A

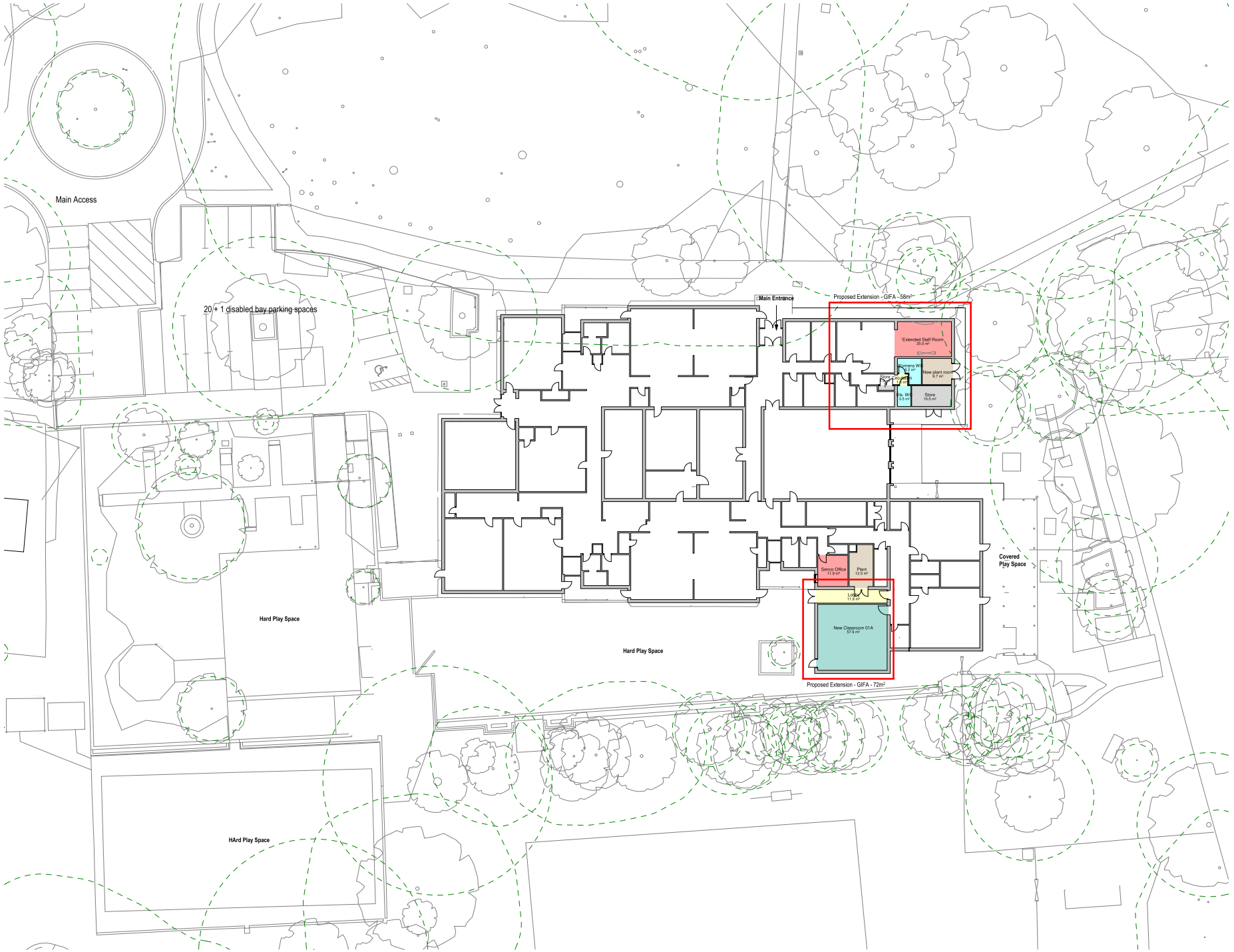
DRAWINGS



Grange Geo	**Site Location Plan** William Stukeley School, Holbeach.	**Client**- Lindum Group Ltd. **Date**- November 2022	North	R22126-DWG1



Grange Geo	**Exploratory Hole Loc. Plan** William Stukeley School, Holbeach.	**Client**- Lindum Group Ltd. **Date**- November 2022	North	R22126-DWG2



NOTES

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1:1250	M	10	20	30	50

NOTE

These drawings are based on the portfolio plans provided and as a result accuracy cannot be guaranteed. These will be subject to being checked against a full measured building survey drawings once they are available.

By Department Legend

- Circulation
- Classroom
- Hall
- Practical
- Resource
- Services
- Staff
- Store
- WC

Proposed Extension - GIFA - 129m²

A-SCH-RoomSchedule Phase 1 - Option A

Name	Area	Department
New Classroom 01A	57.9 m²	Classroom
Senco Office	11.9 m²	Staff
Plant	12.0 m²	Services
Lobby	11.8 m²	Circulation
Extended Staff Room	25.0 m²	Staff
New plant room	9.7 m²	Services
Dis. WC	3.5 m²	WC
Womens WC	6.2 m²	WC
Store	1.0 m²	Store
Store	10.5 m²	Store
Circulation	1.6 m²	Circulation
Grand total: 11	151.0 m²	

No increase in parking provision

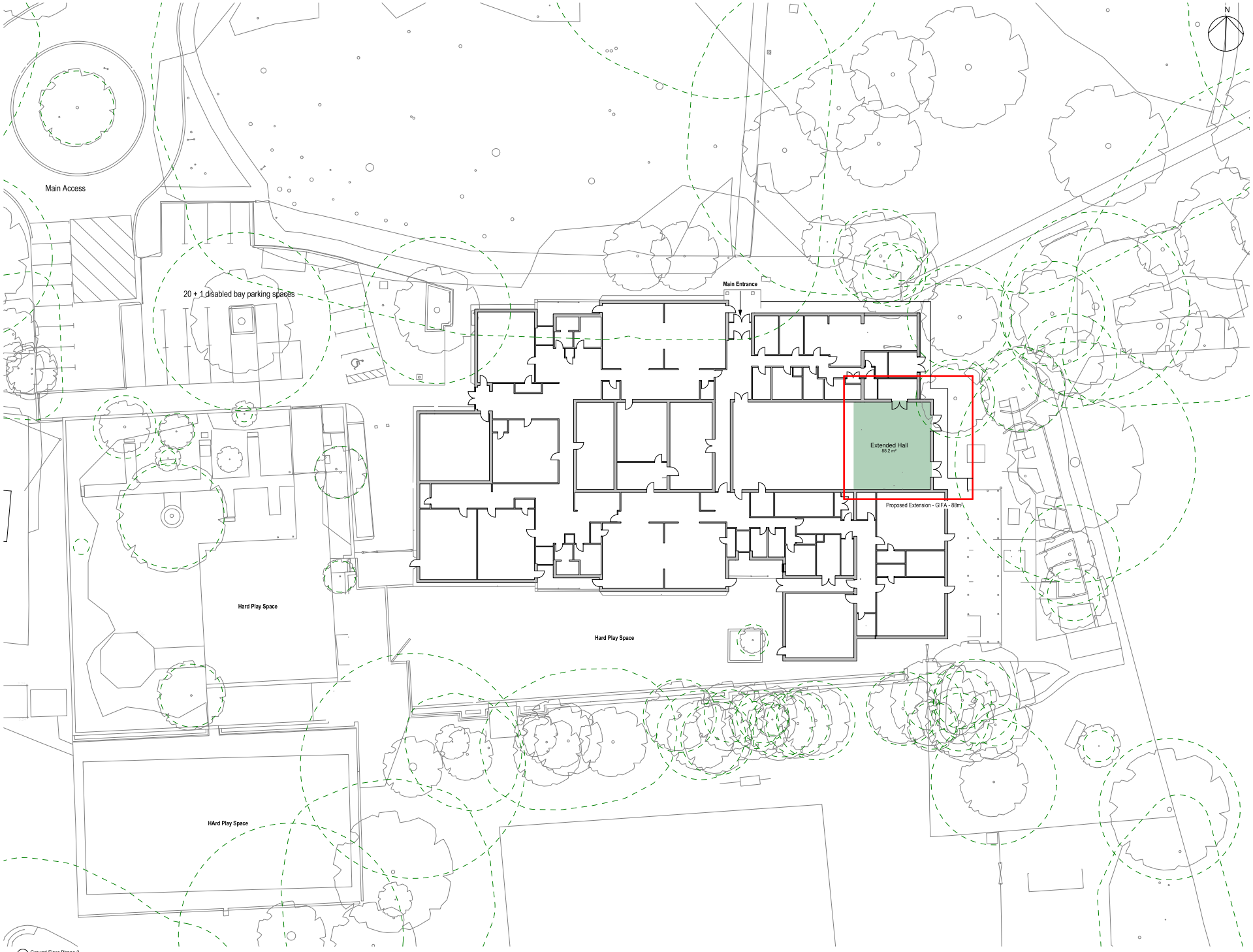
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P01	Initial Issue	LC 18/01/22	CL 18/01/22	PD 18/01/22
Version	Amendment	Drawn & Date	Checked & Date	Approved & Date

KIER

Issuing Office: Liverpool	Telephone: 0151 600 5500
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Internal Project Number: 34069	
Client: LCC	
Project Name: Holbeach William Stukeley CE Primary	
Drawing Title: Proposed GA Plans - Phase 1 - Option A	

Scale: 1 : 200	Original Size: A1	RIBA 2013 Stage: 1	
Date: JAN 22	Drawn: RM	Checked: CL	Approved: LC
Drawing Number: WSP69-DBS-00-00-DR-A-1200			Status: S4
Project Code	Origin	Volume	Level
Type	Role	Number	Revision: P02

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1 Ground Floor Phase 2
Scale @ 1 : 200

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1:200	mm	500	1000	1500	2500
1:500	M	5	10	15	25
1:1250	M	10	20	30	50

NOTE
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By Department Legend

- Circulation
- Classroom
- Hall
- Practical
- Resource
- Services
- Staff
- Store
- WC

Proposed Extension - GIFA - 88m²

A-SCH-RoomSchedule Phase 2

Name	Area	Department
Extended Hall	88.2 m²	Hall
Grand total: 1	88.2 m²	

No increase in parking provision

P02	Possibility Issue	LC 25/02/22	CL 25/02/22	PB 25/02/22
P01	Initial Issue	LC 13/01/22	CL 13/01/22	PB 13/01/22
Version	Amendment	Drawn & Date	Checked & Date	Approved & Date

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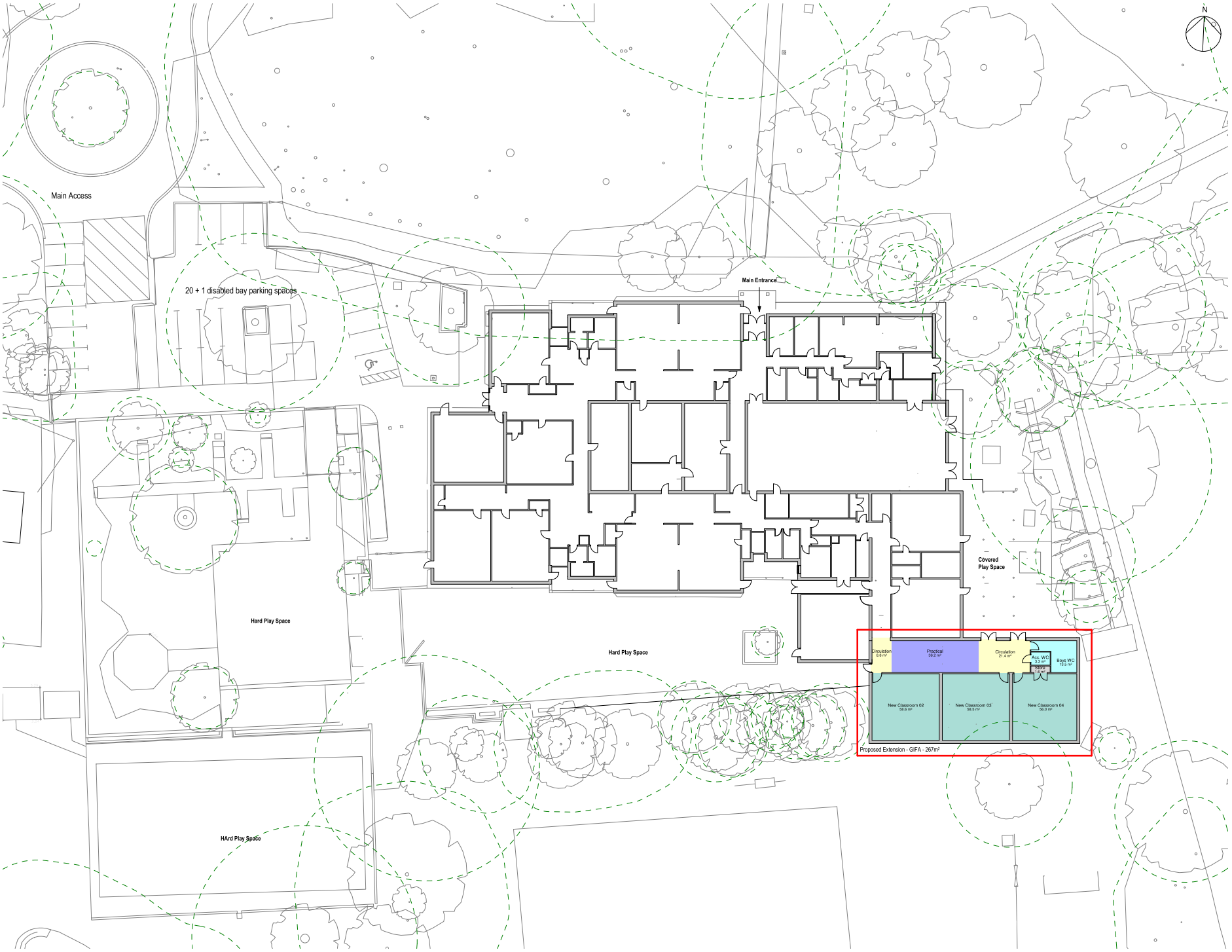
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Telephone: 0151 600 5500
E-mail: Kier@Kier.co.uk
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Client: LCC
Project Name: Holbeach William Stukeley CE Primary
Drawing Title: Proposed GA Plans - Phase 2

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Date	Drawn	Checked	Approved
JAN 22	DB	RM	LC

Drawing Number: WSP69-DBS-00-00-D-A-1202
Status: S4
Revision: P02

Project Code | Origin | Volume | Level | Type | Role | Number

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1 Ground Floor Phase 3
Scale @ 1 : 200

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NOTE
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By Department Legend

- Circulation
- Classroom
- Hall
- Practical
- Resource
- Services
- Staff
- Store
- WC

Proposed Extension - GIFA - 267m²

A-SCH-RoomSchedule Phase 3

Name	Area	Department
New Classroom 02	98.6 m²	Classroom
New Classroom 04	56.0 m²	Classroom
New Classroom 03	58.5 m²	Classroom
Circulation	21.4 m²	Circulation
Boys WC	13.5 m²	WC
Store	1.6 m²	Store
Practical	36.2 m²	Practical
Circulation	6.8 m²	Circulation
Acc. WC	3.3 m²	WC
Grand total: 9	298.0 m²	

No increase in parking provision

Version	Amendment	Drawn & Date	Checked & Date	Approved & Date
P02	Possibility Issue	LC 25/02/22	CL 25/02/22	PB 25/02/22
P01	Initial Issue	LC 13/01/22	CL 13/01/22	PB 13/01/22

KIER

Issuing Office: Liverpool	Telephone: 0151 600 5500
E-mail: Kier@Kier.co.uk	
Internal Project Number: 34069	
Client: LCC	
Project Name: Holbeach William Stukeley CE Primary	
Drawing Title: Proposed GA Plans - Phase 3	

Scale	Original Size	RIBA 2013 Stage	
1 : 200	A1	1	
Date: JAN 22	Drawn: DB	Checked: RM	Approved: LC
Drawing Number: WSP69-DBS-00-00-D-A-1203			Status: S4
Project Code	Origin	Volume	Level	Type	Role	Number	Revision: P02

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Appendix B

GROUND INVESTIGATION PHOTOGRAPHS







Grange Geo	**Photo Record** William Stukeley School, Holbeach.	**Client**- Lindum Group Ltd.	**Date**- November 2022	Appendix B







Grange Geo	**Photo Record** William Stukeley School, Holbeach.	**Client**- Lindum Group Ltd.	**Date**- November 2022	Appendix B







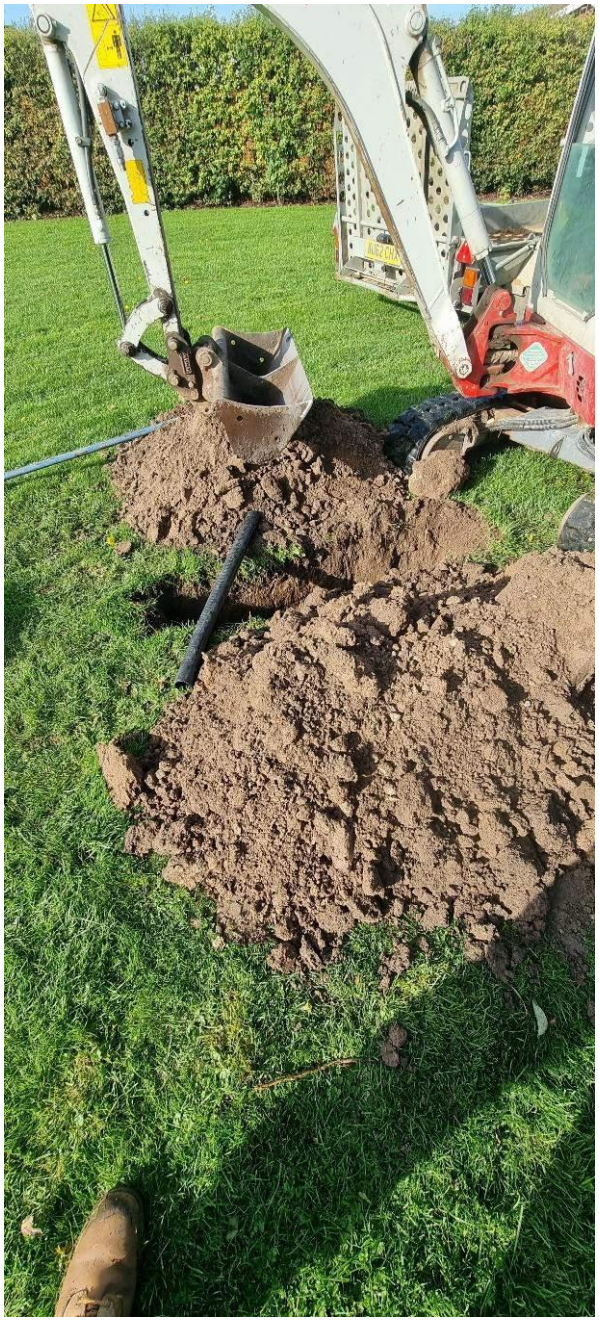
Grange Geo	**Photo Record** William Stukeley School, Holbeach.	**Client**- Lindum Group Ltd.	**Date**- November 2022	Appendix B







Grange Geo	**Photo Record** William Stukeley School, Holbeach.	**Client**- Lindum Group Ltd.	**Date**- November 2022	Appendix B







Grange Geo	**Photo Record** William Stukeley School, Holbeach.	**Client**- Lindum Group Ltd.	**Date**- November 2022	Appendix B

Appendix C

EXPLORATORY HOLE LOGS

Drilling Log

Project Name: William Stukeley Primary School	Client: Lindum Group	Date: 24/10/2022	
Location: Holbeach, Lincs	Contractor:		
Project No. : R22126		Drilling Equipment	Dynamic Sample Rig

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS1	WS		SW	1:30	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.05			Tarmacadam Surfacing [Hardstanding]
		0.35 - 0.50	ES		0.35			Light grey/dark grey Sand and Gravel. Sand is fine to coarse. Gravel is fine to coarse, angular to rounded of flint, dolerite, sandstone, quartz and limestone. [Made Ground]
					0.80			Soft brown slightly sandy Silt. Sand is fine. Geotextile membrane encountered at 0.5m bgl. [Made Ground]
		1.20 - 1.30	ES					Orange slightly gravelly Sand. Sand is fine to medium. Gravel is occasional, fine, rounded of feldspar. Occasional plastic bag fragments. [Made Ground]
		1.20	SPT	N=3 (0,0/0,0,1,2)	1.35			
		1.35 - 1.50	D					Brown very silty SAND. Sand is fine. Dark greyish brown between 4.9m and 5.0m bgl. [Tidal Flat Deposits]
		1.35 - 2.00	B					
		2.00	SPT	N=11 (1,2/2,3,3,3)				
	▼							
		2.80 - 3.00	D					
		3.00	SPT	N=7 (1,0/3,2,1,1)				
		4.00	SPT	N=8 (2,2/1,2,2,3)				
		4.20 - 5.00	B					
		5.00	SPT	N=39 (7,7/9,8,10,12)	5.00			End of Borehole at 5.000m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

Borehole terminated at 5.0m bgl.
Groundwater encountered at ca. 2.3m bgl.
Borehole collapsed to 2.4m bgl on completion of drilling.
Standpipe installed to 3.0m bgl. Response zone between 1.0m and 3.0m bgl.

Drilling Log

Project Name: William Stukeley Primary School	Client: Lindum Group	Date: 24/10/2022	
Location: Holbeach, Lincs	Contractor:		
Project No. : R22126		Drilling Equipment	Dynamic Sample Rig

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS2	WS		SW	1:30	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.00 - 0.40	ES					Brown silty slightly gravelly Sand. Sand is fine. Gravel is fine to coarse, subangular to angular of concrete, sandstone, and rare coal. [Made Ground]
		0.40 - 0.80	D		0.40			Firm brown mottled light brown SILT. [Tidal Flat Deposits]
		0.80 - 1.00	B		0.80			Firm light brown slightly sandy SILT. Sand is fine. Slightly sandy from 2.0m bgl. [Tidal Flat Deposits]
	▼	1.20	SPT	N=10 (1,2/2,3,2,3)				
		1.80 - 2.00	ES					
		2.00	SPT	N=8 (1,2/2,2,2,2)				
		2.50 - 2.80	D					
		2.80 - 4.00	B		2.80			Dark grey very silty SAND. Sand is fine. [Tidal Flat Deposits]
		3.00	SPT	N=8 (1,1/1,2,2,3)				
		4.00	SPT	N=14 (2,3/3,3,4,4)	4.00			End of Borehole at 4.000m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

Borehole terminated at 4.0m bgl.
Groundwater encountered at ca. 1.4m bgl.
Borehole collapsed to 2.08m bgl on completion of drilling.
No installation.. Backfilled with bentonite and arisings.

Drilling Log

Project Name: William Stukeley Primary School	Client: Lindum Group	Date: 24/10/2022	
Location: Holbeach, Lincs	Contractor:		
Project No. : R22126		Drilling Equipment	Dynamic Sample Rig

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS3	WS		SW	1:30	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20 - 0.40	ES					Dark brown very silty slightly sandy gravelly cobbly Sand. Sand is fine. Gravel is fine to coarse. Gravel and cobbles are subangular to angular of concrete. Rare plastic fragments. [Made Ground]
		0.80 - 1.00	D		0.80			
		1.00 - 1.20	ES					Firm friable light orangish brown sandy SILT. Sand is fine. [Tidal Flat Deposits]
		1.20 - 2.00	B					
		1.20	SPT	N=8 (1,1/2,2,2,2)				
	▼							
		2.00	SPT	N=8 (1,2/2,2,2,2)				
					2.30			
		2.50 - 4.00	B					Light brown very silty SAND. Sand is fine. [Tidal Flat Deposits]
		3.00	SPT	N=3 (1,1/0,1,1,1)				
		4.00	SPT	N=3 (1,2/1,0,1,1)	4.00			End of Borehole at 4.000m
		5.00	SPT	N=14 (2,2/2,2,4,6)				

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

Borehole terminated at 4.0m bgl. SPT(c) pushed to 5.0m bgl.
Groundwater encountered at ca. 1.6m bgl.
Borehole collapsed to 2.08m bgl on completion of drilling.
No installation.. Backfilled with bentonite and arisings.

Drilling Log

Project Name: William Stukeley Primary School	Client: Lindum Group	Date: 24/10/2022	
Location: Holbeach, Lincs	Contractor:		
Project No. : R22126		Drilling Equipment	Dynamic Sample Rig

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
WS4	WS		SW	1:30	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10 - 0.40	ES					Grass over dark brown slightly sandy, slightly gravelly Silt. Sand is fine. Gravel is fine to coarse, subangular to subrounded of concrete, sandstone, brick, feldspar and quartz. [Made Ground]	
					0.60			Soft to firm brown slightly gravelly sandy Silt. Sand is fine. Gravel is rare, subangular of brick. [Made Ground]	
		0.80 - 1.00	B		0.80			Soft to firm friable reddish dark brown sandy SILT. Sand is fine. Rare shell fragments. [Tidal Flat Deposits]	1
		1.20	SPT	N=4 (0,0/0,1,1,2)					
		1.50 - 1.60	ES						
	▼								
		2.00	SPT	N=7 (3,2/2,2,2,1)	2.00			Soft to firm orangish brown very sandy SILT. Sand is fine. Firm and mottled grey and orange from 2.6m bgl. [Tidal Flat Deposits]	2
		2.50 - 3.00	D						
		3.00	SPT	N=3 (1,2/1,1,1,0)					3
					3.65			Dark grey very silty SAND. Sand is fine. [Tidal Flat Deposits]	
		3.70 - 4.50	B						
		4.00	SPT	N=3 (1,0/0,0,1,2)					4
		4.70 - 5.00	B		4.70			Dark grey slightly silty SAND. Sand is fine. [Tidal Flat Deposits]	
		5.00	SPT	N=32 (5,5/6,7,9,10)	5.00			End of Borehole at 5.000m	5
									6

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

Borehole terminated at 5.0m bgl.
Groundwater encountered at ca. 1.8m bgl.
Borehole collapsed to 2.7m bgl.
Standpipe installed to 2.7m bgl. Response zone between 1.0m and 2.7m bgl.

Trial Pit Log

Project Name: William Stukeley Primary School	Client: Lindum Group	Date: 25/10/2022
Location: Holbeach, Lincs	Contractor:	
Project No. : R22126	Crew Name:	Equipment:

Location Number	Location Type	Level	Logged By	Scale	Page Number
SA1	TP			1:20	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Grass over dark brown slightly sandy Silt. Sand is fine.
					0.32			Light brown mottled orange slightly sandy SILT. Sand is fine.
	▼				1.50			End of Borehole at 1.500m

1
2
3
4

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks

Remarks

Excavation terminated at 1.5m bgl to enable soakaway. Excavation taken to top of water strike.
Soakaway test undertaken at 1.5m bgl.
Excavation backfilled with arisings.

Trial Pit Log

Project Name: William Stukeley Primary School	Client: Lindum Group	Date: 25/10/2022
Location: Holbeach, Lincs	Contractor:	
Project No. : R22126	Crew Name:	Equipment:

Location Number	Location Type	Level	Logged By	Scale	Page Number
SA2	TP			1:20	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Grass over dark brown slightly sandy Silt. Sand is fine.
					0.20			Dark brown/reddish brown slightly gravelly slightly sandy slightly cobbly Silt. Sand is fine. Gravel is occasional, coarse, subangular to subrounded of quartz. Occasional subangular cobbles of concrete.
					0.80			Brown slightly sandy SILT. Sand is fine.
	▼				1.60			End of Borehole at 1.600m

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks

Remarks

Excavation terminated at 1.6m bgl to enable soakaway. Excavation taken to top of water strike.
Soakaway test undertaken at 1.6m bgl.
Excavation backfilled with arisings.

Appendix D

GROUND GAS/GROUNDWATER MONITORING CERTIFICATES

E S S

Environmental Site Sampling Ltd

2nd November 2022

Environmental Site Sampling Ltd
94 Dillotford Avenue
Styvechale
Coventry
CV3 5DU

Tel : (024) 7669 0514
Mobile : 07971 664 118

e.mail: cosgrove_patrick@hotmail.com

Mr S Woodall
Grange Geo
43 Winchilsea Avenue
Newark-on-Trent
NG24 4AD

In-situ Analysis Report: GGE/6359

Dear Mr Woodall,

Please find enclosed a copy of the in-situ gas analysis undertaken at William Stukeley C of E Primary School, Holbeach, PE12 7HG, on 2nd November 2022.

I trust you find these satisfactory. Should you have any queries please contact us.

Yours Sincerely,

Patrick Cosgrove

P V Cosgrove BSc MSc
Environmental Site Sampling Ltd

In-situ Analysis: GGE/6359

Client: Grange Geo
Project: R22126, William Stukeley C of E Primary School, Holbeach, PE12 7HG

02/11/22

Sample Location	Gas Flow (l/hr)	Borehole Pressure (mb)	Methane (%vol)		Methane (%LEL)		Carbon Dioxide (%vol)		Oxygen (%vol)		Other Gases (ppm)		Water Level (Meters)	Install Depth (Meters)
			Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	H_2S	CO		
BH 1	<0.1	0.09	<0.1	<0.1	<2	<2	1.4	1.4	18.5	18.5	<1	<1	Dry 2.18m	2.18m
BH 4	0.1	0.14	<0.1	<0.1	<2	<2	2.5	2.5	17.0	17.0	<1	<1	Dry 2.28m	2.28m

Notes:
Monitoring order is from left to right.
Steady concentrations are measured up to 3 minutes.

Additional Information	
Date Monitoring Undertaken:	2nd November 2022
Monitoring Undertaken By:	P Cosgrove
Equipment Used:	GA2000+ S/N 11567
Atmospheric Pressure Holbeach a.m. (mb):	1007mb
Atmospheric Pressure On-site (mb):	1005mb
Atmospheric Pressure Holbeach p.m. (mb):	1003mb
Weather During Visit:	Sunny, Dry, Wind SW, 4m/s, 8°C
Comments:	

E S S

Environmental Site Sampling Ltd

9th November 2022

Environmental Site Sampling Ltd
94 Dillotford Avenue
Styvechale
Coventry
CV3 5DU

Tel : (024) 7669 0514
Mobile : 07971 664 118

e.mail: cosgrove_patrick@hotmail.com

Mr S Woodall
Grange Geo
43 Winchilsea Avenue
Newark-on-Trent
NG24 4AD

In-situ Analysis Report: GGE/6366

Dear Mr Woodall,

Please find enclosed a copy of the in-situ gas analysis undertaken at William Stukeley C of E Primary School, Holbeach, PE12 7HG, on 9th November 2022.

I trust you find these satisfactory. Should you have any queries please contact us.

Yours Sincerely,

Patrick Cosgrove

P V Cosgrove BSc MSc
Environmental Site Sampling Ltd

In-situ Analysis: GGE/6366

Client: Grange Geo
Project: R22126, William Stukeley C of E Primary School, Holbeach, PE12 7HG

09/11/22

Sample Location	Gas Flow (l/hr)	Borehole Pressure (mb)	Methane (%vol)		Methane (%LEL)		Carbon Dioxide (%vol)		Oxygen (%vol)		Other Gases (ppm)		Water Level (Meters)	Install Depth (Meters)
			Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	H_2S	CO		
BH 1	<0.1	0.06	<0.1	<0.1	<2	<2	0.9	0.9	19.1	19.1	<1	<1	Dry 2.18m	2.18m
BH 4	0.1	0.16	<0.1	<0.1	<2	<2	2.1	2.1	16.6	16.6	<1	<1	Dry 2.28m	2.28m

Notes:
Monitoring order is from left to right.
Steady concentrations are measured up to 3 minutes.

Additional Information	
Date Monitoring Undertaken:	9th November 2022
Monitoring Undertaken By:	P Cosgrove
Equipment Used:	GA2000+ S/N 11567
Atmospheric Pressure Holbeach a.m. (mb):	1006mb
Atmospheric Pressure On-site (mb):	1008mb
Atmospheric Pressure Holbeach p.m. (mb):	1010mb
Weather During Visit:	Sunny, Dry, Wind SW, 3m/s, 9°C
Comments:	

E S S

Environmental Site Sampling Ltd

15th November 2022

Environmental Site Sampling Ltd
94 Dillotford Avenue
Styvechale
Coventry
CV3 5DU

Tel : (024) 7669 0514
Mobile : 07971 664 118

e.mail: cosgrove_patrick@hotmail.com

Mr S Woodall
Grange Geo
43 Winchilsea Avenue
Newark-on-Trent
NG24 4AD

In-situ Analysis Report: GGE/6370

Dear Mr Woodall,

Please find enclosed a copy of the in-situ gas analysis undertaken at William Stukeley C of E Primary School, Holbeach, PE12 7HG, on 15th November 2022.

I trust you find these satisfactory. Should you have any queries please contact us.

Yours Sincerely,

Patrick Cosgrove

P V Cosgrove BSc MSc
Environmental Site Sampling Ltd

In-situ Analysis: GGE/6370

Client: Grange Geo
Project: R22126, William Stukeley C of E Primary School, Holbeach, PE12 7HG

15/11/22

Sample Location	Gas Flow (l/hr)	Borehole Pressure (mb)	Methane (%vol)		Methane (%LEL)		Carbon Dioxide (%vol)		Oxygen (%vol)		Other Gases (ppm)		Water Level (Meters)	Install Depth (Meters)
			Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	H_2S	CO		
BH 1	<0.1	0.04	<0.1	<0.1	<2	<2	1.2	1.2	18.6	18.6	<1	<1	Dry 2.18m	2.18m
BH 4	0.1	0.12	<0.1	<0.1	<2	<2	1.9	1.9	17.8	17.8	<1	<1	Dry 2.28m	2.28m

Notes:
Monitoring order is from left to right.
Steady concentrations are measured up to 3 minutes.

Additional Information	
Date Monitoring Undertaken:	15th November 2022
Monitoring Undertaken By:	P Cosgrove
Equipment Used:	GA2000+ S/N 11567
Atmospheric Pressure Holbeach a.m. (mb):	0999mb
Atmospheric Pressure On-site (mb):	0998mb
Atmospheric Pressure Holbeach p.m. (mb):	0994mb
Weather During Visit:	Overcast, Dry, Wind SE, 5m/s, 10°C
Comments:	

E S S

Environmental Site Sampling Ltd

23rd November 2022

Environmental Site Sampling Ltd
94 Dillotford Avenue
Styvechale
Coventry
CV3 5DU

Tel : (024) 7669 0514
Mobile : 07971 664 118

e.mail: cosgrove_patrick@hotmail.com

Mr S Woodall
Grange Geo
43 Winchilsea Avenue
Newark-on-Trent
NG24 4AD

In-situ Analysis Report: GGE/6374

Dear Mr Woodall,

Please find enclosed a copy of the in-situ gas analysis undertaken at William Stukeley C of E Primary School, Holbeach, PE12 7HG, on 23rd November 2022.

I trust you find these satisfactory. Should you have any queries please contact us.

Yours Sincerely,

Patrick Cosgrove

P V Cosgrove BSc MSc
Environmental Site Sampling Ltd

In-situ Analysis: GGE/6374

Client: Grange Geo
Project: R22126, William Stukeley C of E Primary School, Holbeach, PE12 7HG

23/11/22

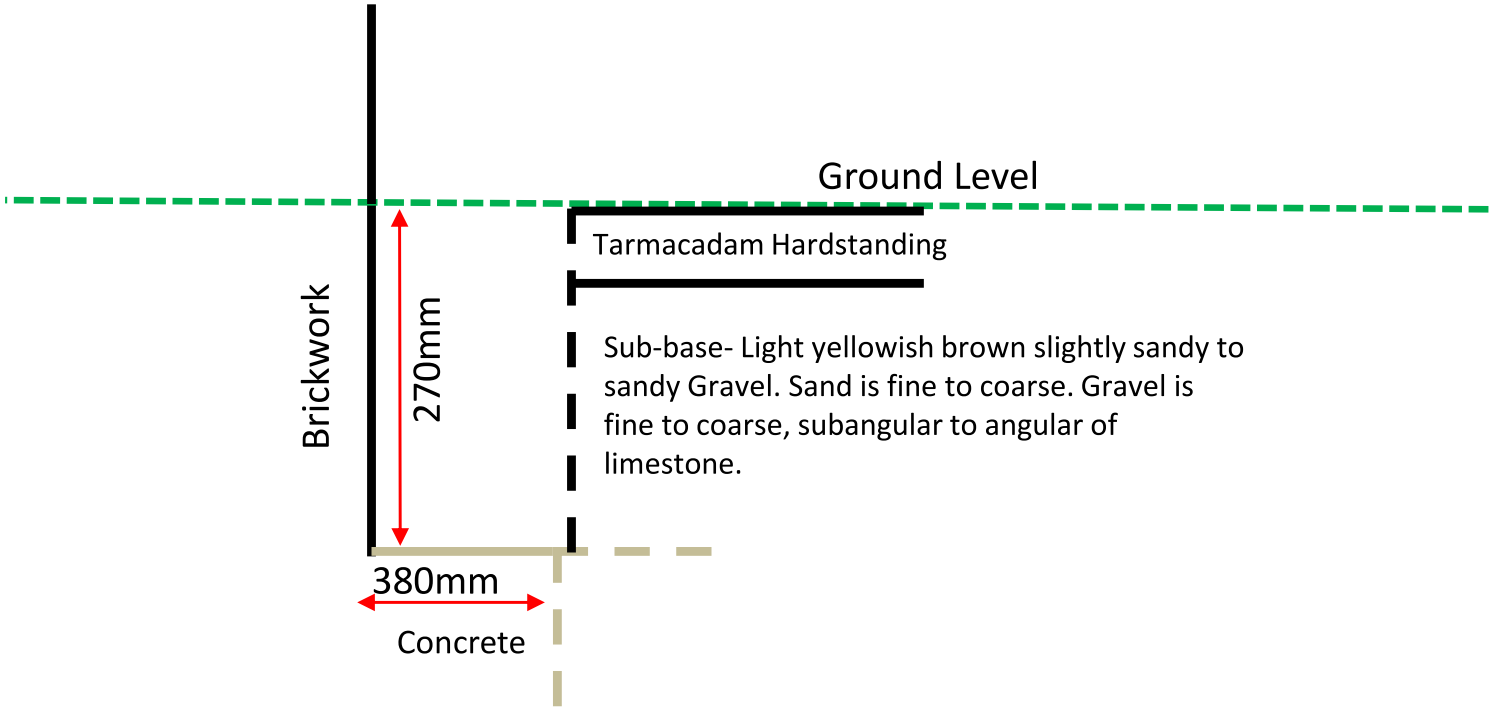
Sample Location	Gas Flow (l/hr)	Borehole Pressure (mb)	Methane (%vol)		Methane (%LEL)		Carbon Dioxide (%vol)		Oxygen (%vol)		Other Gases (ppm)		Water Level (Meters)	Install Depth (Meters)
			Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	H_2S	CO		
BH 1	<0.1	0.06	<0.1	<0.1	<2	<2	1.4	1.4	18.1	18.1	<1	<1	Dry 2.18m	2.18m
BH 4	<0.1	0.04	<0.1	<0.1	<2	<2	2.5	2.5	17.0	17.0	<1	<1	Dry 2.28m	2.28m

Notes:
Monitoring order is from left to right.
Steady concentrations are measured up to 3 minutes.

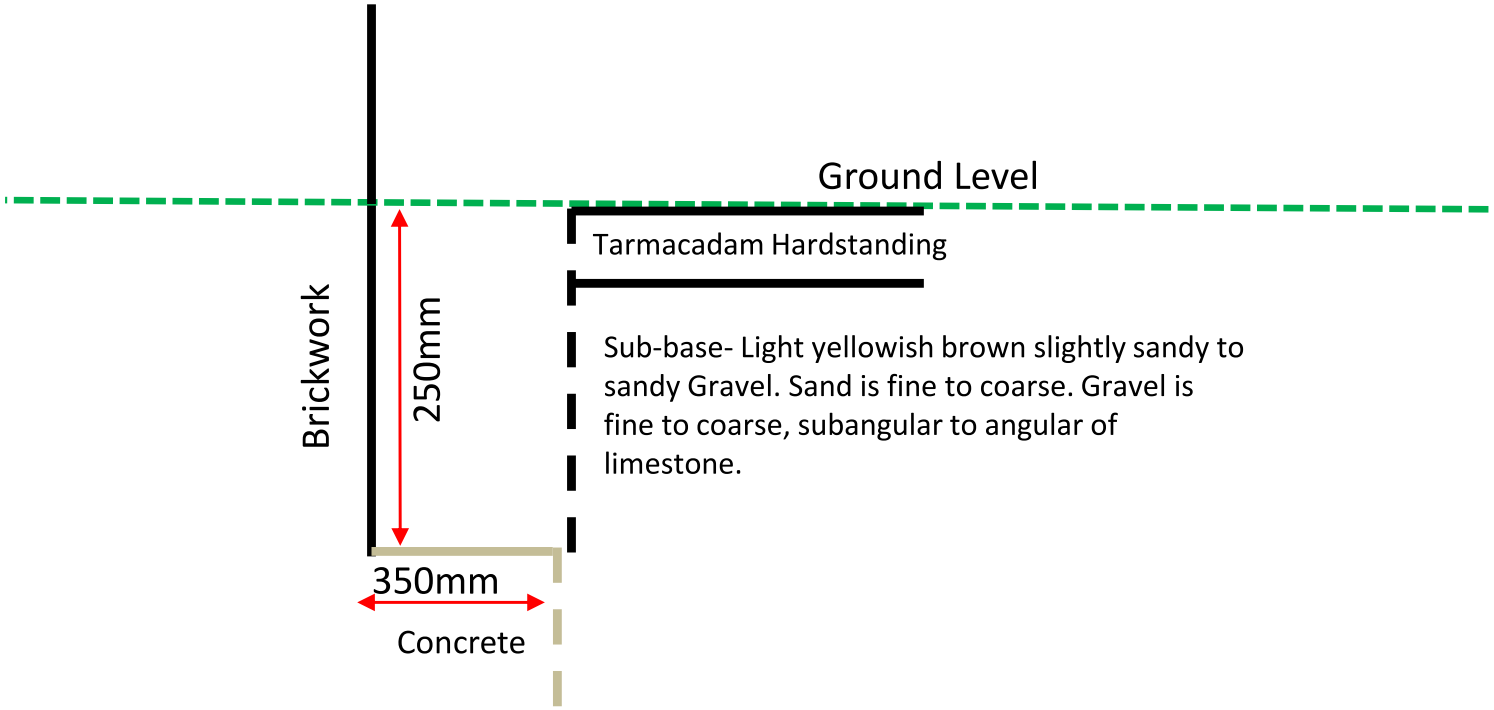
Additional Information	
Date Monitoring Undertaken:	23rd November 2022
Monitoring Undertaken By:	P Cosgrove
Equipment Used:	GA2000+ S/N 11567
Atmospheric Pressure Holbeach a.m. (mb):	0987mb
Atmospheric Pressure On-site (mb):	0992mb
Atmospheric Pressure Holbeach p.m. (mb):	0993mb
Weather During Visit:	Overcast, Dry, Wind S, 4m/s, 6°C
Comments:	

Appendix E

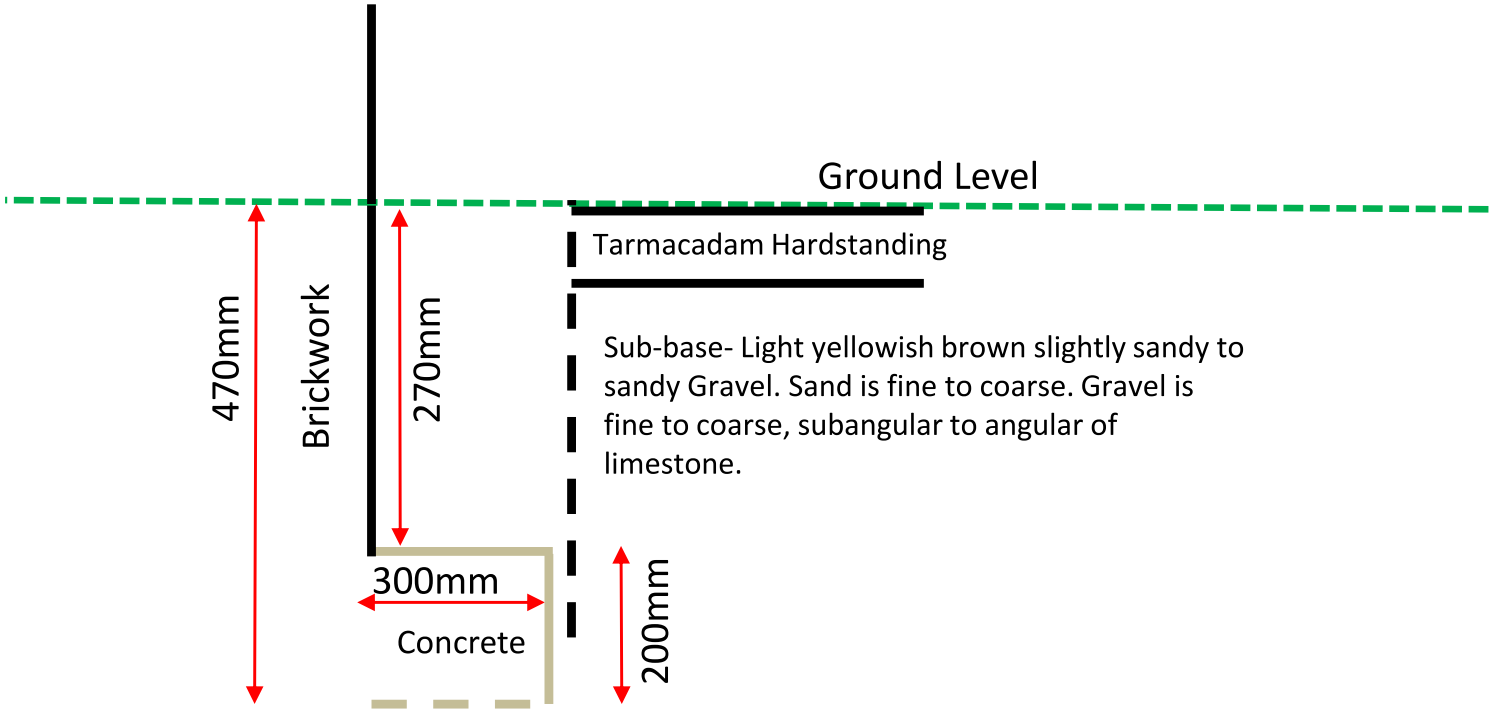
FOUNDATION SKETCH PLANS AND PHOTOGRAPHS



Grange Geo	**William Stukeley, Holbeach** TP1 Foundation Sketch Plan	**Client-** Lindum Group Ltd. **Date-** November 2022		**Job No.** R22126



Grange Geo	**William Stukeley, Holbeach** TP2 Foundation Sketch Plan	**Client-** Lindum Group Ltd. **Date-** November 2022		**Job No.** R22126



Grange Geo	**William Stukeley, Holbeach** TP3 Foundation Sketch Plan	**Client-** Lindum Group Ltd. **Date-** November 2022		**Job No.** R22126

TP1



TP2





Grange Geo	**Foundation Photo Record** William Stukeley School, Holbeach.	**Client:** Lindum Group Ltd.	**Date-** November 2022	Appendix E

TP3







Grange Geo	**Foundation Photo Record** William Stukeley School, Holbeach.	**Client:** Lindum Group Ltd.	**Date-** November 2022	Appendix E

Appendix F

GRANGE GEOCONSULTING LTD METHODOLOGY

RISK ASSESSMENT RATIONALE

The work presented in this report has been carried out in general accordance with recognised best practice as detailed in guidance documents such as in BS5930:1999 and BS10175:2001. Important aspects of the risk assessment process are transparency and justification. The rationale behind the risk assessments presented is given in this appendix.

A preliminary risk assessment is made of both geotechnical and geo-environmental hazards identified at the desk study stage and confirmed (or amended) at the ground investigation stage. This is based on a simple matrix of probability of occurrence versus the consequence, as explained below. In the case of geo-environmental hazards, the risk assessment process proceeds to the next level, the generic risk assessment, in which actual contaminant concentrations are considered.

Preliminary Risk Assessment (Geotechnical Risk Register)

The preliminary geotechnical risk register is compiled in accordance with the Highways Agency Design Manual for Roads and Bridges HD/02. This requires an estimation of the *probability* of an event happening multiplied by the *impact* or consequences of that event. Five levels of probability and impact are given scores and these are multiplied to give a risk rating and a qualitative risk level is assigned as in Table A based on the terminology of Clayton (2001).

Table A: Geotechnical Risk Rating

Assessment of Geotechnical Risks (Risk Register)				
Probability (P)	**Impact (I)**	**Impact in terms of cost or time (% of construction cost or time)**	**Risk Rating (R = P x I)**	**Risk Level**
Very likely (5)	Very High (5)	>25%	17 to 25	Intolerable
Likely (4)	High (4)	10 to 25%	13 to 16	Intolerable
Probable (3)	Medium (3)	4 to 10%	9 to 12	Substantial
Unlikely (2)	Low (2)	1 to 4%	5 to 8	Tolerable
Negligible (1)	Very Low (1)	<1%	1 to 4	Trivial

Preliminary Risk Assessment (Geoenvironmental Consequences and Probability)

The Preliminary Risk Assessment includes a geo-environmental Hazard Identification, which seeks to list all the suspected contaminant **sources**, the **receptors** that might be harmed by those sources and the **pathways** via which the sources might reach the receptors to cause the harm. The source-pathway-receptor concept is known as a pollution linkage, and only when a linkage is complete is there any possibility of risk of harm arising.

The Hazard Identification evaluates all the **possible** pollution linkages in tabular form. Professional judgement is then used to evaluate which of these pollution linkages may be considered as **plausible**. Plausible pollution linkages are unacceptable risks in terms of the current contaminated land regime legal framework and require either remediation or further assessment. These are normally addressed via intrusive ground investigation and the chemical analysis of soil and water samples.

Where no plausible linkage identified, the linkage is classed as ‘no linkage’ in the summary table and no further action is required. If a linkage is plausible, a comparison is made of consequence against probability in general accordance with the guidance given in CIRIA Report C552 (Rudland *et al* 2001). Classification of consequences and probability are given in CIRIA C552 Tables 6.3 and 6.4, respectively, but there are

several inconsistencies in the original Table 6.3, in particular relating to 'significant harm or significant possibility of significant harm' (SH/SPOSH). Consequently, the table has been updated by Grange Geo in line with current practice and is given in Table B. Also added are scores from 1 to 4 for each category.

The basis of the classification is that 'severe' and 'major' are likely to result in SH/SPOSH as defined by the EPA 1990, Part 2A, with 'severe' resulting in acute harm. 'Moderate' lies below the level of SH/SPOSH but above the level of 'no harm' as implied by the relevant Generic assessment criterion (GAC, see below). Minor lies below the 'no harm' level.

Table B: Classification of Consequences of Geoenvironmental Risks

Classification of Consequences for Geoenvironmental Risks		
Classification	**Definition**	**Examples**
Severe (4 points)	Concentration of contaminants is likely to (or is known from previous data to) exceed that indicative of unacceptable intake or contact. I.e. >>SH/SPOSH, concentrations are high enough to cause acute (short-term) effects.	Human health: short-term (acute) effects likely to result in significant harm. E.g. high conc. of cyanide at the surface of an informal recreational area. Planting: complete and rapid die-back of landscaped areas. Controlled waters: short-term pollution, e.g. major spillage into controlled water. Buildings etc.: catastrophic damage, e.g. explosion causing collapse. Ecosystems: short-term risk to an ecosystem or organism forming part of that ecosystem in a designated protected area, e.g. by contamination spillage. Site workers: risk assessment required to determine PPE and this may involve USEPA Level A, B or C protection.
Major (3 points)	Concentration of contaminants is likely to (or is known from previous data to) exceed that indicative of unacceptable intake or contact. I.e. >SH/SPOSH.	Human health: long-term (chronic) effects likely to result in significant harm. E.g. high conc. of contaminants close to the surface of a development site. Planting: stressed or dead plants in landscaped areas. Controlled waters: pollution of sensitive water resources, e.g. leaching into major or minor aquifers or rivers. Buildings etc.: damage renders unsafe to occupy. Ecosystems: death of species in an ecosystem in a designated protected area, e.g. by contamination spillage. Site workers: risk assessment required to determine PPE and this may involve USEPA Level B, C or D protection.

Classification of Consequences for Geoenvironmental Risks		
Classification	**Definition**	**Examples**
Moderate (2 points)	Concentration of contaminants is likely to (or is known from previous data to) exceed that indicative of no harm but not unacceptable intake or contact. I.e. >SVG/GAC but <SH/SPOSH.	Human health: harm but probably not significant harm unless particularly sensitive individual within the receptor group. May be aesthetic/olfactory impacts. Planting: damage to plants in landscaped areas, e.g. stunted growth, discoloration. Controlled waters: pollution of non-sensitive water bodies e.g. leaching into non-classified groundwater or minor ditches. Buildings etc.: damage to sensitive buildings etc. Ecosystems: minor change in an ecosystem in a designated protected area, but not significant harm. Site workers: risk assessment required to determine PPE and this may involve USEPA Level C or D protection.
Minor (1 point)	Concentration of contaminants is likely to (or is known from previous data to) be less than that indicative of no harm. I.e. <SGV/GAC.	No measurable effects, but simple PPE required (USEPA Level D protection, i.e. overalls, boots, goggles, hard hat).

CIRIA Table 6.4 is reproduced as Table C below, but also with the addition of scores from 1 to 4. This provides an estimate of the probability that the event described by the pollution linkage will occur. For example, the likelihood that pollution of groundwater will occur by leaching of metals into the aquifer.

Table C: Classification of Probability of Geoenvironmental Risks

Classification of Probability of Geoenvironmental Risks	
Classification	**Definition**
High (4 points)	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.
Medium (3 points)	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event in not inevitable, but possible in the short term and likely over the long term.
Low (2 points)	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is no means certain that even over a longer period such event could take place, and is less likely in the shorter term.
Unlikely (1 point)	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

The perceived level of risk for each pathway is then derived from the probability versus consequences matrix, modified after CIRIA C552 Table 6.5, given in Table D. The scores are summed accordingly and the result assigned a risk level by dividing the range between the minimum score of 1 and the maximum score of 16 equally into 5 categories i.e. 1 to <4 is very low risk, 4 to <7 is low risk, 7 to <10 is moderate risk, 10 to <13 is high risk and 13 to 16 is very high risk.

Table D: Qualitative Risk Level from Consequence and Probability

		Consequence			
	product	**Severe (4)**	**Major (3)**	**Moderate (2)**	**Minor (1)**
Probability	**High (4)**	16 = Very high risk	12 = High risk	8 = Moderate risk	4 = Low risk
	Medium (3)	12 = High risk	9 = Moderate risk	6 = Low risk	3 = Very low risk
	Low (2)	8 = Moderate risk	6 = Low risk	4 = Low risk	2 = Very low risk
	Unlikely (1)	4 = Low risk	3 = Very low risk	2 = Very low risk	1 = Very low risk

This approach assumes an equivalence between probability and consequences and ignores the difficulty that can arise where to probability of occurrence appears to be almost negligible but the consequences are very severe. In such conditions, there is a degree of subjectivity in assessing the level of risk and it could be low, moderate or high. Such risks may require specialist consideration beyond the scope of this standard report.

A description of the classified risks and the likely action required can be determined from Table E.

Table E: Description of the Classified Risks and Likely Action Required

Description of Classified Risks and Likely Action Required	
Very High Risk	A significant pollution linkage, including actual evidence of significant harm or significant possibility and significant harm, is clearly identifiable at the site (e.g. from visual or documentary evidence) under current conditions, with potential for legal and/or financial consequences for the site owner or other Responsible Person. Remediation advisable based on acute impacts being likely. Immediate action should be considered.
High Risk	A pollution linkage is identifiable at the site under current and future use conditions. Although likely, there is no obvious actual evidence of significant harm or significant possibility and significant harm under current conditions. Extent of risk is therefore subject to confirmation by investigation and risk assessment and most likely to be deemed significant. Remediation required for redevelopment and may also be required under Part 2A for existing receptors.
Moderate Risk	A pollution linkage is identifiable at the site under current and future use conditions. However, it is not likely to be a significant linkage under current conditions. Actual extent of risk subject to confirmation by additional investigation and risk assessment and most likely to lie between no possibility of harm (under current conditions) and significant possibility of significant harm (under conditions created by new use). Remediation may be required for redevelopment.
Low risk	Potential pathways and receptors exist but history of contaminative use or site conditions indicates that contamination is likely to be of limited extent and below the level of no possibility of harm. Precautionary investigations and risk assessment advisable on change of use.
Very Low Risk	No pollution linkage likely to exist under current or future conditions. Site not capable of being determined under Part 2A (in accordance with PPS23) where the Local Authority inspects the site. No further action recommended.

Contaminant Analysis of Samples

CLR 8 (Environment Agency 2002b), the DoE Industry Profile documents and ISO10381-5 provide good summaries of priority pollutants for UK sites. Additionally, the Environment Agency has produced a list of priority pollutants for ecological risk assessment in a consultation document (Environment Agency 2003a). These documents have been used, with the findings of the Phase 1 investigation, to scope the analyses of chemicals of potential concern.

Grange Geo considers there to be a minimum requirement for soil chemical analysis, even for Greenfield sites, to satisfy the 'suitable for use' criterion of the planning regime. The GACs adopted by Grange Geo for the Site are given in the following table.

There is no safe acceptable level for asbestos in soils, detect or non-detect is recorded with asbestos quantification undertaken on samples found to contain asbestos.

The tables below and overleaf for the derivation of Generic Criteria for the **Public Open Spaces (Resi)**

Table F: Generic Assessment Criteria (GAC) for Public Open Space (Resi)

Based on a 1% Soil Organic Matter Content (most conservative approach)

Based on SGVs, C4SL and S4UL values

Heavy Metals	
Arsenic	79
Beryllium	2.2
Boron	21,000
Cadmium	120
Chromium	1,500
Chromium VI	7.7
Copper	12,000
Lead	630
Mercury (elemental)	16
Mercury (inorganic)	120
Nickel	230
Selenium	1,100
Vanadium	2,000
Zinc	81,000
BTEX	
Benzene	72
Toluene	56,000
Ethyl Benzene	24,000
m/p Xylenes	41,000
o Xylenes	41,000
Xylenes	41,000
Speciated PAHs	
Naphthalene	4,900
Acenaphthylene	15,000

Acenaphthene	15,000
Fluorene	9,900
Phenanthrene	3,100
Anthracene	74,000
Fluoranthene	3,100
Pyrene	7,400
Benzo[a]anthracene	29
Chrysene	57
Benzo[b]fluoranthene	7.1
Benzo[k]fluoranthene	190
Benzo[a]pyrene	5.7
Indeno[123-cd]pyrene	82
Dibenzo[ah]anthracene	0.57
Benzo[ghi]perylene	640
Asbestos	
Asbestos	Non-detected

Appendix G

CHEMICAL ANALYSIS RESULTS

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Croxley Green
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Watford,
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WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 22-93394

Project / Site name:	William Stukeley School, W.S School	**Samples received on:**	27/10/2022
Your job number:	R22126	**Samples instructed on/ Analysis started on:**	28/10/2022
Your order number:		**Analysis completed by:**	14/11/2022
Report Issue Number:	1	**Report issued on:**	15/11/2022
Samples Analysed:	6 soil samples		

Sign

Dominika Warjan
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report relate only to the sample(s) submitted for testing

Analytical Report Number: 22-93394
Project / Site name: William Stukeley School, W.S School

Lab Sample Number				2480419	2480420	2480421	2480422	2480423
Sample Reference				WS1	WS1	WS2	WS3	WS4
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.35-0.50	1.20-1.30	0.00-0.40	1.00-1.20	0.10-0.40
Date Sampled				24/10/2022	24/10/2022	24/10/2022	24/10/2022	24/10/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	26	< 0.1	18	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	14	5.3	7.6	20	17
Total mass of sample received	kg	0.001	NONE	0.9	0.9	0.9	0.9	0.9
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	KSZ	KSZ	KSZ	KSZ	KSZ
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	8.5	8.5	7.8	8.2	8
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Organic Matter (automated)	%	0.1	MCERTS	0.6	0.3	4.4	0.7	2.8
Speciated PAHs								
Naphthalene	mg/kg	0.05	NONE	< 0.05	< 0.05	0.23	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	NONE	< 0.05	< 0.05	2.1	< 0.05	0.3
Acenaphthene	mg/kg	0.05	NONE	< 0.05	< 0.05	0.35	< 0.05	< 0.05
Fluorene	mg/kg	0.05	NONE	< 0.05	< 0.05	1.2	< 0.05	0.17
Phenanthrene	mg/kg	0.05	NONE	0.08	0.11	20	0.17	2.1
Anthracene	mg/kg	0.05	NONE	< 0.05	< 0.05	4.9	0.07	0.66
Fluoranthene	mg/kg	0.05	NONE	0.36	0.14	26	0.42	5.8
Pyrene	mg/kg	0.05	NONE	0.35	0.1	23	0.35	5.3
Benzo(a)anthracene	mg/kg	0.05	NONE	0.2	< 0.05	12	0.2	3.3
Chrysene	mg/kg	0.05	NONE	0.25	0.05	11	0.22	3.1
Benzo(b)fluoranthene	mg/kg	0.05	NONE	0.23	< 0.05	14	0.27	3.7
Benzo(k)fluoranthene	mg/kg	0.05	NONE	0.11	< 0.05	3.1	0.12	1.9
Benzo(a)pyrene	mg/kg	0.05	NONE	0.24	< 0.05	11	0.27	3.7
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	0.11	< 0.05	5.7	0.15	1.7
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	< 0.05	< 0.05	1.6	< 0.05	0.54
Benzo(ghi)perylene	mg/kg	0.05	NONE	0.14	< 0.05	6	0.15	1.9
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	NONE	2.07	< 0.80	141	2.39	34.1
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	11	27	17	6.2	17
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	14	21	16	11	17
Copper (aqua regia extractable)	mg/kg	1	MCERTS	10	3	20	4.2	19
Lead (aqua regia extractable)	mg/kg	1	MCERTS	19	6.7	120	11	190
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	11	14	14	9.9	15
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	25	63	30	19	33
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	32	23	70	26	68
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	NONE	< 1.0	-	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	NONE	< 1.0	-	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	NONE	< 1.0	-	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	NONE	< 1.0	-	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	NONE	< 1.0	-	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	NONE	< 1.0	-	< 1.0	< 1.0	< 1.0

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Analytical Report Number: 22-93394
Project / Site name: William Stukeley School, W.S School

Lab Sample Number				2480419	2480420	2480421	2480422	2480423
Sample Reference				WS1	WS1	WS2	WS3	WS4
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.35-0.50	1.20-1.30	0.00-0.40	1.00-1.20	0.10-0.40
Date Sampled				24/10/2022	24/10/2022	24/10/2022	24/10/2022	24/10/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6 HS_1D_AL	mg/kg	0.001	NONE	-	-	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 HS_1D_AL	mg/kg	0.001	NONE	-	-	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 HS_1D_AL	mg/kg	0.001	NONE	-	-	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12 EH_CU_1D_AL	mg/kg	1	NONE	-	-	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 EH_CU_1D_AL	mg/kg	2	NONE	-	-	< 2.0	< 2.0	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21 EH_CU_1D_AL	mg/kg	8	NONE	-	-	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 EH_CU_1D_AL	mg/kg	8	NONE	-	-	100	< 8.0	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35) EH_CU+HS_1D_AL	mg/kg	10	NONE	-	-	110	< 10	< 10
TPH-CWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.001	NONE	-	-	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.001	NONE	-	-	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.001	NONE	-	-	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	NONE	-	-	1.8	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	NONE	-	-	29	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	NONE	-	-	190	< 10	14
TPH-CWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	NONE	-	-	410	< 10	27
TPH-CWG - Aromatic (EC5 - EC35) EH_CU+HS_1D_AR	mg/kg	10	NONE	-	-	630	< 10	41

U/S = Unsuitable Sample I/S = Insufficient Sample

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Analytical Report Number: 22-93394
Project / Site name: William Stukeley School, W.S School

Lab Sample Number				2480424
Sample Reference				WS4
Sample Number				None Supplied
Depth (m)				1.50-1.60
Date Sampled				24/10/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	0.01	NONE	22
Total mass of sample received	kg	0.001	NONE	0.9

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	KSZ

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.9
Total Cyanide	mg/kg	1	MCERTS	< 1.0
Organic Matter (automated)	%	0.1	MCERTS	1.5

Speciated PAHs

Naphthalene	mg/kg	0.05	NONE	< 0.05
Acenaphthylene	mg/kg	0.05	NONE	< 0.05
Acenaphthene	mg/kg	0.05	NONE	< 0.05
Fluorene	mg/kg	0.05	NONE	< 0.05
Phenanthrene	mg/kg	0.05	NONE	< 0.05
Anthracene	mg/kg	0.05	NONE	< 0.05
Fluoranthene	mg/kg	0.05	NONE	< 0.05
Pyrene	mg/kg	0.05	NONE	< 0.05
Benzo(a)anthracene	mg/kg	0.05	NONE	< 0.05
Chrysene	mg/kg	0.05	NONE	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	NONE	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	NONE	< 0.05
Benzo(a)pyrene	mg/kg	0.05	NONE	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	NONE	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	NONE	< 0.80

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	8.2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	17
Copper (aqua regia extractable)	mg/kg	1	MCERTS	11
Lead (aqua regia extractable)	mg/kg	1	MCERTS	19
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	15
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	26
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	45

Monoaromatics & Oxygenates

Benzene	µg/kg	1	NONE	-
Toluene	µg/kg	1	NONE	-
Ethylbenzene	µg/kg	1	NONE	-
p & m-xylene	µg/kg	1	NONE	-
o-xylene	µg/kg	1	NONE	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	NONE	-

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Analytical Report Number: 22-93394
Project / Site name: William Stukeley School, W.S School

Lab Sample Number				2480424
Sample Reference				WS4
Sample Number				None Supplied
Depth (m)				1.50-1.60
Date Sampled				24/10/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Petroleum Hydrocarbons				
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS_1D_AL}$	mg/kg	0.001	NONE	-
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS_1D_AL}$	mg/kg	0.001	NONE	-
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS_1D_AL}$	mg/kg	0.001	NONE	-
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH_CU_1D_AL}$	mg/kg	1	NONE	-
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH_CU_1D_AL}$	mg/kg	2	NONE	-
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH_CU_1D_AL}$	mg/kg	8	NONE	-
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH_CU_1D_AL}$	mg/kg	8	NONE	-
TPH-CWG - Aliphatic (EC5 - EC35) $_{EH_CU+HS_1D_AL}$	mg/kg	10	NONE	-
TPH-CWG - Aromatic >EC5 - EC7 $_{HS_1D_AR}$	mg/kg	0.001	NONE	-
TPH-CWG - Aromatic >EC7 - EC8 $_{HS_1D_AR}$	mg/kg	0.001	NONE	-
TPH-CWG - Aromatic >EC8 - EC10 $_{HS_1D_AR}$	mg/kg	0.001	NONE	-
TPH-CWG - Aromatic >EC10 - EC12 $_{EH_CU_1D_AR}$	mg/kg	1	NONE	-
TPH-CWG - Aromatic >EC12 - EC16 $_{EH_CU_1D_AR}$	mg/kg	2	NONE	-
TPH-CWG - Aromatic >EC16 - EC21 $_{EH_CU_1D_AR}$	mg/kg	10	NONE	-
TPH-CWG - Aromatic >EC21 - EC35 $_{EH_CU_1D_AR}$	mg/kg	10	NONE	-
TPH-CWG - Aromatic (EC5 - EC35) $_{EH_CU+HS_1D_AR}$	mg/kg	10	NONE	-

U/S = Unsuitable Sample I/S = Insufficient Sample

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number : 22-93394
Project / Site name: William Stukeley School, W.S School

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2480419	WS1	None Supplied	0.35-0.50	Brown clay and sand with stones and gravel
2480420	WS1	None Supplied	1.20-1.30	Brown sandy clay with gravel.
2480421	WS2	None Supplied	0.00-0.40	Brown loam and clay with stones and gravel
2480422	WS3	None Supplied	1.00-1.20	Brown sandy clay with gravel.
2480423	WS4	None Supplied	0.10-0.40	Brown clay and loam with gravel.
2480424	WS4	None Supplied	1.50-1.60	Brown clay and sand with gravel.

Analytical Report Number : 22-93394
Project / Site name: William Stukeley School, W.S School

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	NONE
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Analytical Report Number : 22-93394
Project / Site name: William Stukeley School, W.S School

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 22-93396

Project / Site name:	William Stukeley School, W.S School	**Samples received on:**	27/10/2022
Your job number:	R22126	**Samples instructed on/ Analysis started on:**	28/10/2022
Your order number:		**Analysis completed by:**	16/11/2022
Report Issue Number:	1	**Report issued on:**	16/11/2022
Samples Analysed:	3 10:1 WAC Samples		

Signe

Dominika Warjan
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report relate only to the sample(s) submitted for testing

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Waste Acceptance Criteria Analytical Results

Report No:	**22-93396**							
					Client:	**GRANGEGC**		
Location	**William Stukeley School, W.S School**							
Lab Reference (Sample Number)	2480431 / 2480432				**Landfill Waste Acceptance Criteria Limits**			
Sampling Date	24/10/2022				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill	
Sample ID	WS1							
Depth (m)	1.20-1.30							
Solid Waste Analysis								
TOC (%)**	0.1				3%	5%	6%	
Loss on Ignition (%) **	1.1				--	--	10%	
BTEX (µg/kg)	< 10				6000	--	--	
Sum of PCBs (mg/kg)	< 0.007				1	--	--	
Mineral Oil (mg/kg) EH_1D_CU_AL	90				500	--	--	
Total PAH (WAC-17) (mg/kg)	< 0.85				100	--	--	
pH (units)**	8.5				--	>6	--	
Acid Neutralisation Capacity (mmol / kg)	4.6				--	To be evaluated	To be evaluated	
Eluate Analysis	10:1			10:1	Limit values for compliance leaching test			
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)	mg/l			mg/kg	using BS EN 12457-2 at L/S 10 l/kg (mg/kg)			
Arsenic *	0.0022			0.0210	0.5	2	25	
Barium *	0.0064			0.0597	20	100	300	
Cadmium *	< 0.0001			< 0.0008	0.04	1	5	
Chromium *	< 0.0004			< 0.0040	0.5	10	70	
Copper *	0.0035			0.033	2	50	100	
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2	
Molybdenum *	0.0011			0.0098	0.5	10	30	
Nickel *	0.0005			0.0042	0.4	10	40	
Lead *	< 0.0010			< 0.010	0.5	10	50	
Antimony *	< 0.0017			< 0.017	0.06	0.7	5	
Selenium *	< 0.0040			< 0.040	0.1	0.5	7	
Zinc *	0.0031			0.029	4	50	200	
Chloride *	0.43			4.0	800	15000	25000	
Fluoride*	0.38			3.6	10	150	500	
Sulphate *	1.2			11	1000	20000	50000	
TDS*	35			330	4000	60000	100000	
Phenol Index (Monohydric Phenols) *	< 0.010			< 0.10	1	-	-	
DOC	8.51			79.3	500	800	1000	
Leach Test Information								
Stone Content (%)	< 0.1							
Sample Mass (kg)	0.90							
Dry Matter (%)	95							
Moisture (%)	5.3							

Results are expressed on a dry weight basis, after correction for moisture content where applicable.
*= UKAS accredited (liquid eluate analysis only)
Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation
** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Waste Acceptance Criteria Analytical Results

Report No:	**22-93396**						
					Client:	**GRANGEGC**	
Location	**William Stukeley School, W.S School**						
Lab Reference (Sample Number)	2480433 / 2480434				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	24/10/2022				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	WS3						
Depth (m)	1.00-1.20						
Solid Waste Analysis							
TOC (%)**	0.4				3%	5%	6%
Loss on Ignition (%) **	1.3				--	--	10%
BTEX (µg/kg)	< 10				6000	--	--
Sum of PCBs (mg/kg)	< 0.007				1	--	--
Mineral Oil (mg/kg) EH_1D_CU_AL	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	2.26				100	--	--
pH (units)**	8.7				--	>6	--
Acid Neutralisation Capacity (mmol / kg)	23				--	To be evaluated	To be evaluated
Eluate Analysis	10:1			10:1	Limit values for compliance leaching test		
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)	mg/l			mg/kg	using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic *	< 0.0010			< 0.0100	0.5	2	25
Barium *	0.0268			0.178	20	100	300
Cadmium *	< 0.0001			< 0.0008	0.04	1	5
Chromium *	< 0.0004			< 0.0040	0.5	10	70
Copper *	0.0044			0.029	2	50	100
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2
Molybdenum *	0.0020			0.0132	0.5	10	30
Nickel *	< 0.0003			< 0.0030	0.4	10	40
Lead *	0.0014			< 0.010	0.5	10	50
Antimony *	< 0.0017			< 0.017	0.06	0.7	5
Selenium *	< 0.0040			< 0.040	0.1	0.5	7
Zinc *	0.0037			0.025	4	50	200
Chloride *	0.57			3.8	800	15000	25000
Fluoride*	0.43			2.8	10	150	500
Sulphate *	1.5			9.9	1000	20000	50000
TDS*	44			290	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.010			< 0.10	1	-	-
DOC	8.12			53.7	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	0.90						
Dry Matter (%)	80						
Moisture (%)	20						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.
*= UKAS accredited (liquid eluate analysis only)
Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation
** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Waste Acceptance Criteria Analytical Results

Report No:	**22-93396**							
					Client:	**GRANGEGC**		
Location	**William Stukeley School, W.S School**							
Lab Reference (Sample Number)	2480435 / 2480436				**Landfill Waste Acceptance Criteria Limits**			
Sampling Date	24/10/2022				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill	
Sample ID	WS4							
Depth (m)	1.50-1.60							
Solid Waste Analysis								
TOC (%)**	0.9				3%	5%	6%	
Loss on Ignition (%) **	2.3				--	--	10%	
BTEX (µg/kg)	< 10				6000	--	--	
Sum of PCBs (mg/kg)	< 0.007				1	--	--	
Mineral Oil (mg/kg) EH_1D_CU_AL	< 10				500	--	--	
Total PAH (WAC-17) (mg/kg)	< 0.85				100	--	--	
pH (units)**	8.0				--	>6	--	
Acid Neutralisation Capacity (mmol / kg)	7.6				--	To be evaluated	To be evaluated	
Eluate Analysis	10:1			10:1	Limit values for compliance leaching test			
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)	mg/l			mg/kg	using BS EN 12457-2 at L/S 10 l/kg (mg/kg)			
Arsenic *	0.0034			0.0260	0.5	2	25	
Barium *	0.0130			0.0991	20	100	300	
Cadmium *	< 0.0001			< 0.0008	0.04	1	5	
Chromium *	< 0.0004			< 0.0040	0.5	10	70	
Copper *	0.012			0.089	2	50	100	
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2	
Molybdenum *	0.0004			< 0.0040	0.5	10	30	
Nickel *	0.0013			0.0097	0.4	10	40	
Lead *	< 0.0010			< 0.010	0.5	10	50	
Antimony *	< 0.0017			< 0.017	0.06	0.7	5	
Selenium *	< 0.0040			< 0.040	0.1	0.5	7	
Zinc *	0.010			0.077	4	50	200	
Chloride *	0.55			4.2	800	15000	25000	
Fluoride*	0.38			2.9	10	150	500	
Sulphate *	2.1			16	1000	20000	50000	
TDS*	41			310	4000	60000	100000	
Phenol Index (Monohydric Phenols) *	< 0.010			< 0.10	1	-	-	
DOC	5.67			43.2	500	800	1000	
Leach Test Information								
Stone Content (%)	< 0.1							
Sample Mass (kg)	0.90							
Dry Matter (%)	78							
Moisture (%)	22							

Results are expressed on a dry weight basis, after correction for moisture content where applicable.
*= UKAS accredited (liquid eluate analysis only)
Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation
** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Analytical Report Number : 22-93396
Project / Site name: William Stukeley School, W.S School

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2480431	WS1	None Supplied	1.20-1.30	Brown sandy clay with gravel.
2480433	WS3	None Supplied	1.00-1.20	Brown sandy clay with gravel.
2480435	WS4	None Supplied	1.50-1.60	Brown clay and sand with gravel.

Analytical Report Number : 22-93396
Project / Site name: William Stukeley School, W.S School

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
BS EN 12457-2 (10:1) Leachate Prep	10:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-2.	L043-PL	W	NONE
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance""	L046-PL	W	NONE
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Mineral Oil (Soil) C10 - C40	Determination of mineral oil fraction extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L076-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270.	L064-PL	D	NONE
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	NONE
pH at 20oC in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In house method.	L005-PL	W	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	NONE
Total BTEX in soil (Poland)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073-PL	W	NONE
Metals in leachate by ICP-OES	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Chloride 10:1 WAC	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Fluoride 10:1 WAC	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Sulphate 10:1 WAC	Determination of sulphate in leachate by ICP-OES	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Total dissolved solids 10:1 WAC	Determination of total dissolved solids in water by EC probe using a factor of 0.6.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L031	W	ISO 17025

Analytical Report Number : 22-93396
Project / Site name: William Stukeley School, W.S School

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Monohydric phenols 10:1 WAC	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
Dissolved organic carbon 10:1 WAC	Determination of dissolved inorganic carbon in leachate by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

Appendix H

GEOTECHNICAL TESTING RESULTS

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with:BS 1377-2:1990:Clause 4.4 and 5

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Brackmills Industrial Estate
Northampton NN4 7EB

4041

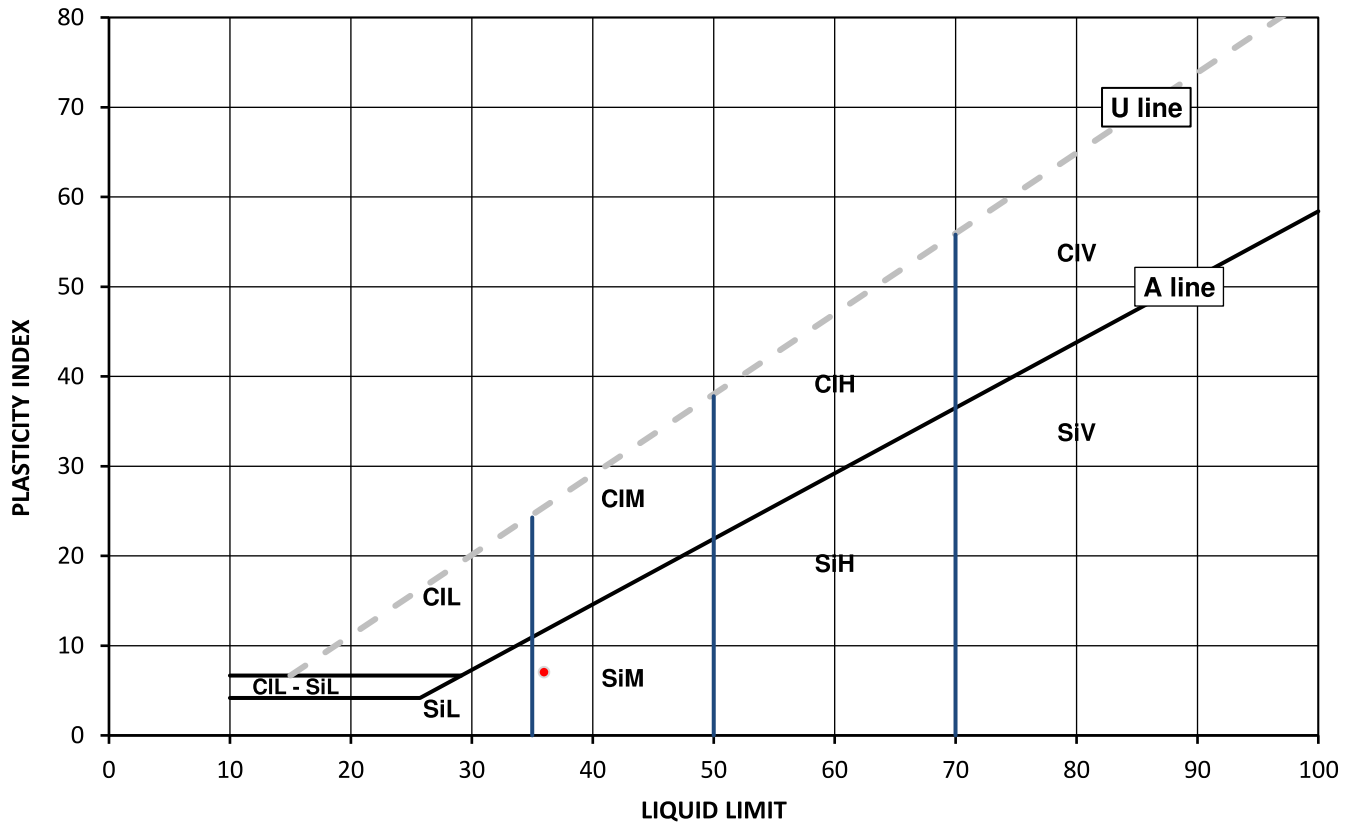
Client:	Grange Geo Consulting Ltd	Client Reference:	R22126
Client Address:	43 Winchilsea Avenue, Newark, Notts, NG24 4AD	Job Number:	22-94125
		Date Sampled:	24/10/2022
		Date Received:	27/10/2022
Contact:	Steve Woodall	Date Tested:	08/11/2022
Site Address:	William Stukeley School W S School	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2485038	Depth Top [m]:	1.35
Hole No.:	WS1	Depth Base [m]:	1.50
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Yellowish brown sandy clayey SILT		
Sample Preparation:	Tested in natural condition		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
31	36	29	7	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 11/11/2022

GF 232.12

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with:BS 1377-2:1990:Clause 4.4 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

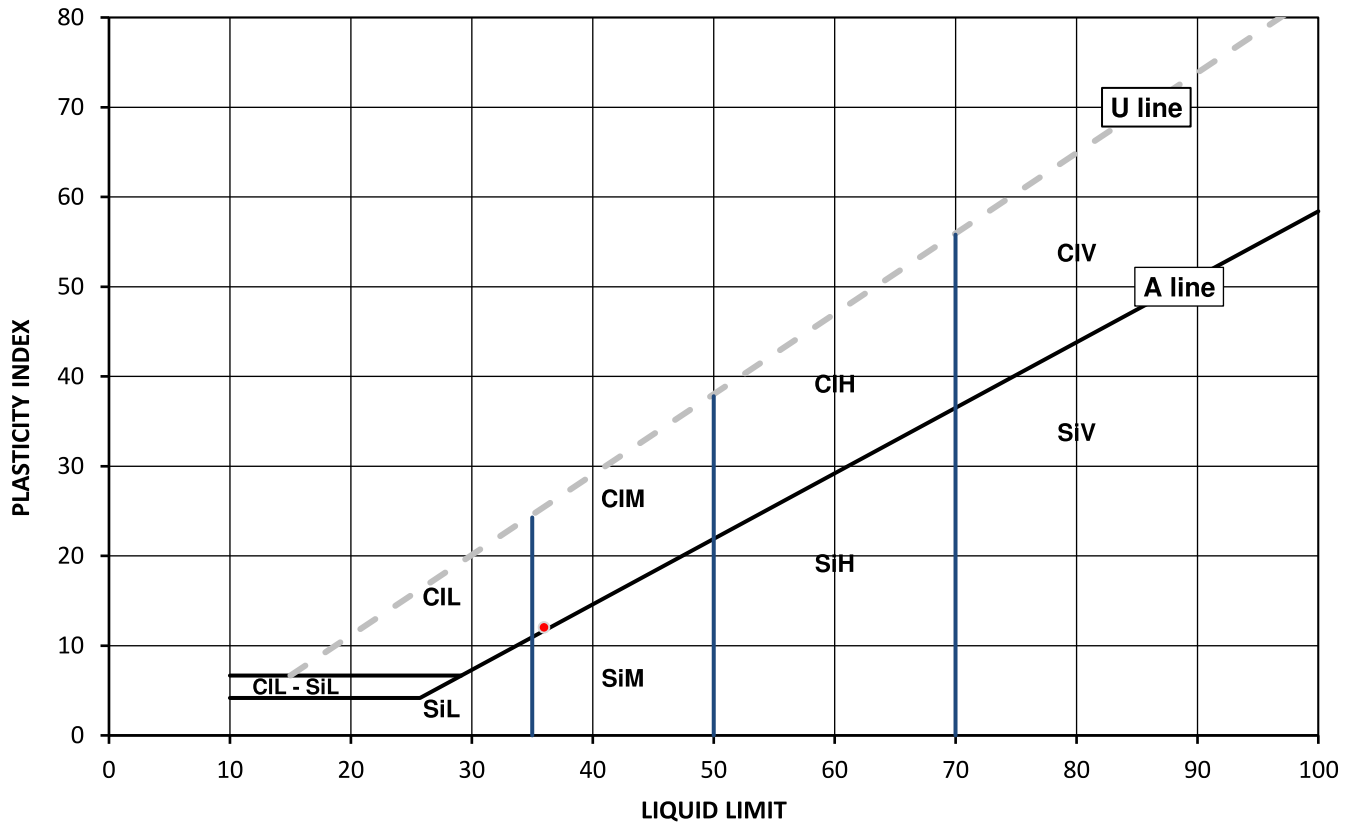
Client:	Grange Geo Consulting Ltd	Client Reference:	R22126
Client Address:	43 Winchilsea Avenue, Newark, Notts, NG24 4AD	Job Number:	22-94125
		Date Sampled:	24/10/2022
		Date Received:	27/10/2022
Contact:	Steve Woodall	Date Tested:	08/11/2022
Site Address:	William Stukeley School W S School	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2485040	Depth Top [m]:	0.40
Hole No.:	WS2	Depth Base [m]:	0.80
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brown slightly gravelly sandy slightly silty CLAY		
Sample Preparation:	Tested after >425um removed by hand		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
20	36	24	12	96



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 11/11/2022

GF 232.12

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with:BS 1377-2:1990:Clause 4.4 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

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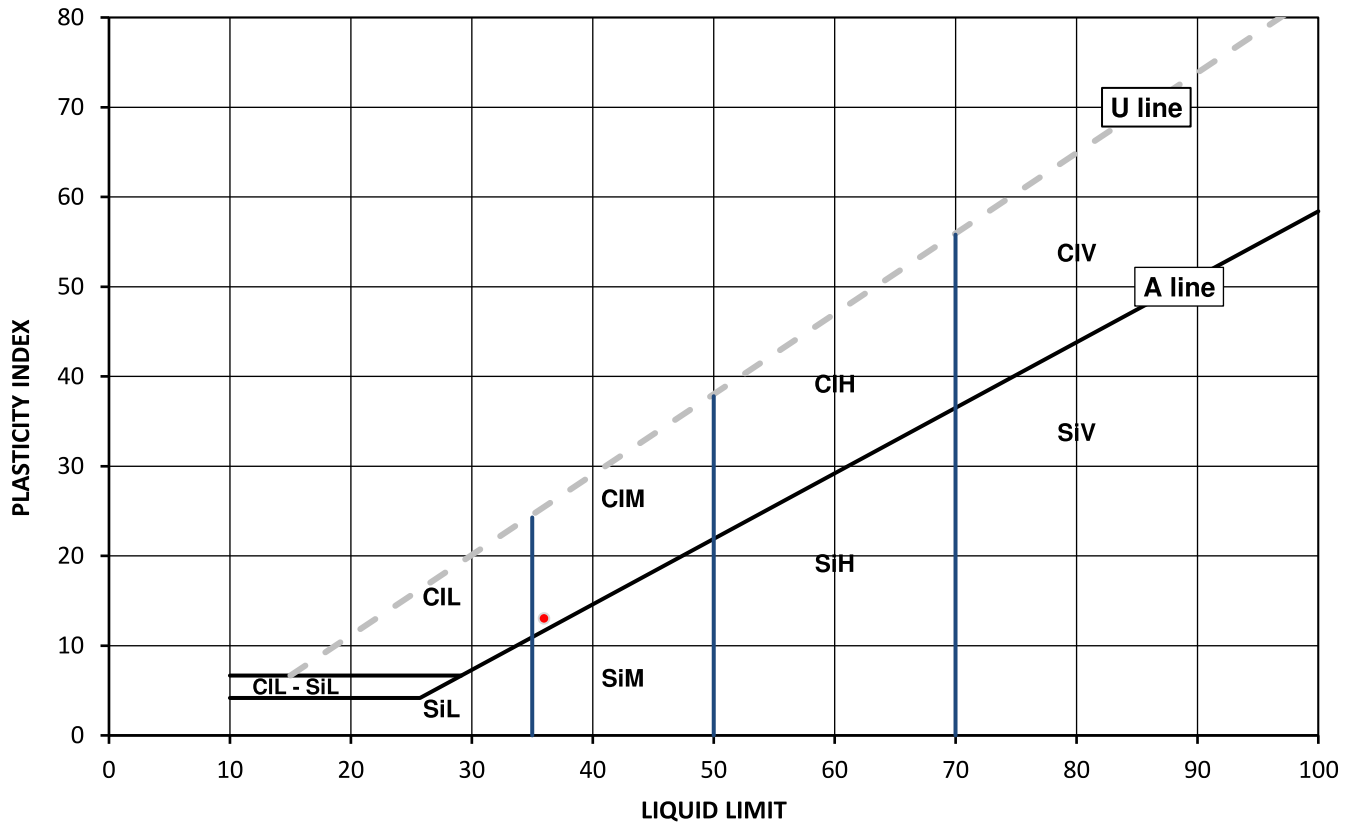
Client:	Grange Geo Consulting Ltd	Client Reference:	R22126
Client Address:	43 Winchilsea Avenue, Newark, Notts, NG24 4AD	Job Number:	22-94125
		Date Sampled:	24/10/2022
		Date Received:	27/10/2022
Contact:	Steve Woodall	Date Tested:	08/11/2022
Site Address:	William Stukeley School W S School	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2485042	Depth Top [m]:	2.50
Hole No.:	WS2	Depth Base [m]:	2.80
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brown sandy slightly silty CLAY		
Sample Preparation:	Tested in natural condition		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
34	36	23	13	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 11/11/2022

GF 232.12

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with:BS 1377-2:1990:Clause 4.4 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

Environmental Science

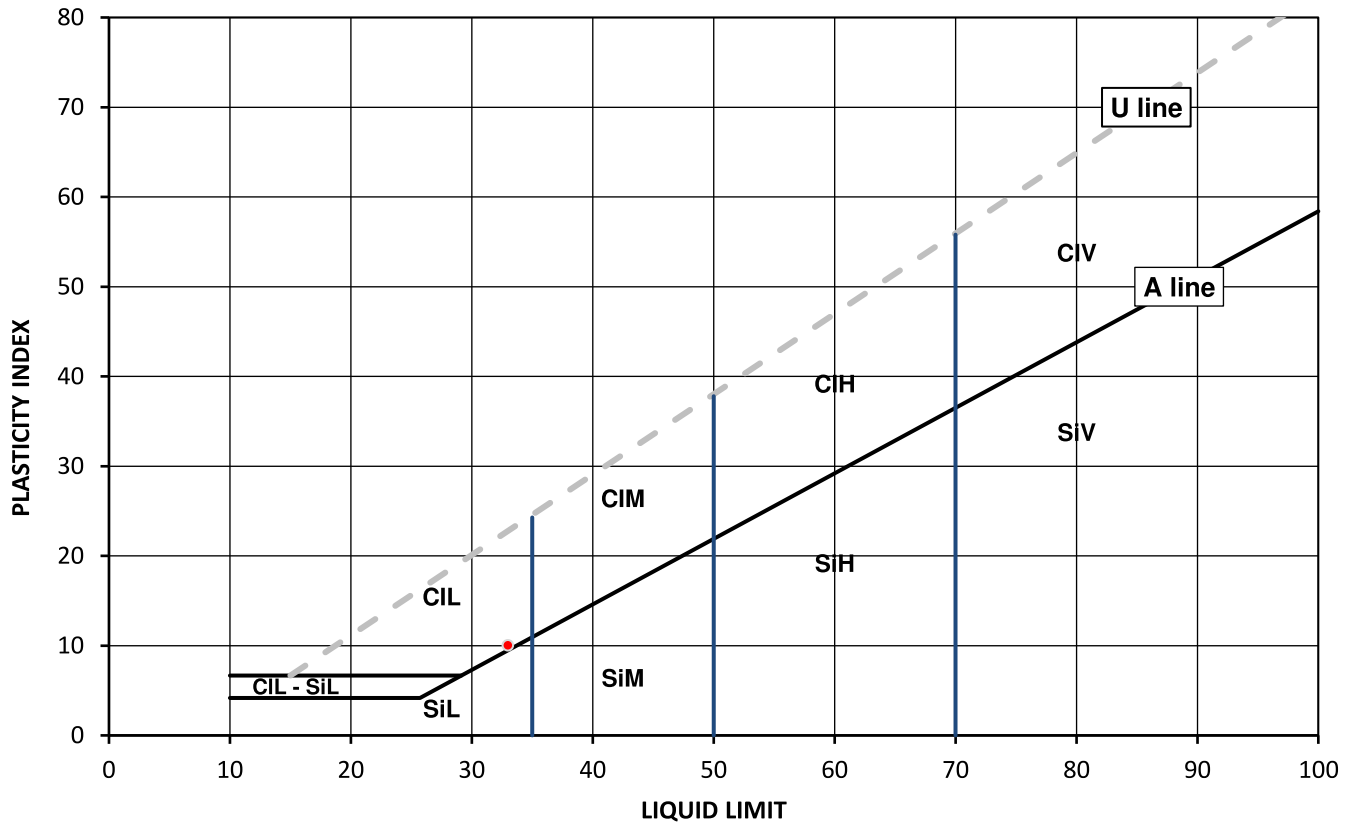
Client:	Grange Geo Consulting Ltd	Client Reference:	R22126
Client Address:	43 Winchilsea Avenue, Newark, Notts, NG24 4AD	Job Number:	22-94125
		Date Sampled:	24/10/2022
		Date Received:	27/10/2022
Contact:	Steve Woodall	Date Tested:	08/11/2022
Site Address:	William Stukeley School W S School	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2485044	Depth Top [m]:	0.80
Hole No.:	WS3	Depth Base [m]:	1.00
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Yellowish brown slightly gravelly very sandy silty CLAY		
Sample Preparation:	Tested after >425um removed by hand		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
24	33	23	10	99



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

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Date Reported: 11/11/2022

GF 232.12

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with:BS 1377-2:1990:Clause 4.4 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

Environmental Science

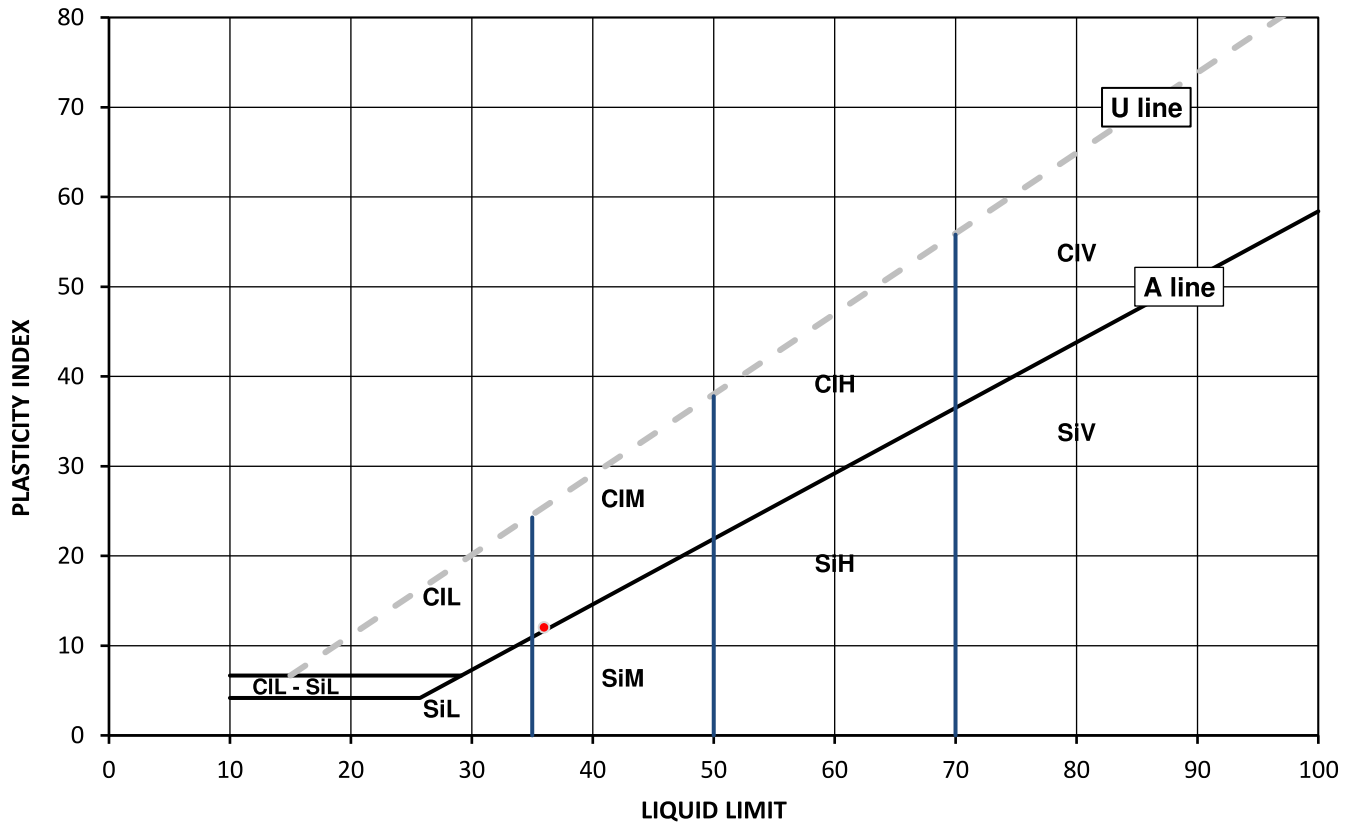
Client:	Grange Geo Consulting Ltd	Client Reference:	R22126
Client Address:	43 Winchilsea Avenue, Newark, Notts, NG24 4AD	Job Number:	22-94125
		Date Sampled:	24/10/2022
		Date Received:	27/10/2022
Contact:	Steve Woodall	Date Tested:	07/11/2022
Site Address:	William Stukeley School W S School	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2485047	Depth Top [m]:	0.80
Hole No.:	WS4	Depth Base [m]:	1.00
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Brown slightly gravelly sandy silty CLAY		
Sample Preparation:	Tested after >425um removed by hand		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
32	36	24	12	99



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

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Date Reported: 11/11/2022

GF 232.12

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with:BS 1377-2:1990:Clause 4.4 and 5

i2 Analytical Ltd
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Brackmills Industrial Estate
Northampton NN4 7EB

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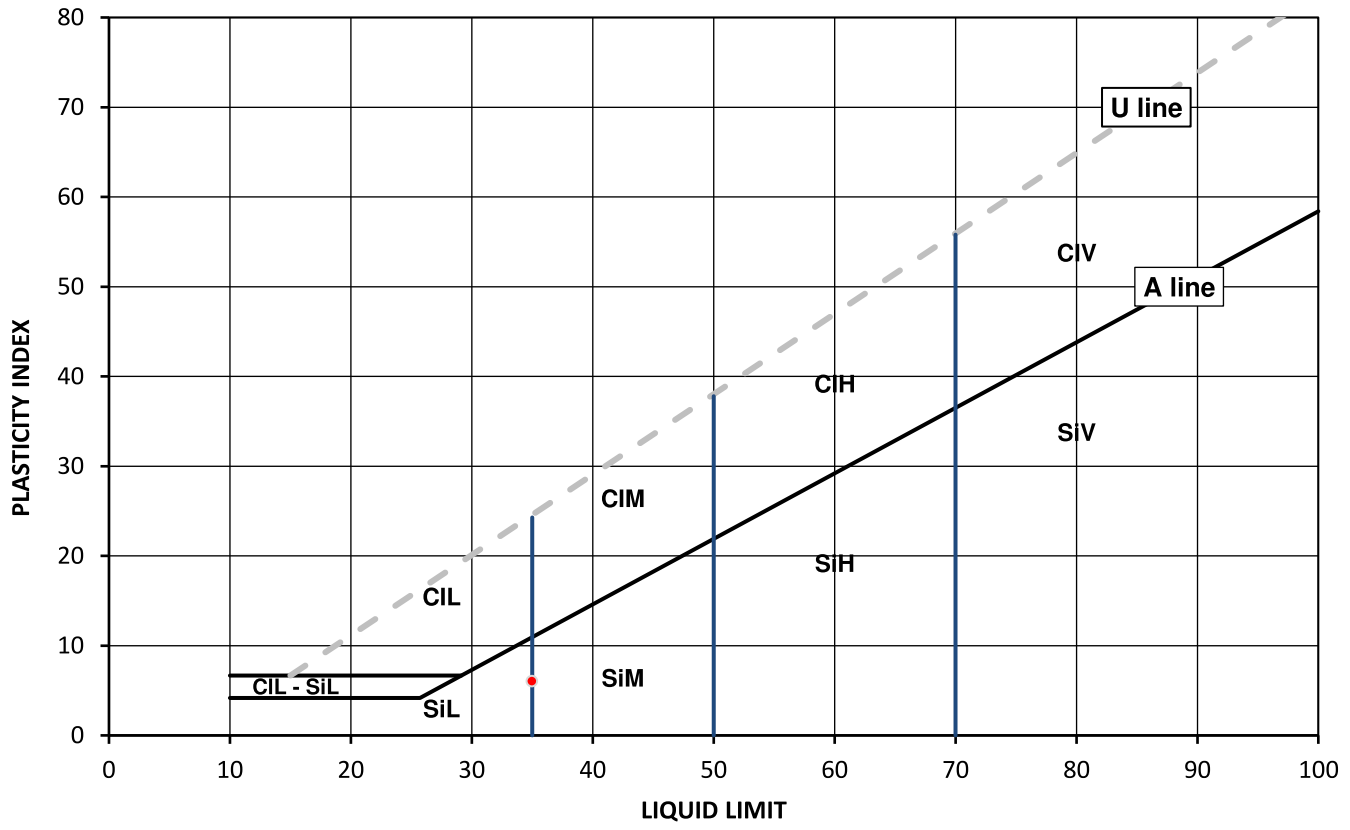
Client:	Grange Geo Consulting Ltd	Client Reference:	R22126
Client Address:	43 Winchilsea Avenue, Newark, Notts, NG24 4AD	Job Number:	22-94125
		Date Sampled:	24/10/2022
		Date Received:	27/10/2022
Contact:	Steve Woodall	Date Tested:	08/11/2022
Site Address:	William Stukeley School W S School	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2485048	Depth Top [m]:	2.50
Hole No.:	WS4	Depth Base [m]:	3.00
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Yellowish brown sandy clayey SILT		
Sample Preparation:	Tested in natural condition		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
27	35	29	6	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

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Date Reported: 11/11/2022

GF 232.12

SUMMARY REPORT

SUMMARY OF CLASSIFICATION TEST RESULTS

Tested in Accordance with:

Water Content by BS 1377-2:1990: Clause 3.2; Atterberg by BS 1377-2: 1990: Clause 4.3 (4 Point Test), Clause 4.4 (1 Point Test) and 5; PD by BS 1377-2: 1990: Clause 8.2

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client: Grange Geo Consulting Ltd

Client Address: 43 Winchilsea Avenue, Newark, Notts, NG24 4AD

Contact: Steve Woodall

Site Address: William Stukeley School W S School

Client Reference: R22126
Job Number: 22-94125
Date Sampled: 24/10/2022
Date Received: 27/10/2022
Date Tested: 07/11 - 08/11/2022
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	Water Content BS 1377-2 [W]	Water Content BS EN ISO 17892-1 [W]	Atterberg				Density			Total Porosity#		
		Reference	Depth Top	Depth Base	Type					% Passing 425um	WL	Wp	Ip	bulk	dry	PD			
			m	m				%	%	%	%	%	%	Mg/m3	Mg/m3	Mg/m3	%		
2485038	WS1	Not Given	1.35	1.50	D	Yellowish brown sandy clayey SILT	Atterberg 1 Point	31		100	36	29	7						
2485040	WS2	Not Given	0.40	0.80	D	Brown slightly gravelly sandy slightly silty CLAY	Atterberg 1 Point	20		96	36	24	12						
2485042	WS2	Not Given	2.50	2.80	D	Brown sandy slightly silty CLAY	Atterberg 1 Point	34		100	36	23	13						
2485044	WS3	Not Given	0.80	1.00	D	Yellowish brown slightly gravelly very sandy silty CLAY	Atterberg 1 Point	24		99	33	23	10						
2485047	WS4	Not Given	0.80	1.00	B	Brown slightly gravelly sandy silty CLAY	Atterberg 1 Point	32		99	36	24	12						
2485048	WS4	Not Given	2.50	3.00	D	Yellowish brown sandy clayey SILT	Atterberg 1 Point	27		100	35	29	6						

Note: # Non accredited; NP - Non plastic

Comments:

Signed:

Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

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Date Reported: 11/11/2022

GF 234.14

SUMMARY REPORT

DETERMINATION OF WATER CONTENT

Tested in Accordance with: BS 1377-2: 1990: Clause 3.2

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client: Grange Geo Consulting Ltd

Client Address: 43 Winchilsea Avenue, Newark, Notts, NG24 4AD

Contact: Steve Woodall

Site Address: William Stukeley School W S School

Client Reference: R22126
Job Number: 22-94125
Date Sampled: 24/10/2022
Date Received: 27/10/2022
Date Tested: 07/11 - 08/11/2022
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	WC	Sample preparation / Oven temperature at the time of testing			
		Reference	Depth Top m	Depth Base m	Type			%				
2485038	WS1	Not Given	1.35	1.50	D	Yellowish brown sandy clayey SILT		31	Sample was quartered, oven dried at 109 °C			
2485040	WS2	Not Given	0.40	0.80	D	Brown slightly gravelly sandy slightly silty CLAY		20	Sample was quartered, oven dried at 109 °C			
2485042	WS2	Not Given	2.50	2.80	D	Brown sandy slightly silty CLAY		34	Sample was quartered, oven dried at 109 °C			
2485044	WS3	Not Given	0.80	1.00	D	Yellowish brown slightly gravelly very sandy silty CLAY		24	Sample was quartered, oven dried at 109 °C			
2485047	WS4	Not Given	0.80	1.00	B	Brown slightly gravelly sandy silty CLAY		32	Sample was quartered, oven dried at 109 °C			
2485048	WS4	Not Given	2.50	3.00	D	Yellowish brown sandy clayey SILT		27	Sample was quartered, oven dried at 109 °C			

Comments:

Signed: Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

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Date Reported: 11/11/2022

GF 099.16

TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

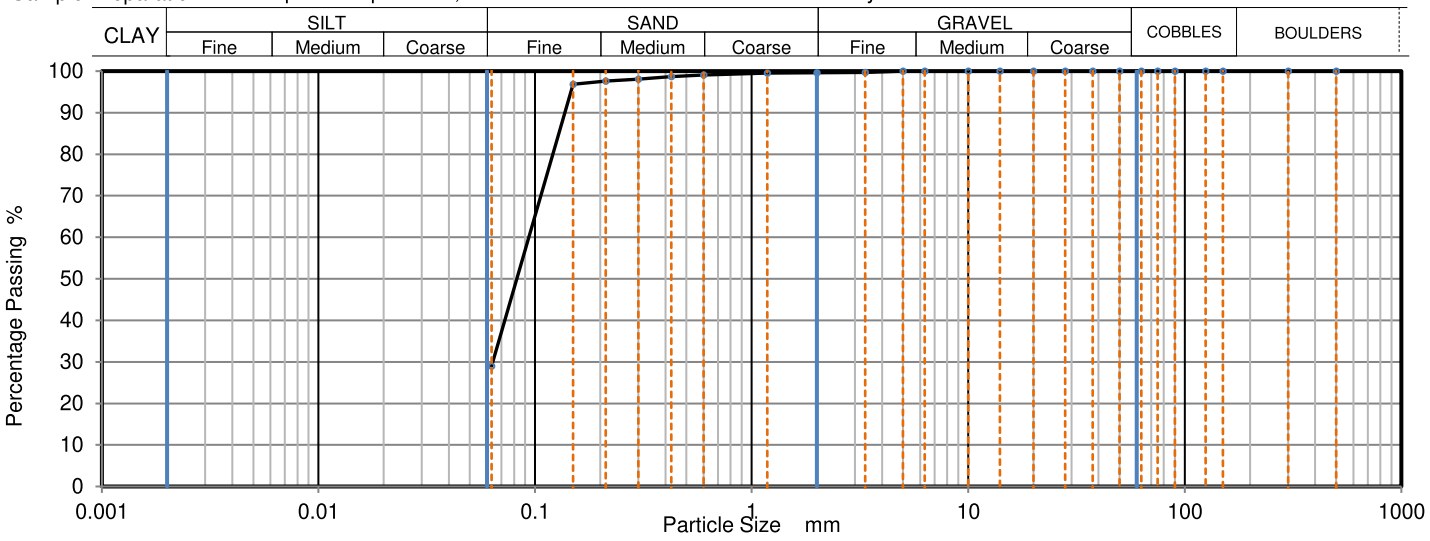
4041

Client:	Grange Geo Consulting Ltd	Client Reference:	R22126
Client Address:	43 Winchilsea Avenue, Newark, Notts, NG24 4AD	Job Number:	22-94125
		Date Sampled:	24/10/2022
		Date Received:	27/10/2022
Contact:	Steve Woodall	Date Tested:	07/11/2022
Site Address:	William Stukeley School W S School	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2485039	Depth Top [m]:	4.20
Hole No.:	WS1	Depth Base [m]:	4.50
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Light brown clayey SAND		
Sample Preparation:	Sample was quartered, oven dried at 109.0 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	99		
0.425	99		
0.3	98		
0.212	98		
0.15	97		
0.063	30		

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	70
Fines <0.063mm	30

Grading Analysis		
D100	mm	5
D60	mm	0.0933
D30	mm	0.0634
D10	mm	
Uniformity Coefficient		> 1.5
Curvature Coefficient		

Uniformity Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

Signed:

Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

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Date Reported: 11/11/2022

GF 100.21

TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

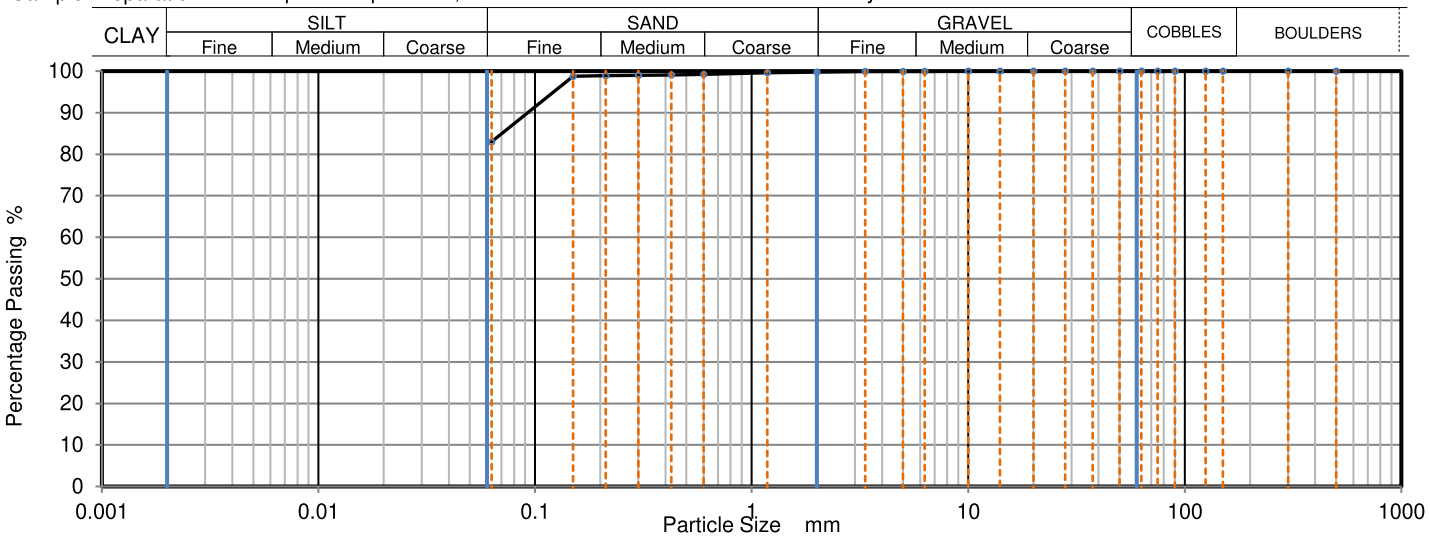
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Client:	Grange Geo Consulting Ltd	Client Reference:	R22126
Client Address:	43 Winchilsea Avenue, Newark, Notts, NG24 4AD	Job Number:	22-94125
		Date Sampled:	24/10/2022
		Date Received:	27/10/2022
Contact:	Steve Woodall	Date Tested:	07/11/2022
Site Address:	William Stukeley School W S School	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2485041	Depth Top [m]:	0.80
Hole No.:	WS2	Depth Base [m]:	1.00
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Brown sandy CLAY		
Sample Preparation:	Sample was quartered, oven dried at 109.0 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	99		
0.425	99		
0.3	99		
0.212	99		
0.15	99		
0.063	83		

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	17
Fines <0.063mm	83

Grading Analysis		
D100	mm	10
D60	mm	
D30	mm	
D10	mm	
Uniformity Coefficient		N/A
Curvature Coefficient		

Uniformity Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

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Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 11/11/2022

GF 100.21

TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

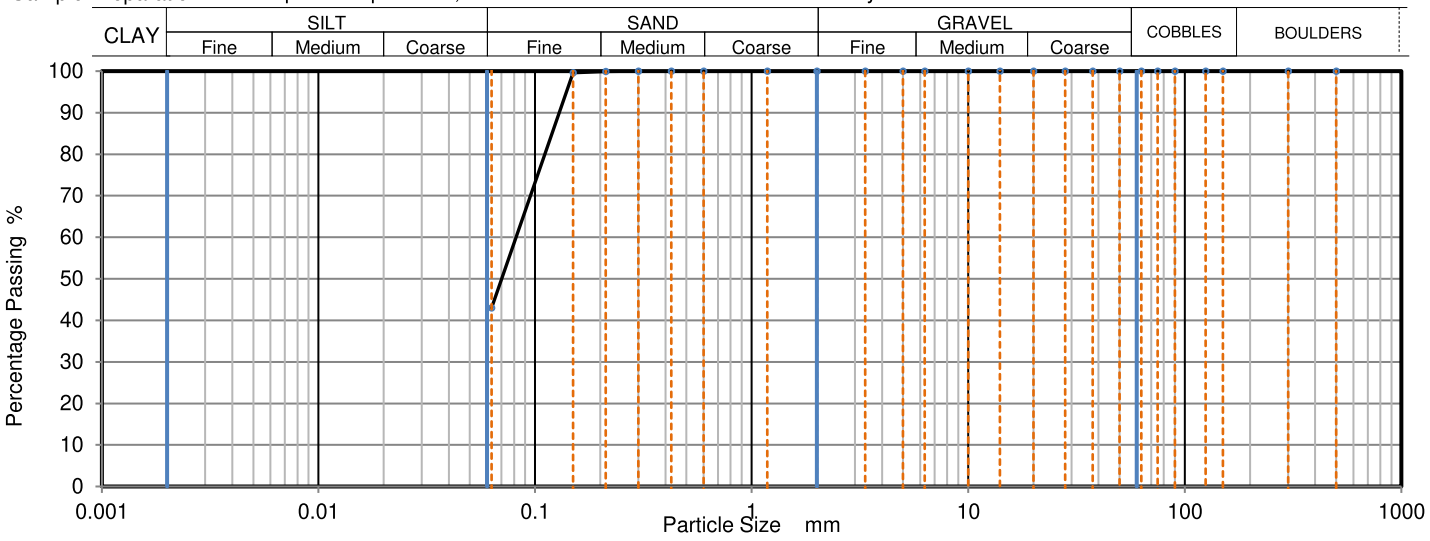
4041

Client:	Grange Geo Consulting Ltd	Client Reference:	R22126
Client Address:	43 Winchilsea Avenue, Newark, Notts, NG24 4AD	Job Number:	22-94125
		Date Sampled:	24/10/2022
		Date Received:	27/10/2022
Contact:	Steve Woodall	Date Tested:	07/11/2022
Site Address:	William Stukeley School W S School	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2485043	Depth Top [m]:	2.80
Hole No.:	WS2	Depth Base [m]:	4.00
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Brownish grey very clayey SAND		
Sample Preparation:	Sample was quartered, oven dried at 109.0 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	100		
0.3	100		
0.212	100		
0.15	100		
0.063	44		

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	57
Fines <0.063mm	43

Grading Analysis		
D100	mm	0.425
D60	mm	0.0814
D30	mm	
D10	mm	
Uniformity Coefficient		> 1.3
Curvature Coefficient		

Uniformity Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

Signed:

Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

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Date Reported: 11/11/2022

GF 100.21

TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

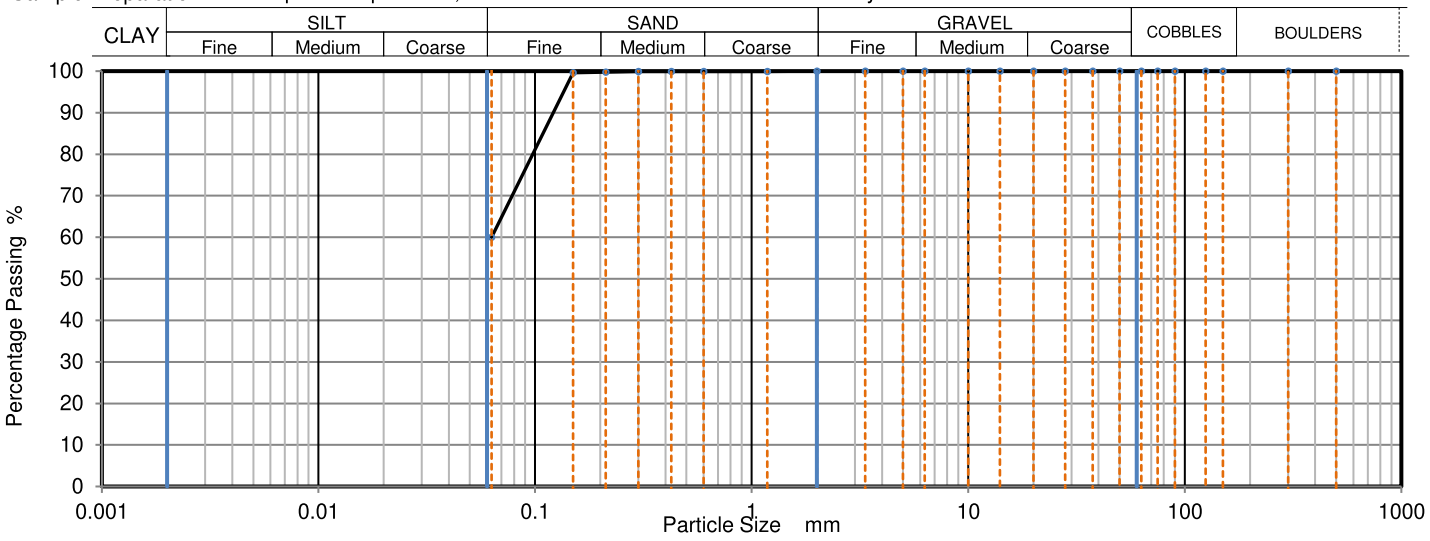
4041

Client:	Grange Geo Consulting Ltd	Client Reference:	R22126
Client Address:	43 Winchilsea Avenue, Newark, Notts, NG24 4AD	Job Number:	22-94125
		Date Sampled:	24/10/2022
		Date Received:	27/10/2022
Contact:	Steve Woodall	Date Tested:	07/11/2022
Site Address:	William Stukeley School W S School	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2485045	Depth Top [m]:	1.20
Hole No.:	WS3	Depth Base [m]:	2.00
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Brown very sandy CLAY		
Sample Preparation:	Sample was quartered, oven dried at 109.0 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	100		
0.3	100		
0.212	100		
0.15	100		
0.063	60		

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	40
Fines <0.063mm	60

Grading Analysis		
D100	mm	5
D60	mm	
D30	mm	
D10	mm	
Uniformity Coefficient		N/A
Curvature Coefficient		

Uniformity Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

Signed:

Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

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Date Reported: 11/11/2022

TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

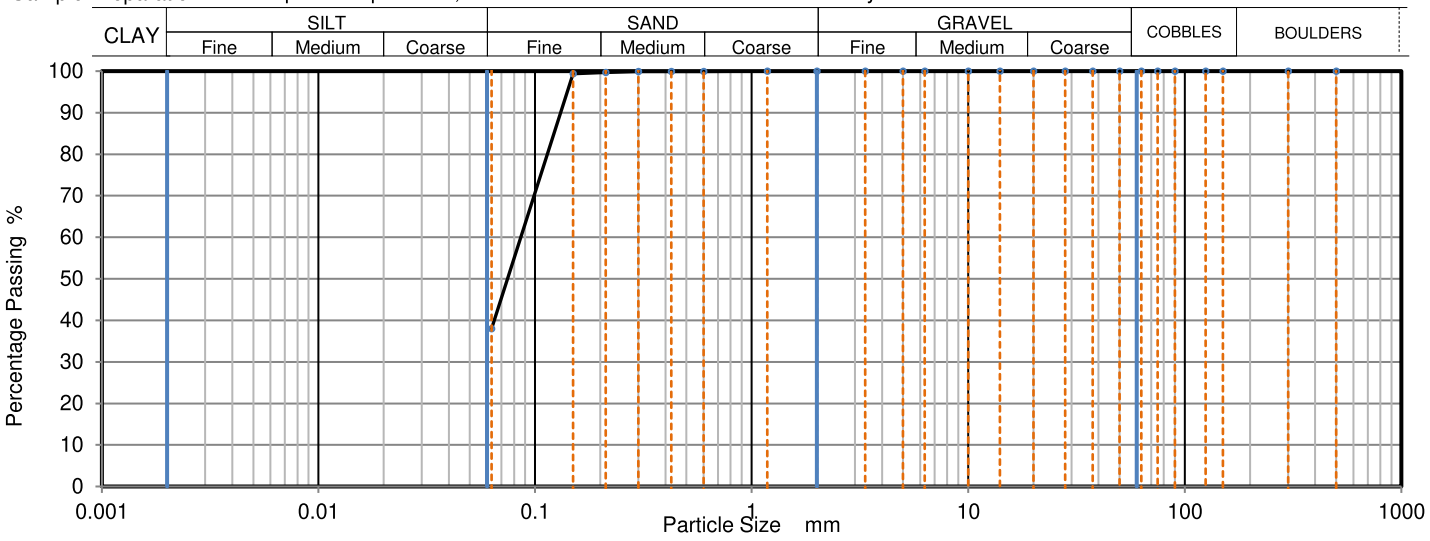
4041

Client:	Grange Geo Consulting Ltd	Client Reference:	R22126
Client Address:	43 Winchilsea Avenue, Newark, Notts, NG24 4AD	Job Number:	22-94125
		Date Sampled:	24/10/2022
		Date Received:	27/10/2022
Contact:	Steve Woodall	Date Tested:	07/11/2022
Site Address:	William Stukeley School W S School	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2485046	Depth Top [m]:	2.50
Hole No.:	WS3	Depth Base [m]:	4.00
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Brown very clayey SAND		
Sample Preparation:	Sample was quartered, oven dried at 109.0 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	100		
0.3	100		
0.212	100		
0.15	99		
0.063	38		

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	62
Fines <0.063mm	38

Grading Analysis		
D100	mm	2
D60	mm	0.0858
D30	mm	
D10	mm	
Uniformity Coefficient		> 1.4
Curvature Coefficient		

Uniformity Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

Signed:

Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

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Date Reported: 11/11/2022

GF 100.21

TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

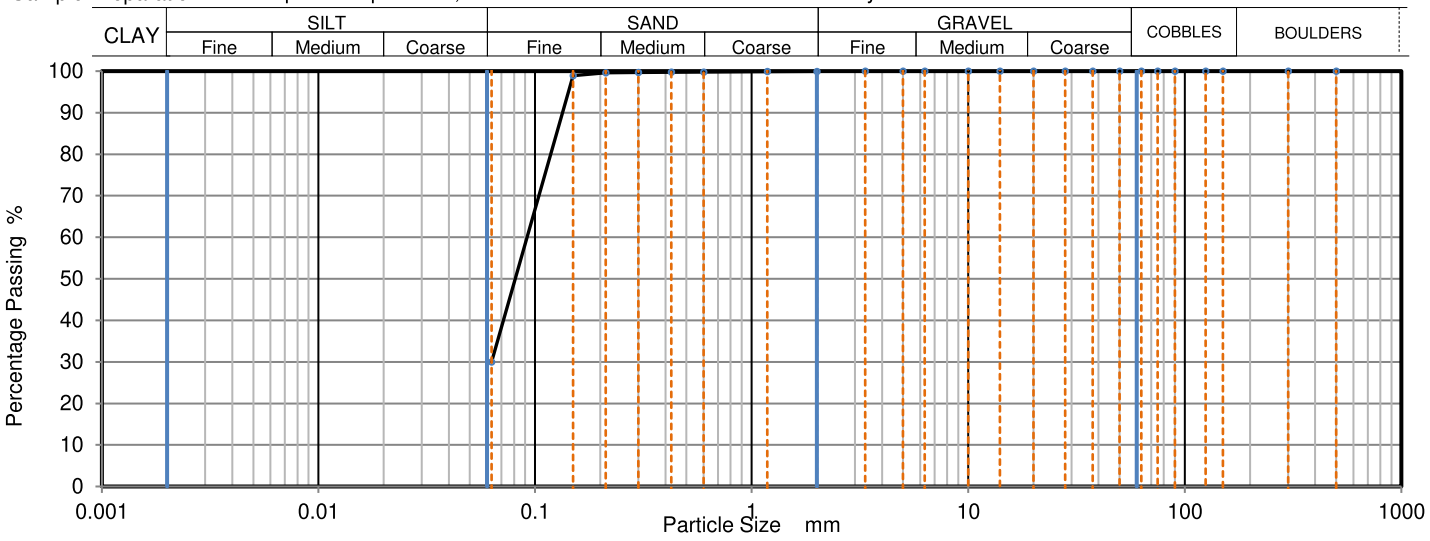
4041

Client:	Grange Geo Consulting Ltd	Client Reference:	R22126
Client Address:	43 Winchilsea Avenue, Newark, Notts, NG24 4AD	Job Number:	22-94125
		Date Sampled:	24/10/2022
		Date Received:	27/10/2022
Contact:	Steve Woodall	Date Tested:	07/11/2022
Site Address:	William Stukeley School W S School	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2485049	Depth Top [m]:	3.70
Hole No.:	WS4	Depth Base [m]:	4.50
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Brown clayey SAND		
Sample Preparation:	Sample was quartered, oven dried at 109.0 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	100		
0.3	100		
0.212	100		
0.15	99		
0.063	31		

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	69
Fines <0.063mm	31

Grading Analysis		
D100	mm	3.35
D60	mm	0.0914
D30	mm	
D10	mm	
Uniformity Coefficient		> 1.5
Curvature Coefficient		

Uniformity Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

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Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 11/11/2022

GF 100.21

Steve Woodall
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43 Winchilsea Avenue
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Notts
NG24 4AD

e: steve@grangegeo.co.uk

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Herts,
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f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 22-94127

Project / Site name:	William Stukeley School W S School	**Samples received on:**	27/10/2022
Your job number:	R22126	**Samples instructed on/ Analysis started on:**	27/10/2022
Your order number:		**Analysis completed by:**	10/11/2022
Report Issue Number:	1	**Report issued on:**	10/11/2022
Samples Analysed:	4 soil samples		

Signed:

Dominika Warjan
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report relate only to the sample(s) submitted for testing

Analytical Report Number: 22-94127
Project / Site name: William Stukeley School W S School

Lab Sample Number				2485058	2485059	2485060	2485061
Sample Reference				WS1	WS2	WS3	WS4
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.35-2.00	0.40-0.80	2.50-4.00	4.70-5.00
Date Sampled				24/10/2022	24/10/2022	24/10/2022	24/10/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**				
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	21	16	21	19
Total mass of sample received	kg	0.001	NONE	0.3	0.4	0.4	2

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	9	8.3	8.7	7.9
Total Sulphate as SO4	%	0.005	MCERTS	0.019	0.032	0.03	0.037
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.0074	0.017	0.044	0.077
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	2.7	11	1	3
Total Sulphur	%	0.005	MCERTS	0.01	0.015	0.027	0.055
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	< 5.0	5.6	6.2	10
Magnesium (leachate equivalent)	mg/l	2.5	NONE	< 2.5	2.8	3.1	5.1

U/S = Unsuitable Sample I/S = Insufficient Sample

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number : 22-94127
Project / Site name: William Stukeley School W S School

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2485058	WS1	None Supplied	1.35-2.00	Brown silt with gravel.**
2485059	WS2	None Supplied	0.40-0.80	Brown clay and sand with vegetation.
2485060	WS3	None Supplied	2.50-4.00	Brown sand.
2485061	WS4	None Supplied	4.70-5.00	Brown silt with gravel.**

**NON MCERTS MATRIX

Analytical Report Number : 22-94127
Project / Site name: William Stukeley School W S School

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Appendix I

INFILTRATION (SOAKAWAY) TESTING RESULTS

BRE BR365 - Trial Pit Soakaway Data Sheet

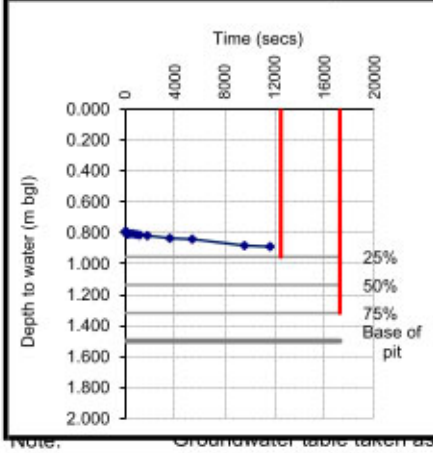
Site: William Stukeley School
Client: Lindum Group
Test Location SA1 **Date of start of testing** 25/10/2022 **Date at end of testing** 25/10/2022

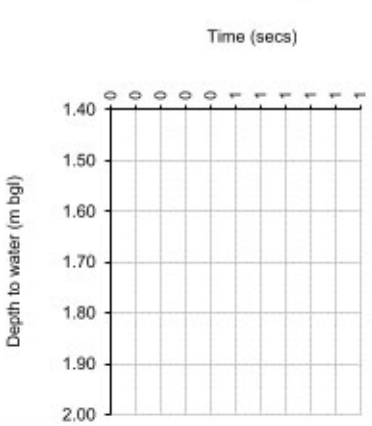
Test Run 1		Test Run 2		Test Run 3	
Pit Dimensions (m)		**Pit Dimensions (m)**		**Pit Dimensions (m)**	
Length	1.060m	Length		Length	
Width	0.380m	Width		Width	
Depth	1.500m	Depth		Depth	
Fill Depth	0.725m	Fill Depth	0.000m	Fill Depth	0.000m
Max Volume	0.292m³	Max Volume	0.000m³	Max Volume	0.000m³
Gravel used to backfill Test Pit	No	Gravel used to backfill Test Pit	No	Gravel used to backfill Test Pit	No

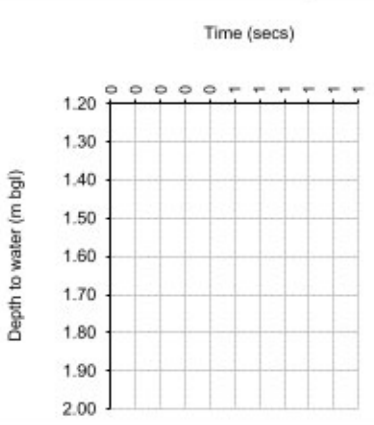
Time to soakaway

Time (secs)	Time (min)	Depth to water (m bgl)	Time (secs)	Time (min)	Depth to water (m bgl)	Time (secs)	Time (min)	Depth to water (m bgl)
	0	*0.775*		*0*		*0*	*0*	
60	1	0.790						
120	2	0.805						
180	3	0.805						
240	4	0.807						
300	5	0.807						
600	10	0.807						
900	15	0.810						
1200	20	0.815						
1800	30	0.820						
3600	60	0.835						
5400	90	0.842						
9600	160	0.883						
11640	194	0.890						

25% water depth	0.956m	**25% water depth**	0.000m	**25% water depth**	0.000m
50% water depth	1.138m	**50% water depth**	0.000m	**50% water depth**	0.000m
75% water depth	1.319m	**75% water depth**	0.000m	**75% water depth**	0.000m
25% time (seconds)		**25% time (seconds)**		**25% time (seconds)**	
75% time (seconds)		**75% time (seconds)**		**75% time (seconds)**	
$V_{p\ 75\text{-}25}$		$V_{p\ 75\text{-}25}$	0.0000m³	$V_{p\ 75\text{-}25}$	0.0000m³
$a_{p\ 50}$ **(Actual area from test)**		$a_{p\ 50}$ **(Actual area from test)**	0.0000m²	$a_{p\ 50}$ **(Actual area from test)**	0.0000m²
$t_{p\ 75\text{-}25}$		$t_{p\ 75\text{-}25}$		$t_{p\ 75\text{-}25}$	
Soil Infiltration Rate		**Soil Infiltration Rate**		**Soil Infiltration Rate**	







Note: Groundwater table taken as base of pit for infiltration rate calculation.

BRE BR365 - Trial Pit Soakaway Data Sheet

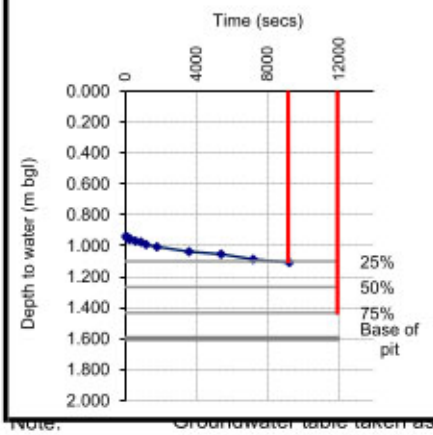
Site: William Stukeley School
Client: Lindum Group
Test Location SA2 **Date of start of testing** 25/10/2022 **Date at end of testing** 25/10/2022

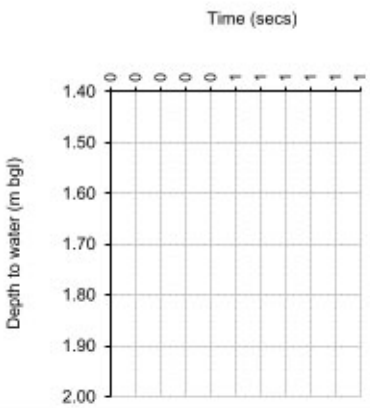
Test Run 1		Test Run 2		Test Run 3	
Pit Dimensions (m)		**Pit Dimensions (m)**		**Pit Dimensions (m)**	
Length	1.100m	Length		Length	
Width	0.370m	Width		Width	
Depth	1.600m	Depth		Depth	
Fill Depth	0.665m	Fill Depth	0.000m	Fill Depth	0.000m
Max Volume	0.271m³	Max Volume	0.000m³	Max Volume	0.000m³
Gravel used to backfill Test Pit	No	Gravel used to backfill Test Pit	No	Gravel used to backfill Test Pit	No

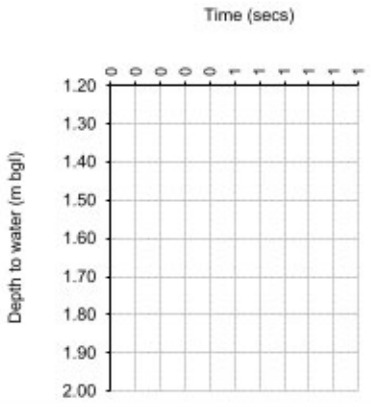
Time to soakaway

Time (secs)	Time (min)	Depth to water (m bgl)	Time (secs)	Time (min)	Depth to water (m bgl)	Time (secs)	Time (min)	Depth to water (m bgl)
	0	*0.935*		*0*		*0*	*0*	
60	1	0.940						
120	2	0.949						
180	3	0.950						
240	4	0.955						
300	5	0.958						
600	10	0.970						
900	15	0.977						
1200	20	0.992						
1800	30	1.008						
3600	60	1.039						
5400	90	1.055						
7200	120	1.088						
9240	154	1.110						

25% water depth	1.101m	**25% water depth**	0.000m	**25% water depth**	0.000m
50% water depth	1.268m	**50% water depth**	0.000m	**50% water depth**	0.000m
75% water depth	1.434m	**75% water depth**	0.000m	**75% water depth**	0.000m
25% time (seconds)		**25% time (seconds)**		**25% time (seconds)**	
75% time (seconds)		**75% time (seconds)**		**75% time (seconds)**	
$V_{p\ 75\text{-}25}$		$V_{p\ 75\text{-}25}$	0.0000m³	$V_{p\ 75\text{-}25}$	0.0000m³
$a_{p\ 50}$ (Actual area from test)		$a_{p\ 50}$ (Actual area from test)	0.0000m²	$a_{p\ 50}$ (Actual area from test)	0.0000m²
$t_{p\ 75\text{-}25}$		$t_{p\ 75\text{-}25}$		$t_{p\ 75\text{-}25}$	
Soil Infiltration Rate		**Soil Infiltration Rate**		**Soil Infiltration Rate**	







Note: Groundwater table taken as base of pit for infiltration rate calculation.