Frodsham Solar

Applicant's Response to ExA Second Written Questions

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1.0 INTRODUCTION

1.1 Purpose of this Document

1.1.1 This document responds to the Examining Authority's (ExA's) second written questions **[PD-016]** which were issued on 13 March 2026, as part of the examination of the application for development consent for the proposed Frodsham Solar project (the 'Proposed Development').

1.1.2 This response is issued at Deadline 5 in accordance with the ExA's Rule 8 Letter **[PD-008]** issued on the 16th December 2025 detailing the examination timetable and procedure.

1.2 Approach

1.2.1 The Applicant has presented responses to the ExA's second written questions that are directed to it within Table 2-1 of this document. The table provides the reference for the relevant ExA question, the question, and the Applicant's response. The Applicant has also, where it considers that it may be helpful to the ExA, provided comments on questions directed to other parties.

1.2.2 The documents submitted with the application and at previous examination deadlines are referenced using the reference number assigned by the Planning Inspectorate (PINS) i.e. [APP-XXX].

2.0 APPLICANT RESPONSES

2.1 Overview

2.1.1 The ExA has asked questions under the following themes / sub-headings, to which the Applicant has responded:

- General and cross-topic questions
- Need case, effects on climate change, site selection, alternatives, electricity generation, grid connection, decommissioning
- Ground Conditions
- Biodiversity and Ecology
- Habitats Regulations Assessment
- Landscape and Visual
- Water Environment
- Other Planning Issues
- Compulsory Acquisition
- Draft DCO

2.2 Response Table

2.2.1 The Applicant's responses are presented in **Table 2-1**, overleaf.

Table 2-1: Applicant's Response to ExA Second Written Questions

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
1. General and cross-topic questions		
Q2.1.1	**Solar Roadmap 2025** The applicant and all interested parties are invited to make any comments or representations about the Solar Roadmap 2025 and its applicability and implications for the proposed development. This is across all topics but, most notably, the areas of need, alternatives and waste management are likely to require some explanation and commentary.	The Solar Roadmap 2025 details Government and industry actions that will be delivered to radically increase the deployment of solar in all its forms across the UK. It is intended to support the rapid acceleration of solar deployment to meet Clean Power by 2030, including measures addressing planning, networks, supply chains, skills, and longer-term implementation and monitoring. The document provides current Government direction on the scale, pace, and mix of solar deployment required, including the continuing role for ground-mounted, large-scale solar. The Solar Roadmap reaffirms the target for a rapid acceleration of solar deployment from over 18GW at present to 45-47GW by 2030 (including both ground mounted and rooftop solar), with scope to exceed this range subject to system need. The Solar Roadmap also notes the potential for total solar capacity in 2030 to be higher in practice, with an additional 9-10GW of smaller-scale rooftop solar that could potentially deploy before 2030. The Solar Roadmap indicates that large-scale solar is expected to remain the principal contributor to meeting the 2030 clean power target stating that, of the capacity installed by 2030 (with reference to Figure 2 of the document) around 60-65% could be large-scale projects, with domestic rooftop around 20%, and commercial rooftop and ground mount around 15-20%. It is therefore clear that in relation to alternatives, even with a strong policy push on rooftop deployment, the national pathway assumes

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
		that large-scale ground-mounted projects form the majority of delivered capacity by 2030. In terms of impacts, the Solar Roadmap states that "*As solar sites typically cause minimal disturbance to the ground, the remainder of the land on which they are installed can be used for plant growth and wildlife enhancements during the lifetime of the solar site. In some cases, these biodiversity benefits, including increases in the numbers of pollinators, can lead to increased productivity on adjacent agricultural land. A recent study, from the Royal Society for the Protection of Birds and University of Cambridge found that, hectare for hectare, solar farms in East Anglia contained nearly three times as many birds compared to surrounding arable land.*" Appendix 2 of the Solar Roadmap sets out some common misconceptions in relation to solar. Of relevance to waste management it is stated that: "*Solar panels can be reused and recycled. The typical lifespan of a new silicon-based solar panel will be around 40 years. Earlier panels are expected to last at least 25 years. This means that some of the first solar systems to be installed in the UK are around halfway through their intended lifespan. There are already organisations in the UK which specialise in solar reuse and recycling, and as the volume of solar panels ready to be recycled increases, more are expected to begin providing such 'end-of-life' services. Second-life markets may also develop for older models which still work well.*" Overall, the Proposed Development aligns with the Solar Roadmap's emphasis on rapid deployment of large-scale solar, contributing to the 2030 capacity target and to energy security outcomes. The Applicant considers that the Solar Roadmap supports the principle of the Proposed

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
		Development and does not introduce any new policy implications that would weigh against the grant of development consent.
Q2.1.2	**Grid connection statement** At present, the grid connection statement [APP-145] predicts part energising of the project in 2029, with full construction completed 2030. The actual grid connection date is 2029 as per paragraph 2.1.4. The ExA notes that the examination completes on 30 April 2026, the recommendation report is due with the SoS by 30 July 2026 and, assuming the SoS issues a decision in 3 months, a decision made by 30 October 2026. Assuming pre-construction works commence immediately on the day of the decision, the skylark mitigation area would take time to establish (6 months – April 2027), the Non-Breeding Bird Mitigation Area (NBBMA) is said to require 6-9 months (January 2028) to establish, then construction would be 30 months (June 2030). This timetable assumes a smooth running and immediate attention to all works and activities but does not appear to account for avoiding the overwintering seasons (November to March) each year.	The grid connection date is based on that detailed in the connection agreements between the Applicant and SPEN, and between the Applicant and National Energy System Operator (NESO), as referenced in the grid connection statement [APP-145]. Whilst these agreements remain in place, the Proposed Development is subject to the current Connections Reform of the grid connections queue, as being led by NESO. In respect to that reform process, the Proposed Development has been awarded Gate 2, Phase 1 status which means that NESO intends for the electricity generated by its PV arrays to be exported onto the distribution network to meet increasing demand in the surrounding area and to help meet the Clean Power 2030 Action Plan goal of enough clean power to meet 100% of electricity demand by 2030, with at least 95% of electricity generation coming from low-carbon sources and no more than 5% from unabated gas. There have been delays to the reform process and the latest advice from NESO is that the Applicant will be notified of the new connection date in approximately June 2026. Although the Gate 2, Phase 1 status means that NESO, NGET and SPEN will aim to connect the project before 2030, it is entirely possible that the connection date will be pushed out from the current 2029 date. Regardless, in the event that the connection date is unachievable based on the wider construction programme, measures would be taken to ensure the Proposed Development can still connect to the distribution network. The distribution network operator (DNO) which is SPEN, insists on regular progress update meetings to ensure the project is on-track to be able to connect when its expected to. Should either party deem it necessary, an application to modify the connection date would be submitted. This is a

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
	This seems ambitious. Is the grid connection date secure? Further to that, on the basis of the above, the NBBMA would be delivered between April 2027 and January 2028. Are you confident that the Runcorn Spur Pipeline, if approved, would be built in advance of these dates?	mechanism that is frequently implemented to align the expectations of the DNO and the commissioning of new electricity generating stations. In relation to the integration of the delivery of the Skylark Mitigation Area (SMA) and the Non Breeding Bird Mitigation Area (NBBMA) the Applicant that this can be achieved within the programme dates set out in the application. As noted by the ExA, a decision by the Secretary of State is expected by 30 October 2026. The SMA would involve the reversion of the existing field to permanent meadow. The field is already grassland and would be managed during the operational period to enhance species diversity, for example through a managed cutting regime and, if necessary, overseeding. It would therefore be available immediately as a grassland resource for skylark, with the cutting regime managed to provide optimum skylark habitat. In addition, the first skylark breeding season would occur during the creation of the NBBMA. During that period, the remainder of the Order limits would remain accessible to skylark, with disturbance limited to the NBBMA area. The creation of the NBBMA would commence at the end of the core non-breeding bird season, which runs from November to February inclusive, as set out in paragraph 2.4.5 of the oCEMP [REP4-026]. The Applicant has addressed the Council's comments that construction should avoid the passage periods within the Information to Inform Habitats Regulations Assessment [REP4-012]. Analysis of the survey data collected at the Site indicates that use of Cell 3 outside the core non-breeding bird period is minimal, as described in paragraphs 8.2.10 to 8.2.51 of [REP4-012]. Paragraph 8.25 of REP4-012 states that: *"NBBMA works are anticipated to require a maximum of nine months from commencement to completion and may be completed within 6 months.*

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		Construction of the NBBMA will be focussed outside the peak sensitive period for non-breeding birds (i.e., undertaken between March and October inclusive)." Although some use is recorded during the passage season, that use is limited. Given that the remainder of the Order limits would not be subject to construction works while the NBBMA is being created, any effects on the populations of SPA species are considered to be de minimis, as stated at paragraph 8.2.7 of REP4-012. In addition, the oCEMP [REP4-026] includes adaptive mitigation measures in Table 5-3 to address any exceptional circumstances. Once the NBBMA has been created, there would be no general requirement to avoid construction during the core non-breeding bird season. Table 5-3 of the oCEMP [REP4-026] notes that some areas of the Site may nevertheless be subject to seasonal restrictions: *"Work within the Western SADA, particularly the area directly adjacent to the NBBMA in Cell 2 and Cell 1, will be completed outside of the sensitive non-breeding period where possible (Nov-Feb inclusive). The programming for construction works in these areas will be included within the Construction Environmental Management Plan."* Table 5-3 also refers specifically to limitations on noisy operations within 180m of the eastern boundary of the NBBMA. However, those limitations are relatively limited in scope, and it is considered that they can be accommodated within the overall construction programme, with much of the Site unaffected by seasonal restrictions once the NBBMA has been created. Accordingly, if the decision is issued on 30 October 2026, construction of the NBBMA could commence in March 2027, enabling a connection to be made in mid-2029 in accordance with the indicative resourcing schedule

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
		provided in the Note on Updated Construction Resourcing Schedule [REP1-042].
Q2.1.3	**Any remaining issues** Frodsham Wind Farm Limited submitted a relevant representation [RR-047] to the examination, but there are no further submissions expressly recorded in the examination. The ExA notes [RR-047] placed a holding objection to the proposed development. Is there still an objection, or is there now common ground?	The Applicant and Frodsham Wind Farm Limited have made good progress in their discussions, and are working towards FWFL's objection being able to be withdrawn prior to the end of Examination.
2. Principle of Development and Need		
Need case		
Q2.2.1	**Capacity and upper limits** No energy cap is proposed for the project, allowing the solar farm to produce increased energy yields in the future following maintenance upgrades and panel replacements. This does however raise a few questions: 1) When the cabling for the development is initially laid, what capacity would the cables be able to manage (for example, would the cables be fitted with a greater carrying capacity than	1) The Applicant can confirm that the cabling at the point of installation will have sufficient carrying capacity to accommodate the maximum conceivable installed capacity of the Proposed Development. The future detailed design work will include producing an electrical system design which will ensure that the underground cables to be installed from the outset have sufficient capability to meet the needs of the maximum envisaged capacity. The Applicant does not consider ground excavations during the operational phase required to replace cabling is a viable option given the associated financial cost of capital works, loss of income from reduced power generation during those works and the associated environmental disbenefits that would arise.

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
	what would be generated at the onset of the proposal, thus reducing the need to dig them up when the panels are replaced)? 2) Regardless of what generation capacity is available now or in the future, would the project be restricted or constrained by the National Grid connection offer? Would you need to renegotiate the terms of that connection agreement before undertaking major replacement works? 3) Would any future increases in energy yield be in any way constrained by capacity at the SPEN Frodsham Substation? 4) Would the private wire agreements (if any) subvert the need for any renegotiation of the grid connection agreement? 5) It is noted that in table 2-13 [APP-035] the battery energy storage system (BESS) is rated to have an operational lifespan of 10-20 years. Is it also the intention, as part of the major replacement works, to upgrade the BESS so as to increase its capacity (from 100MW and 400MWh) or would those parameters not change? Taking the lower end of that lifespan, could that mean the BESS would be replaced 4 times over the course of the project?	2) There are two elements to consider here: i. The export capacity (MW) specified in the connection agreement, which reflects both the rating of the connection assets and the wider network's ability to accommodate export. ii. The installed capacity and design of the solar PV project, which can be optimised independently to improve energy yield and operational efficiency. An increase in the export capacity beyond the level specified in the existing connection agreement would require renegotiation through a modification application with the DNO. The DNO would then assess whether any network reinforcement or additional works are required to support the revised export level. While this process is formal and may have cost or time implications, it is entirely possible to undertake this and, given the likely future demand, and noting the capacity shortfall in the NESO D5 distribution network region (see Section 7.2 of the Planning Statement [APP-128], it is considered a realistic prospect at Frodsham Substation. Any change to the installed capacity or internal design of the site that does not increase the maximum export capacity would not require renegotiation of the connection agreement. However, it would still need to be discussed with the DNO to ensure that any changes to the site's technical characteristics are understood. This engagement is part of the normal G99 compliance process (the process for connecting power generation to the UK distribution network) and is standard practice across all generation sites.

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		If major equipment replacements are planned, such as replacing more than 80% of the inverters or introducing equipment that materially alters the site's electrical characteristics, these changes would also trigger the need to follow the G99 modification process. This ensures that both the site and the wider network continue to operate safely and within required technical standards and is a very standard process. 3) The 100MW solar installed capacity that has been secured for export in the grid connection agreements was informed by the DNO's projected capacity at the SPEN substation. This will not, however, form a cap on power generation, as measured in Megawatt hours (MWh) but would limit the amount of power that can be exported. Design optimisation will continue at every stage of the solar farm's life cycle with the aim of increasing the energy yield. This includes optimising solar panel tilt and orientation to capture maximum solar irradiance, efficient layout to reduce cable lengths and associated electrical losses etc. Increasing energy yield will enable the solar farm to maximise exported electricity at periods outside maximum solar irradiance in terms of time of the day (e.g. morning and evenings) and also due to weather conditions. 4) A private wire arrangement wouldn't require a modification application to the existing grid connection offer but it would need careful design and consideration of the interaction between the SPEN network and the private network, particularly around protection and fault levels. The Applicant has discussed this with the DNO (SPEN) and would ensure coordination with them if the private wire agreements progress. The aim of a private wire connection would be to reduce the loading on the wider network and improve the ability of this project to directly support

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		local load and it could facilitate increased maximum export capacity above the 100MW connection agreement already in place. 5) Paragraph 1.1.3 of the Gird Connection Statement sets out that the proposed BESS would be capable of storing approximately 100MW of electricity over a 4-hour duration (400MWh). This does not mean that the export capacity of the connection needs to be 400MW, it means that the batteries when fully charged would be capable of dispatching up to 100MW of electricity per hour for a period of 4 hours. This is also set out at paragraph 2.4.66 of Environmental Statement: Volume 1 Chapter 2: The Proposed Development [APP-035].
Effects on climate change		
Q2.2.2	**Commentary on case law** Could the applicant provide comment in light of the recent cases of R (on the application of Finch on behalf of the Weald Action Group) v Surrey County Council [2024] UKSC 20 and Friends of the Earth Ltd and South Lakeland Action on Climate Change v SSLUHC [2024] EWHC 2349 (Admin), and whether these cases have any implications for the assessments of greenhouse gas emissions?	The Supreme Court judgment in Finch seeks to ensure that EIA sufficiently considers 'indirect effects'. It (and the South Lakeland case that followed it) emphasised the need for an ES to consider all impacts where they can be considered to be an 'inevitable causation' between a project and an effect. Such effects must, however, not be mere 'conjecture or speculation', i.e. the relevant information needs to be available or an appropriate methodology able to be applied. Furthermore, it emphasised that an assessment should only be required if a reasoned conclusion is able to be reached – there must be sufficient evidence to draw the link between the project and effect, to say that the effect is a 'likely' significant effect of the development being considered.

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		Most relevantly, the judgment highlights the need to ensure that an ES, particularly in respect of GHG assessments, considers the potential upstream and downstream effects of the project in question, which could be adverse or beneficial. The Applicant can confirm that the ES considers these matters, particularly in Chapter 5: Greenhouse Gases (APP-038) and Appendix 5-1: GHG Assessment (APP-060) through the provision of information in respect of the construction supply chain for the Proposed Development, including associated transport movements. From the downstream perspective, it would be conjecture or speculation to assume any particular use of the electricity generated by the Proposed Development: • where the electricity goes into the Grid and it would not be possible to allocate 'Frodsham electricity' as arriving at any particular location, as opposed to any other electricity, and so no assumptions can be made about 'downstream' use of Frodsham electricity by customers of the Grid; and • whilst the private wire connection is acknowledged, at this stage, no specific use for that electricity has been identified. As the Protos site could be used for a wide range of different technologies, it would be speculation to choose just one possible user or what its impacts would be as a result of being powered by Frodsham electricity. It is also noted that the referenced judgments do not comment on the approach to cumulative carbon assessments, meaning that the approach

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		set out in paragraph 5.12.2 of the ES, which has been supported by other case law and the IEMA GHG Guidance, remains correct.
Site selection and alternatives		
2.2.3	**Battery Energy Storage System (BESS)** It is acknowledged that the final decision on whether to develop the BESS under Work No.2A or work No.2B would be made at detailed design stage should development consent be forthcoming. At present, however, is the applicant any closer to fixing the location?	The decision on selecting the final location is intended to be informed by detailed design work and will require advice from the Engineering and Procurement Contractor, to be appointed post-consent/pre-construction. In reaching the decision, the relationship between the BESS and the wider final scheme layout will be considered. For example, future modelling will inform the optimised layout and consider which location is preferrable for solar power generation and which is best for BESS, based on things like onsite shadowing and cable lengths. The final location will form part of the detailed design to be submitted for approval under Requirement 6 of the draft DCO.
2.2.4	**Determination of what constitutes an alternative** The ExA acknowledges the applicant's answer to ExQ1 question 8.2.5 regarding defining a 5km search area [REP2-003]. However, there are several further questions arising from this: 1) Section 1.2 [APP-053] describes the applicant's methodology to assessing alternatives. The 'methodology' does not describe a process of alternative site assessment, but rather straight away	1) The Applicant acknowledges that Section 1.2 is not simply a description of the methodology used for the alternative site assessment (ASA). It is a combination of the background to the identification of the application site and a description of the methodology for the ASA. Paragraphs 1.2.2 to 1.2.16 explain why the Site was originally identified as a potential development opportunity, including reasons such as land ownership, co-location with Frodsham Wind Farm, proximity to energy users and grid connection considerations. Those paragraphs were intended to explain

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	promotes the application site as the best option from a commercial perspective only. The way section 1.2 is written reads could be taken as conclusions rather than the method taken to appraise and sift potential sites. Do you have any comments on this? 2) In paragraph 1.2.8 [APP-053], the applicant states: *"Having secured the opportunity at the Site, the Applicant needed to ensure there was the necessary infrastructure and capacity within the transmission and distribution network to accommodate the electricity generated."* In light of this statement and the later sections of the ES Chapter on Alternatives promoting the application site, is it reasonable to conclude that there was, in fact, no real consideration of alternatives because there was already commitment, financial or otherwise, in the application site itself? Were options B and C ever realistic propositions if the application site had already been secured? 3) In paragraph 2.4.9 [APP-053], the applicant declares that Option A within the search area is superior except for matters of ecology and flood risk. With regard to ecology, given the international importance of the Special Protection Area and the neighbouring Site of Special Scientific Interest (SSSI) and there	how the Site first emerged as a potential opportunity, rather than to constitute the ASA itself. The Applicant considers it was both logical and reasonable for a renewable energy developer to begin its assessment from a starting point where a large proportion of the Site was already under the control of, at that stage, its joint venture partner, particularly where that land also appeared capable of supporting a commercial-scale solar project on the basis of potential nearby grid availability. However, that starting point did not pre-judge the decision to take the Site forward through the planning process. Rather, it provided the basis from which the Applicant needed to test whether there were any other reasonably available and sequentially preferable sites or areas capable of delivering the Proposed Development. The methodology for that ASA is then set out at paragraphs 1.2.17 and 1.2.18 and applied through Section 2. In summary, the assessment: • defines a reasonable search area by reference to the SPEN Frodsham Substation at which it was determined there was capacity for a 100MW export connection; • excludes areas that are inappropriate or demonstrably unsuitable; and • identifies and compares the remaining option areas against relevant factors set out in NPS EN-3 and other planning, environmental and deliverability criteria in order to determine whether there are any more sequentially preferable, reasonably available sites or areas capable of delivering the Proposed Development. The Applicant therefore accepts that the drafting of Section 1.2 could have more clearly distinguished between the background to initial site identification and the methodology for the ASA. However, when read as a

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	was an existing area purposefully set aside for environmental mitigation related to the Frodsham Wind Farm, the ExA is unclear how the applicant a) gave weight to such considerations in the optioneering process and b) reconciled that direct interference with land in the SSSI and functionally linked land was preferred. Provide more detail on this with a clear rationale. 4) Can the applicant provide the calculations that relate to transmission losses? The ExA is not wholly convinced that the transmission losses are so significant past the 5km point to make a project beyond this unviable, unattractive or inefficient. 5) There are overhead power lines and pylons in existence stretching to the east and to the west. Was a direct connection into the overhead network ever considered? If not, why not?	whole, APP-053 does not simply determine at the outset that the application site is the best option. Rather, it explains why the Site was a reasonable starting point for consideration and then goes on to apply a staged process to identify, appraise and sift potential alternatives. 2) The Applicant does not consider it reasonable to conclude from paragraph 1.2.8 that there was no real consideration of alternatives. For a renewable energy developer, securing an interest in land that appears capable of accommodating a project, and located close to available grid export capacity (as noted by NPS EN-3 paragraph 2.10.17) is a normal and logical early stage in the development process. It provides a basis on which technical, commercial, environmental and planning due diligence can then be undertaken. It does not, of itself, pre-determine that the site will be taken forward irrespective of the outcome of that later assessment. In this case, although the Applicant had secured the opportunity at the Site, the ASA was then undertaken to test whether there were any other reasonably available sites or areas which had a realistic prospect of delivering the same infrastructure capacity within the same timescale. As set out in the previous response the ASA defined a search area by reference to the SPEN Frodsham Substation, excluded areas that were inappropriate or demonstrably unsuitable, and then identified three option areas, A, B and C, for comparative appraisal. Options B and C were therefore treated as potential alternatives and were assessed against the same framework, rather than being dismissed merely because the application site had already been secured. The outcome of that assessment was that Options B and C did not offer a realistic prospect of delivering the same infrastructure capacity in the same

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		timescale as Option A (noting that this is a relevant consideration pursuant to NPS EN-1 paragraph 4.3.23). The reasons identified in the ASA were not limited to land control. They included, amongst other matters, more constrained grid connection arrangements, greater proximity to dwellings, less favourable agricultural land characteristics, more constrained accessibility, and the fact that Areas B and C were predominantly made up of smaller parcels under multiple ownerships. Collectively, the ASA concludes that these constraints would reduce capacity and/or delay delivery, such that Areas B and C did not represent realistic deliverable alternatives to the Site. The ASA document demonstrates that the Site's early identification and control formed the starting point for the assessment, not its conclusion, and that potential alternatives were then identified and tested through the ASA process. 3) The comparative assessment in Table 2.2 considered a wide range of factors and was intended to provide a proportionate but thorough evaluation of the different option areas. As explained in paragraph 2.4.6 of the ASA, this was informed both using the factors identified in NPS EN-3 as relevant to site selection and design, and on additional planning and environmental considerations, including heritage, ecological and landscape designations, flood risk and Green Belt. In relation to ecological designations, the ASA expressly recognises that the southern fringe of the Mersey Estuary SSSI lies within the northern extent of Option Area A and that the Site is in close proximity to the Mersey Estuary SPA and Ramsar Site. Table 2.2 records that the ecological SSSI within Options B and C could in all likelihood be accommodated within

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		those option areas without affecting the relevant SSSIs. On this basis, Option Areas B and C were assessed as being 'Significantly Less Constrained' than Option A in ecological terms, clearly giving weight to these factors. However, the ASA did not assess ecology in isolation. There were many other factors which also contributed to the overall conclusion that Areas B and C were less preferable from a land-use planning perspective because of other significant constraints, including network connection, proximity to dwellings, agricultural land classification, accessibility, heritage, landscape, number of landowners and Green Belt. The ASA concludes that these constraints would be likely either to reduce the scale or capacity of development that could be brought forward, or to delay delivery, such that Areas B and C did not offer a realistic prospect of delivering the same infrastructure capacity in the same timescale as Area A. The approach taken is considered to align with the NPS EN-1 paragraph 4.3.22 which guides the Secretary of State as to the weight that should be applied to the consideration of alternatives in the decision-making process. This approach does not mean that factors such as the proximity to the Mersey Estuary SPA and the presence of an area of the Mersey Estuary within the site were disregarded, but meant that the Applicant needed to ensure that when developing the scheme, the mitigation hierarchy was applied and that the design was developed to avoid an adverse impact on the integrity of the designated site. As set out below in the subsequent response, the Proposed Development was designed in a way that enabled impacts on the SSSI and the SPA, including the functionally linked land, to be mitigated, including adding a clear improvement in ecological functionality to the environmental mitigation put forward by the Frodsham Wind Farm (and noting the important point that the only 'development' in the SSSI, is not solar development, but an improvement to habitat within

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		the NBBMA (see the discussion in section 2.8 of the ONBBMS (as updated alongside this submission)). The Applicant's case is therefore that ecology was given substantial weight at the optioneering stage, but that it was considered that the residual concerns associated with Option A could be appropriately addressed in the final scheme design and assessment. 4) The Applicant has not relied solely on transmission losses to define the 5km search area, and APP-053 should not be read as suggesting that a project beyond 5km would automatically be unviable because of transmission losses. The 5km radius was identified as a reasonable and proportionate search area having regard to a combination of a number of factors relevant to connection feasibility. These include the increasing capital cost of longer 132kV cable routes, the reduction in electrical efficiency over longer distances, the increased number of affected landowners over a greater distance, and the particular physical and environmental constraints surrounding the Frodsham Substation. Paragraph 2.10.24 of NPS EN-3 discusses grid connection and does not prescribe any specific distance threshold or identify any single decisive factor, but it does recognise that the distance from the solar farm to the existing network can have a significant effect on the commercial feasibility of a development proposal. Distance was therefore a relevant consideration, but it was considered alongside the practical routeing, engineering, environmental and land-related constraints that would arise from seeking to connect sites at distances greater than 5km from the SPEN Frodsham Substation.

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		The ASA explains that, in this location, longer routes would be constrained by the Mersey Estuary, the River Weaver and Weaver Navigation, sensitive industrial facilities, the M56 corridor, the Chester-Manchester railway line and nearby urban areas, all of which would require complex crossings or avoidance measures and materially increase cost and delivery complexity. The 5km radius was therefore not based on transmission losses in isolation. It is also noted that in the Secretary of State's recent decision on the 190MW (and thus larger capacity) Helios solar DCO, he accepted that a 5km search area was an acceptable distance of a scheme of that size and where constraints such as the above were referred to as reasons as why the search area was not larger for that project. 5) There are SPEN 132kV and NGET 400kV overhead lines passing through the Site and crossing adjacent land. NGET as a transmission operator doesn't allow a direct connection to the 400kV network and would require a new transmission substation which would be technically complex, environmentally significant and prohibitively expensive with multi-year construction timescales and was deemed not to be technically or economically feasible in the context of the connection date. Connection to the 132kV SPEN network is technically possible but there is no capacity available on those circuits to accommodate the proposed generation.
2.2.5	**Site of Special Scientific Interest** Having determined that option A was to be the preferred option, the ExA notes that table 2.2 [APP-053] states: *"The southern fringe of the Mersey Estuary Site of Special Scientific Interest (SSSI) is*	The Site includes a small section of the Mersey Estuary SSSI along its northern boundary. This land was retained within the Site boundary, in part because it was included within the lease demise for the larger landholding option. However, this part of the Site was not included within the solar array development area (SADA), and this decision was made at the start of the

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	located within the northern extent of Option Area A." The ExA also notes the same table, in respect of Option B, states: *"a large solar farm development could be accommodated within this Option Area without affecting these SSSIs."* Set out clearly why the 'southern fringe' was not excluded from the project site and why a large solar farm could not be accommodated at the project site without affecting the SSSI, just as in option B.	project design process to avoid direct impacts on the SSSI. The approach to the assessment and the subsequent design of mitigation were also undertaken cognisant that the SSSI is designated for its bird interest, and therefore, the mitigation strategy for the Mersey Estuary SPA and its associated functionally linked land also supports the maintenance and enhancement of the SSSI. The Outline Non Breeding Bird Mitigation Strategy [REP3-032] highlights several benefits provided by the proposed mitigation; at paragraph 1.6.1, point (7) lists the benefits to the SSSI: *Restoration of the corresponding area of the Mersey Estuary SSSI which falls within the NBBMA (namely Unit 1011753) to favourable status by:* *(a) Eradication and/or on-going treatment of NZPW.* *(b) Restoration of pools within the SSSI with features suitable for use as a high tide roost.* *(c) Removal of a stand of semi-mature trees adjacent to the Canal Pools (within the SSSI), thereby increasing the attractiveness of the SSSI (and surrounding habitats) to wetland species waders through increasing open aspects adjacent to the SPA, and reducing predator opportunities.* *(d) Reduced disturbance of the SSSI through the removal of uncontrolled recreational fishing of the Canal Pools.* As such the Proposed Development not only avoids impacts on the SSSI but also offers a series of benefits to it. On this basis the inclusion of the SSSI within the Site boundary was not considered to represent an insurmountable constraint. In fact the Proposed Development provides an

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		opportunity to enhance the SSSI, which through the provisions included in the draft DCO at Article 7, will persist beyond the point of decommissioning as a result of tying the measures associated with the SSSI to form part of the management scheme of the Mersey Estuary SSSI for the purposes of section 28J of the Wildlife and Countryside Act 1981(b).
2.2.6	**Land at the Frodsham Wind Farm** Knowing that the Frodsham Wind Farm had land designated as a mitigation area and that land had been modified and improved to support wildlife as a means of mitigation for the wind farm (particular emphasis on Cell 2), why was this area not avoided when undertaking the site selection process? Justify why the site selection and order limit refinement process did not seek to exclude this land and set out what other alternatives were considered to using the said land.	The presence of the Frodsham Wind Farm and the associated mitigation was a careful consideration for the Proposed Development from the outset, acknowledged in initial meetings with Natural England, Cheshire West and Chester Council and the Planning Inspectorate. Paragraphs 8.4.65 to 8.4.69 of the Environmental Statement: Volume 2 Appendix 1-1: Frodsham Solar Scoping Report (May 2023) [APP-048] describes the existing impacts of Frodsham Wind Farm, including the use of Cell 2, Cell 3 and Cell 5 for mitigation areas. The mitigation section of the scoping report recognised the presence of the wind farm mitigation and that the extent of mitigation required to be delivered by the Proposed Development would depend on the results of ongoing baseline data collection and project design. As such it is evident that this was an acknowledged factor from the outset of the project. Table 3-2 of Environmental Statement: Volume 1 Chapter 3: Alternatives and Design Evolution [APP-036] summarises the main alternatives considered by the Applicant. This includes ecological mitigation / enhancement on page 24 of the chapter. The option of providing additional mitigation within the scoping site boundary are acknowledged in that table, but it is noted how this would: *"result in the loss of solar generating capacity which would harm one of the key objectives of the Proposed Development, which is to deliver as much renewable energy as possible from the Site. The Government's intention to*

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		maximise renewable energy is clear within NPS EN-1 via the designation of low carbon generating capacity as CNP infrastructure. However, it is also the case that the mitigation hierarchy must be followed, and that development must not come at any cost and adverse effects, in particular effects on a designated habitat site, must be mitigated such that development of CNP Infrastructure does not have an adverse impact on the integrity of the UK National site network. In order to achieve an outcome of maximising renewable generation and also avoid an adverse impact on the integrity of the Mersey Estuary SPA a number of mitigation options were considered." In this context, the mitigation package was developed to address impacts across the entirety of the Order Limits, including the areas identified for mitigation associated with the wind farm (Cells 2, 3 and 5). This approach informed the preparation of the Outline Non-Breeding Bird Mitigation Strategy [REP3-032], which concluded that it is feasible to mitigate the effects of the Proposed Development on functionally linked land of the Mersey Estuary SPA by increasing the ecological value of Cell 3 to provide sufficient enhancement to offset impacts arising from both the wind farm and the Proposed Development. Had this approach not been achievable, it may have been necessary to refine the Order Limits or reduce the extent of the solar array. However, a solution has been identified and agreed with Natural England that both maximises renewable energy generation and mitigates harm to the Site's ecological resource, ensuring no adverse effect on the integrity of the Mersey Estuary SPA.
2.2.7	**Initial scope of substations** Whilst ES Chapter 3 [APP-036] and its accompanying appendix [APP-053] discuss the suitability of the	Section 1.2 of the Alternative Site Assessment (ASA) [APP-053] describes the arrangement of the distribution and transmission network within the wider Merseyside area, and how capacity is initially scoped through the use

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	SPEN Frodsham Substation and options A, B and C, no information is volunteered about whether other substations were considered. Explain why or what research was actually done with regards to alternative substations other than the SPEN Frodsham Substation. .	of heat maps, and then through enquiries with the grid companies / network operators. A study was undertaken by the Applicant in 2020 to identify all feasible locations where a commercial scale solar project could connect to the electricity network. This included four different substations in the area - not just the SPEN Frodsham Substation. These were Ince A, the Protos 33 kV substation, the National Grid 400 kV site at Frodsham, and the SPEN Frodsham 132 kV substation. The study found that: • Ince A had insufficient capacity and is difficult to access. • Protos 33 kV has insufficient capacity for the Proposed Development as a starting point and much of that capacity was already allocated to other projects. • A connection to the 400 kV National Grid substation is technically possible but at significant cost and would take many years to build, requiring much larger new infrastructure than connection to the SPEN Frodsham 132kV substation. It is noted in any event that given this substation is located directly adjacent to the SPEN substation, this would have had no effect to the alternatives process. • SPEN Frodsham 132 kV was the only location with enough capacity, reasonable cost, and a practical construction programme. On this basis Frodsham 132 kV was chosen. For a 100MW connection, this connection involves relatively straightforward works, with limited impacts arising from those works, accessed by an existing substation access road that has a junction with the A56, and which is in a location a distance from local communities.

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		Following an application to the District Network Operator (DNO) for a connection offer, the decision on which substation a generating station connects to is taken by the DNO and stipulated in the grid connection offer/agreement that they issue. The DNO is obligated to appraise the options for point of connection and put forward the most effective solution, with consideration to cost of works to connect and technical compatibility with the DNO's assets and wider network. The DNO decided that the SPEN Frodsham Substation was the most suitable connection point available, noting that the Frodsham substation has a spare bay that can accommodate the connection of the project and therefore doesn't require any major works on the SPEN network apart from general refurbishment of the substation bay.
2.2.8	**Contamination and alternatives** In comparing options A, B and C, there does not appear to have been any consideration of historic land uses or historic contamination. Representations to the examination, particularly at issue specific hearing 2 (ISH2), suggest a high level of known contaminants in and around the project site. In determining and considering alternatives, was any weight given to this environmental constraint on the option A land that presumably does not exist on either options B or C?	In considering the approach to alternatives, a proportionate approach was taken, in line with NPS EN-1 paragraph 4.3.22. Contamination was not considered to be a factor that needed to be taken into account in the site selection process for the Proposed Development as: • the nature of a solar development is such that the majority of the infrastructure (including the panels) would, as a starting point, be highly unlikely to interact with contaminated land or substances, given the low level of ground intrusion that is required; and

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		• where ground intrusion is required, such as for the BESS, appropriate siting (as is the case for the Proposed Development) and standard mitigation measures are able to be deployed. As explored at ISH2, there is nothing arising from the baseline characterisation of the SADA that cannot be dealt with through the application of standard mitigation measures, and so the site is appropriate to develop. The Applicant also makes the general point that, although this was not a factor in site selection, national policy prefers development on brownfield or previously developed land. As such, although the Order limits have the appearance of being a 'green' site, its history is one that has involved extensive engineering operations and which has ground conditions similar to brownfield/PDL sites (whilst acknowledging that it does not meet the policy definitions for brownfield/PDL land). The Applicant considers that it is positive that it has chosen such a location as compared to more traditional 'pure' greenfield locations that would have been likely within options B and C.
2.2.9	**Alternatives and Habitats Regulations Assessment (HRA)** Several IPs have suggested incorporating Cell 2 into the NBBMA so as to avoid an Adverse Effect on Integrity occurring. Could this be an alternative solution that could mitigate harm arising to the	The Applicant notes that at this stage, the question is not whether the exclusion of Cell 2 from the SADA would constitute an 'alternative solution' in HRA terms, as the Proposed Development is not at the stage of putting forward a derogation case. The question at hand is whether the Applicant's mitigation proposals are sufficient to reach a conclusion of no adverse effects on integrity. The

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
	Mersey Estuary Special Protection Area (SPA)? With regard to the consideration of alternative solutions in relation to the Habitats Regulations, explain the importance and relevance of this alternative to the SoS' decision-making process for this project.	Applicant and Natural England's (the Statutory Nature Conservation Body (SNCB)) position is that its current proposals, supported by experienced ornithologists, as set out on the Works Plans and in the ONBBMS, are sufficient, for the reasons set out in response to question 2.5.11 below. However, given some of the concerns raised, the Applicant updated the ONBBMS at Deadline 4, to provide, at paragraph 4.4.5, that the adaptive management could include 'implementation of reasonable design or layout refinement within the Order Limits, where necessary and considered proportionate'. This could, therefore, allow for panels to be removed from Cell 2, if the ongoing management of the NBBMA indicated that this was necessary. At Deadline 5, the Applicant has updated the Works Plans to ensure this is properly catered for (i.e. extending Work 6C to overlap with Work No. 1 within the area of Cell 2). This allows for complete flexibility in the adaptability of the NBBMA, including changes to the extent of the SADA, which has been a request of all stakeholders; and is secured via the DCO and so can be relied upon. If, however, despite the views of SCNB, the ExA considers that the extent of mitigation needs to include the Cell 2 area, in order to reach a conclusion of no adverse effects on integrity, then this can be achieved. This is not an 'alternative' but is instead a different approach to mitigation that can be delivered via the DCO to reach a conclusion of no adverse effects on integrity and thus avoid the need for a derogation. To achieve this, two options are available: The Applicant considers that the preferred option is that the ExA recommended DCO could be updated to provide that:

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		• a sub-paragraph (3) is added to article 4 to say that 'Work No. 1 must not be carried out within Solar PV Array Areas A04 and A02 shown on Figure 2-1 of the environmental statement; and • Requirement 9 (2)(j) could be amended to state: '*details of the establishment, maintenance, management and monitoring regime (including a programme) for Work No. 6C (which must be substantially in accordance with the nonbreeding bird mitigation strategy) which must include a New Zealand pygmyweed control and management strategy* ***and details of how the land labelled as Solar PV Array Areas A04 and A02 shown on Figure 2-1 of the environmental statement have been incorporated into the proposed regime****, which must be prepared following consultation by the undertaker with Natural England and the Royal Society for the Protection of Birds;* or Alternatively, the Applicant could submit without prejudice versions of the following documents: • Works Plans which only show Work No. 6C in the area of Cell 2; • LEMP with an updated Illustrative Masterplan; and • Outline NBBMS with updated drawings to account for Cell 2 being included. These documents would be submitted with specific new reference numbers that would enable the Certified documents schedule in the DCO to be easily updated if these versions of the documents were preferred.

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		The Applicant considers that no other certified documents need to change as there is no change to the Order limits or land powers arising, and it is only those documents which require the ecological mitigation details to be shown. At this stage, the Applicant has not submitted versions of such documents on the basis that it considers that the first option is sufficient. However, if the ExA considers that this is necessary (e.g. in the REIS/DCO comments schedule), it will do so. The Applicant is preparing such documents in the meantime in case the ExA asks this, which would enable quick submission of them (and responses to them) if the ExA considers it is necessary. The Applicant re-iterates, however, that these options are presented on a without prejudice position – it considers that its mitigation proposals are sufficient, but recognises that the ExA needs to be clear on how it can make a recommendation on adverse effects on integrity if its opinion differs from the Applicant and Natural England's position, and considers that the above options achieve this
Decommissioning		
2.2.10	**Re-powering** In the document about Future Baseline Decommissioning [REP4-054] there is discussion about whether or not the Frodsham Wind Farm would be decommissioned or re-powered. The applicant's position during the examination is a belief that the	What prevents Frodsham Solar from being re-powered is the fact that the DCO explicitly states that the Proposed Development must be decommissioned within 40 years. As noted in paragraph 2.10.65 – 2.10.66 of NPS EN-3 it is accepted in national policy that solar developments are often time limited, specifically noting a typical period of

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	wind farm would be re-powered because of the national drive for renewable energy and that the need would continue in the future. Applying that same rationale regarding the need for renewables going forward and the likelihood of projects being re-powered, on what basis should the ExA consider the proposed development to be 'temporary'? Whilst there is a decommissioning date written into the dDCO, if the applicant is confident the Frodsham Wind Farm would be re-powered under current national policy, what is to stop the proposed development being re-powered? In such circumstances, would not the label of 'temporary' be misplaced in all ES assessments?	40 years, and recognising that after that period the project would cease to have consent. In assessing the application in the ES, and in the ExA's recommendation, that control is in-built into the consent, and thus can be assumed to apply. As such, the impacts of the Proposed Development can be considered temporary. If an extension of this time was sought, this would require a change to the DCO or, potentially an entirely new DCO which would be subject to a separate decision considering all relevant factors, a decision on the DCO now could not assume what that separate decision might be. This approach reflects the approach that has been taken on all time limited solar DCOs to date, and there is nothing about the approach for Frodsham Solar that would suggest that a different one needs to be taken here. In respect of the Frodsham Wind Farm, the Applicant has simply set out its opinion but acknowledges that no assumption can be made either way. Through the submission of REP4-054, it has presented the consequence of if FWF is decommissioned.
3. Ground conditions		
2.3.1	**Extent of contamination** The examination has received strong concerns from Councillor Mrs Sumner regarding contaminated land in, at and around the proposed development Order	The extent of contamination has been fully considered within the Stage 1 Geo-Environmental Assessment [APP-096 and APP-097] which provides technical background to Environmental Statement: Volume 1 Chapter 10: Ground Conditions [APP-043].

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	limits. To assist the ExA understanding the baseline, and perhaps to give reassurance to the interested party regarding the likelihood of encountering high concentrations of contamination, could any contaminated land reports, surveys and investigations for the Frodsham Wind Farm investigations and any other relevant investigations be submitted to the examination? An accompanying commentary from the submitting party would be welcomed to clarify what, if any, the findings show. The relevant investigations to include are those listed in table 3.1 of Appendix 10-1 of the ES [APP-096]: 1) Groundsure Report Datasheet GSIP-2023-13776-14419 (SADA) GSIP-2023-13776-14430 (Private Wire Connection and Main Site Access); June 2023 (provided in Appendix B) 2) Frodsham Wind Farm Preliminary Site Investigation, March 2014 3) Frodsham Wind Farm Phase 2 Site Investigation, April 2015 4) Frodsham Wind Farm. Condition 38: Hydrocarbon Contamination within Cell 3, April 2015 *The ExA notes that MSCDDG Cell 3 Summary of Chemical Testing (March 2025) has already been	The Full Groundsure Datasheets reference: GSIP-2023-13776-14419 (SADA) and GSIP-2023-13776-14430 (Private Wire Connection and Main Site Access); June 2023 is provided in Appendix B of the Stage 1 Geo-Environmental Assessment [APP-096]. Copies of the relevant investigations as listed in items 2, 3, and 4 are included in Appendices A - C. The current site status is described from both an inspection of the site and the Groundsure report in sections 5.1 to 5.15 of the Stage 1 Geo-Environmental Assessment Report. [APP-096]. A review of the historical development taken from the Groundsure Report and accompanying historical Ordnance Survey mapping is contained in sections 5.16 to 5.18 plus Tables 5.1, 5.2 and 5.3 of the Stage 1 Geo-Environmental Assessment Report. [APP-096]. A full summary is provided in Appendix C of the Stage 1 Geo-Environmental Assessment Report. [APP-097]. The scope of works undertaken during previous Site investigation is provided in Section 6.1 of the Stage 1 Geo-Environmental Assessment Report. [APP-096]. Section A considers the Wardell Armstrong Frodsham Windfarm Preliminary Site Investigation, March 2014 and Section B refers to the Wardell Armstrong Frodsham Windfarm Phase 2 Site Investigation, April 2015. Section F details the scope of works undertaken in accordance with the Frodsham Wind Farm Condition 38: Hydrocarbon Contamination within Cell 3 report.

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	provided in Appendix G [APP-097] and that the Wildfowlers Land – Summary of Soil Chemical Results Recorded in June 2024 Ground Investigation (July 2024) has already been provided in Appendix H [APP-097].	Drawing D02 of the Stage 1 Geo-Environmental Assessment Report. [APP-096] details the Exploratory Hole Locations Made During Previous Ground Investigations. Section 7 of the Stage 1 Geo-Environmental Assessment Report. [APP-096] summarises the site characterisation of ground conditions encountered during all the intrusive investigations as listed in Section 6.1. Section 8 of the Stage 1 Geo-Environmental Assessment Report. [APP-096] details the Site characterisation of contaminant sources encountered within previous site investigations and associated exceedances of threshold limits for human health and controlled waters separately for the SADA and NBBMA. All information as provided within the site investigation reports and Groundsure datasheet has been assessed within Section 9 of the Stage 1 Geo-Environmental Assessment Report. [APP-096]. which presents the preliminary Conceptual Site Model and associated risk assessment. The surrounding land uses are considered within the Stage 1 Geo Environmental Assessment Report [APP-096] as per the requirements of LCRM in the development of a Conceptual Site Model. Section 5.15 refers to neighbouring land uses / nearby contaminative activities and Table 5.3 presents a summary of the development history of the immediate surrounds within 500m of the SADA, NBBMA and Private Wire Connection. A further detailed summary of the historical site surrounds is presented in Section 5.18. It is important to note that the dredgings deposits are homogenous in both composition and chemistry and that whilst a detailed summary of these within the proposed development Order limits has been reported

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		(see above references), similar conditions are expected within the wider dredgings cells outside the Order limits (Cells 4 and 6). Reference to the homogenous nature of the dredging deposits was made during ISH2 (Agenda item 3g) [REP4-057]. Furthermore, the dredging cells were constructed for the purpose to deposit and retain dredgings and so if any high levels of contaminants within Cells 4 and 6 located outside the Order Limits were present, their migration onto the Site are highly unlikely due to the physical containment of the cells.
2.3.2	**Chemicals referred to by interested parties in the examination** The ExA notes the applicant's response to action point 43 was provided in Appendix D [REP4-055] for arsenic, vinyl chloride and carbon tetrachloride. The ExA would like the applicant to expand this appendix to include the following chemicals which have been raised by interested parties as a concern, within the examination: • chloroform • hydrogen chloride • polychlorinated biphenyls	See updated table provided in Appendix D
4. Biodiversity and Ecology		

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Biodiversity Net Gain (BNG)		
2.4.1	**BNG unit baseline** Explain why the baseline habitat units within the BNG assessment in section 3.1.2 of the: Biodiversity Net Gain Report [REP4-038] have changed for deadline 4, see screen shot below. Fully explain the basis of the recalculation. ***Summary of BNG Unit Baseline*** 3.1.2 Baseline habitats ~~with~~within the Site generate a total of ~~1692.01~~1457.21 habitat units (~~379.48~~330.85 units from the NBBMA and ~~1314.28~~1126.368 units from the remainder of the Site). Baseline hedgerow units generate a total of ~~54.25~~47.18 hedgerow units (0.~~82~~71 units from the NBBMA and ~~53.44~~46.47 units from the remainder of the Site). Watercourse units generate a baseline of ~~109.71~~113.60 watercourse units (~~8.51~~13.64 units from the NBBMA and ~~101.19~~99.95 units from the remainder of the Site).	Baseline habitat units have changed due to the following reasons, which are expanded upon in turn below: i) The publication of the Cheshire and Warrington Local Nature Recovery Strategy (LNRS) in late 2025 which affected the strategic significance; ii) Re-classification of an area previously categorised as reedbed at Frodsham Windfarm East (approximate OS Grid Ref: SJ5070978474) as explained in Annex 4 of the Biodiversity Net Gain Report [REP4-038] iii) Inclusion of additional watercourses iv) Use of different Geographical Information Systems (GIS) Software for the calculations The strategic significance multiplier gives additional units where a council has determined an area is ecologically significant according to either the LNRS (where published, or other strategic documents where it is not yet published) by applying a multiplier of up to x1.15. In accordance with the Statutory Biodiversity Metric User Guide User Guide, the strategic significance multiplier is applied differently where a LNRS is published (User Guide Table 7, P28) compared to where it is not (User Guide Table 8, P29). Under the previous submissions, strategic significance was applied according to the 'Interim Biodiversity Net Gain and Ecological Networks

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		Guidance Note' (Cheshire West and Chester Council, 2024). Following this document, baseline units were assigned high strategic significance due to the location within Helsby and Ince Marshes Local Wildlife Site. Where a LNRS is published (such as for the most recent calculations) strategic significance is applied only to the post-works scenario. This has the effect of comparatively lowering the baseline through removal of the 1.15x 'high' strategic significance multiplier. An area of habitat (metric ID RB58) previously included as 'reedbed' habitat has been reclassified to 'other neutral grassland' habitat as outlined within Annex 4 of the Biodiversity Net Gain Report [REP4-038]. As a higher distinctiveness habitat, when classified as reedbed this generated 47.61 units, reduced to 18.42 units when classified as other neutral grassland – a reduction of 29.19 baseline units. As set out in Annex 4, the latter classification is considered accurate and correct in accordance with UKHabitat Survey guidance. Following receipt of representations from Cheshire West and Chester Council and the Cheshire Wildlife Trust (e.g., PD2-027 CWACC7.100) additional lengths of the River Weaver and Manchester ship Canal have also been included in the watercourse baseline. Due to inclusion of these habitats baseline watercourse units have increased. Original calculations used MapInfo GIS software whereas more recent calculations have used QGIS software. These software differ in how areas are calculated, with MapInfo using Cartesian measurements and QGIS using Ellipsoid measurements. The former assumes a flat surface, whereas the latter accounts for the earth curvature, which results in a slight change in the baseline habitat areas calculated and so a related

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
		change in baseline units. This change is small, equivalent to a c. 0.4% change.
2.4.2	**Post works BNG summary** Explain why the BNG units within the BNG assessment in sections 5.1.3 to 5.1.6 and section 6.1 of the Biodiversity Net Gain Report [REP4-038] have changed for deadline 4, see screen shot below. Fully explain the basis of the recalculation, including the changes within tables 6.1, 6.2 and 6.3.	Post-development units have changed due to the following reasons, which are expanded upon in turn below: vi) Post-development units are calculated relative to baseline units, and so the changes outlined in 2.4.1 also affect this calculation. For brevity, these are not repeated. vii) The publication of the Cheshire and Warrington Local Nature Recovery Strategy (LNRS) in late 2025 which affected the strategic significance; viii) Use of different Geographical Information Systems (GIS) Software for the calculations ix) Changes to the Non-Breeding Bird Mitigation Area (NBBMA) x) Changes to assumptions on retained and lost habitats. The Statutory Biodiversity Metric applies negative multipliers (penalties) for created habitats based on the time to achieve target condition and also the difficulty (risk) of creation. These two multipliers mean that creating an equivalent area of new habitat results in fewer units than the equivalent area of habitat at baseline. These principles underpin the changes in units. The strategic significance multiplier gives additional units where a council has determined an area is ecologically significant according to either the LNRS (where published), or other strategic documents where it is not yet

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	Post-works BNG Summary 5.1.2 In the undertaking of the BNG assessment it has been assumed that 5% of habitat within the solar fenceline would be lost to built development, such as panel framework. This is in line with established industry practice[15] and has been taken into account within the Metric. ~~5.1.2~~5.1.3 The development footprint results in the loss of ~~131.24~~169.87 ha of habitats, equating to ~~477.23~~551.07 habitat units (~~79.53~~247.42 units from the NBBMA and ~~401.51~~303.64 units from the remainder of the Site). The development footprint results in a loss of 0.18 km of hedgerows, equating to 1.~~49~~30 hedgerow units (0.~~05~~04 units from the NBBMA and 1.~~45~~26 units from the remainder of the Site. The development footprint results in a loss of 0.16 km of watercourse, equating to 0.~~78~~68 watercourse units (all 0.~~78~~68 units from the remainder of the Site). ~~5.1.3~~5.1.4 Created habitats generate a total of ~~669.93~~888.77 habitat units (~~92.56~~364.65 units from the NBBMA and ~~577.37~~530.28 from the remainder of the Site). Enhanced habitats generate a total of ~~4.73~~71.61 habitat units (~~4.73~~all 71.61 units from the remainder of the Site). ~~5.1.4~~5.1.5 Created hedgerows generate a total of ~~49.74~~43.25 hedgerow units (~~49.74~~all 43.25 units from the remainder of the Site). ~~5.1.5~~5.1.6 Created watercourses generate a total of ~~1.10~~0.95 watercourse units (~~1.10~~all 0.95 units from the remainder of the Site). Enhanced watercourses generate a total of ~~83.34~~72.47 watercourse units (~~9.45~~8.22 units from the NBBMA and ~~73.89 units~~64.25units from the remainder of the Site). Although D57 will be removed during habitat creation works within the NBBMA, the ditch will be reinstated within two years of initial removal, and is anticipated to achieve baseline condition, furthermore, following its reinstatement and due to the proposed habitat management measures to be implemented, the condition of this ditch is expected to be enhanced (from poor to moderate). As such, and in accordance with The Statutory Biodiversity Metric User Guide (DEFRA, 2024), this ditch has been assigned as being enhanced within the Metric, with a one-year delay in starting the habitat enhancement. A series of ditches will also be enhanced through the reduction in riparian zone encroachment. These ditches are shown on **Figure 6** and identified on the corresponding shapefiles (provided separately). and **6.1 Overview** 6.1.1 The Proposed Development will generate a net change of +~~194.86 (11.52~~373.19 (25.61 %) habitat units, +~~48.25~~41.95 (88.92 %) hedgerow units and +~~14.65 (13.35~~12.74 (11.21%) watercourse units. A summary of the biodiversity net gain interventions across each distinctiveness and habitat type is provided as **Table 6.1**	published by applying a multiplier of up to x1.15. In accordance with the Statutory Biodiversity Metric User Guide User Guide, the strategic significance multiplier is applied differently where a LNRS is published (User Guide Table 7, P28) compared to where it is not (User Guide Table 8, P29). Under the previous scenario, strategic significance was applied according to the 'Interim Biodiversity Net Gain and Ecological Networks Guidance Note' (Cheshire West and Chester Council, 2024). Following this document, post-development habitats were assigned high strategic significance due to the location within Helsby and Ince Marshes Local Wildlife Site. Where a LNRS is published (such as for the most recent calculations) strategic significance is applied only to specific interventions within the LNRS, in this case creation of other neutral grassland habitats. This has the effect of comparatively lowering the post-development units through removal of the 1.15x 'high' strategic significance multiplier for most habitats. Original calculations used MapInfo GIS software whereas more recent calculations have used QGIS software. These software differ in how areas are calculated, with MapInfo using Cartesian measurements and QGIS using Ellipsoid measurements. The former assumes a flat surface, whereas the latter accounts for the earth curvature, which results in a slight change in the baseline habitat areas calculated and so a related change in baseline units. This change is small, equivalent to a c. 0.4% change. As a result of ongoing consultation with relevant stakeholders (e.g., Natural England) the design of the NBBMA has changed. This has been carried through to the post-development scenario. In addition, following representations received from Cheshire West and Chester Council and

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		the Cheshire Wildlife Trust the NBBMA is classified as lost and recreated for the purposes of the BNG calculation. Assumptions around retained and lost habitats have been revised, in particular the post-development habitat type 'existing track' is now treated as a retained habitat. Due to differences in mapping software baseline habitats occasionally overlap this habitat type, however no additional works (e.g. widening) are proposed to occur here. As such due to an absence of impacts, baseline habitats overlapping the post-development 'existing track' are treated as retained. Similarly, where a proposed habitat type overlays an existing one of the same type and no interim works are proposed it has been input as retained.
2.4.4	**Trading rules – net loss of reedbed habitat** The applicant states in section 6.3 of the deadline 4 Biodiversity Net Gain Report [REP4-038], that there would be a deficit of reedbed habitat type and scrub broad habitat type, see screen shot below. **6.3 -Trading Rules** 6.3.1 There is a deficit of -10.95 units in reedbed habitat type required to achieve trading rules, which is a high distinctiveness habitat requiring the same habitat type to offset losses. **Annex 3** discusses the baseline classification of reedbed. 6.3.2 There is a deficit of -2.23 units of scrub broad habitat type required to achieve trading rules, which is a medium distinctiveness habitat requiring the same broad habitat type to offset losses. Table 6.1 [REP4-038] provides a summary of area and unit change for each habitat type within the draft	

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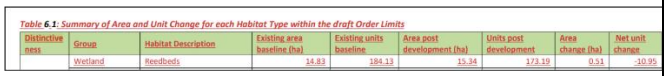
	order limits. A screen shot is provided below for the first line concerning reedbeds.  *Table 6.1: Summary of Area and Unit Change for each Habitat Type within the draft Order Limits* Distinctiveness: Wetland; Group: Reedbeds; Habitat Description: Reedbeds; Existing area baseline (ha): 14.83; Existing units baseline: 184.13; Area post development (ha): 15.34; Units post development: 173.19; Area change (ha): 0.51; Net unit change: -10.95 1) Can the applicant explain why post development there would be an increase in reedbed area but a decrease in reedbed units? What is it about the properties of the post development reedbed area that cause the calculation of resulting BNG units to fall? 2) The ExA acknowledges that BNG requirements are not yet mandatory for NSIP applications and that the applicant has clearly stated that the trading rules for reedbeds are not proposed to be met. Nevertheless, the mitigation hierarchy should still be adhered to. The ExA would like the applicant to explain how much reedbed is proposed to be lost for each of the areas given below and provide justification as to why these areas of reedbed are proposed to be lost and not retained: a. Reedbed 12 shown in the NBBMA (see screenshot below from Map 2 of Figure 3 of	1) Unit calculations include provision for the time it takes newly created habitat to mature, and the complexity of that habitat. It is therefore possible to increase physical area but have a unit reduction. The Applicant also highlights that unit value is also based on a 30-year provision (in accordance with mandatory BNG under the Environment Act), whereas the habitat management measures under the Proposed Development will be implemented for the forty-year operational lifetime. 2) In accordance with the mitigation hierarchy, reedbed has been avoided where possible, balancing the need to maximise generational output with nature conservation priorities. a. Reedbed 12 falls within the NBBMA, which is proposed principally to be of benefit to qualifying bird species associated with the Mersey Estuary SPA. In order to create the NBBMA it is considered necessary to fully remove existing ponds which support reedbed habitat. Further, representations by consultees including Cheshire West and Chester Council and the Cheshire Wildlife Trust suggest that the NBBMA should be treated as lost for the purposes of the BNG calculations. The qualifying features of the Mersey Estuary SPA, for which the NBBMA will be managed, do not use reedbed habitats and therefore reedbed is not part of the wider Order Limits' value as Functionally Linked Land (FLL), which is acknowledged by all IPs. As such the retention of this small isolated reedbed does

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	the deadline 4 Biodiversity Net Gain Report [REP4-038]) b. Reedbed 40 (see screenshot below from Map 4 of Figure 3 of the deadline 4 Biodiversity Net Gain Report [REP4-038])	not support the conservation function of the NBBMA. The decision to remove this section of reedbed is conservation led, i.e., to maximise the benefit for SPA birds. b. The reedbed in this location was not retained as it was located within the centre of a field which was otherwise suitable for solar development. It would not be feasible to retain the area of reedbed in the centre of the field and construct around and therefore the retention of the reedbed would lead to the loss of that entire solar panel area. In light of the overarching approach to retention, enhancement and creation of habitats and the points noted in response to point 5 below this was considered an appropriate approach to take in the context of the projects objectives and reading the policies of EN1 as a whole. c. It is clarified that RB07 would not be lost, as shown under Tab A-!, Row 133 of the Biodiversity metric. This area forms part of a wetland habitat creation areas in which existing reedbed will be retained and expanded upon.

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	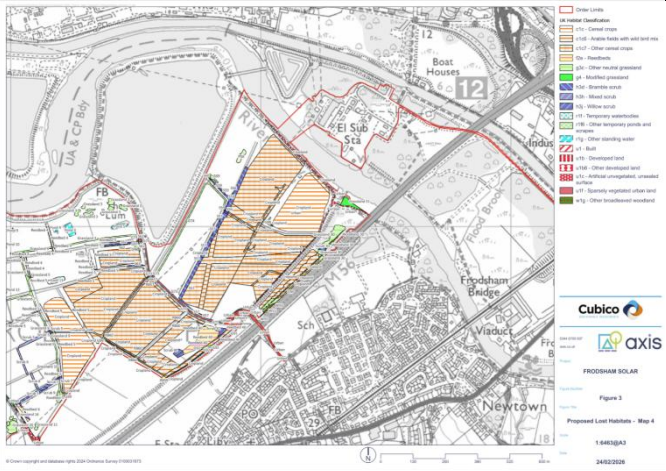 c. Reedbed 7 near Marsh Farm (see screenshot below from Map 3 of Figure 3 of the deadline 4 Biodiversity Net Gain Report [REP4-038])	

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	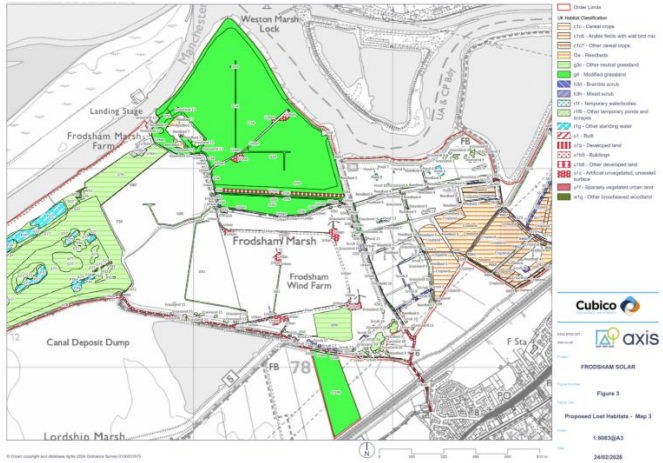 3) Can the applicant explain why it has not proposed more areas of reedbed to be retained or the creation of more reedbed habitat to achieve at least a no net loss? Would this be possible? If not, explain why not. 4) Can the applicant explain why it has not proposed more areas for the retention or creation of scrub broad habitat to achieve at least a no net loss? Would this be possible? If not, explain why not. 5) Can the applicant explain how it has adhered to the principle of the mitigation hierarchy in	3) The proposed development incorporates reedbed habitat where reasonably practicable and results in a net gain in reedbed area of approximately 0.5ha. Reedbed requires specific ground conditions (waterlogged or inundated soils, with water at the surface for most of the year) and as such cannot be created easily where for example gradient or soil drainage is not conducive to holding of water. The assessment has taken a precautionary approach in assuming ground conditions are not suitable for reedbed creation, other than where these conditions are pre-existing. Suitable conditions for reedbed creation may be created within the NBBMA, however as outlined in 2 a) above this would be contrary to the acknowledged value of the Order Limits to SPA birds. 4) The Applicant has prepared an Indicative Environmental Masterplan (Appendix A to the oLEMP, [as updated alongside this submission]), which proposes the creation of extensive areas of scrub through new planting and the enhancement of existing scrub. It also includes the provision of substantial areas of grassland habitat.

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	relation to these two habitat types (reedbed and scrub broad habitat)?	The balance between the habitats has been proposed to achieve a high-quality design, with habitat types located in areas considered most suitable for their establishment and long-term management. However, minor adjustments to the design could be made to achieve no net loss of scrub habitat. Such refinements could be secured at the detailed design stage through the approval of the detailed LEMP, should the Council prefer a different balance of habitat types. 5) As set out in refs CWACC7.96 and CWACC7.97 of the Response to Local Planning Authority and Statutory Environmental Body Relevant Representations [PD2-027], the Proposed Development avoids higher value habitats where reasonably practicable and in relation to reedbed limits loss principally to lower value reedbed, before providing enhancement and creation measures elsewhere. Ref 4.5.7 of the Applicant Response to IP ExAQ1 Submissions [REP3-043] makes clear that the mitigation hierarchy does not require absolute avoidance of all loss in every case, and it does not state that no loss can occur, because otherwise there would be no requirement for the remainder of the hierarchy. Ref 4.6.3 of REP3-043 explains that national policy recognises that residual effects may remain, provided the overall approach is proportionate and balanced when considered in the context of delivering a renewable energy scheme which seeks to maximise the generation opportunity at a site. The design of the Proposed Development reduces reedbed and scrub loss as far as reasonably practicable in the context of the project objectives, mitigates for that loss through enhancement and creation measures, and seeks to secure wider biodiversity

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		benefit across the site as a whole. It is noted that this approach, and the application of the mitigation hierarchy, was considered at Paragraph 5.3.30 of the Examining Authority's report on the Cory Decarbonisation Project where the ExA stated *"application of the mitigation hierarchy as required by NPS EN-1 does not necessarily mean that avoidance (that is the first level) of all adverse effects is the only way to comply with the hierarchy. Rather, that as the first level of the mitigation hierarchy process, such effects should be avoided and if they cannot then the next stage of the process is considered, and so on".*
Mitigation measures		
2.4.6	**Damaged or end of life batteries** The ExA requests that the applicant: 1) Acknowledges within the ES that batteries can cause chemical pollution and present a fire risk	1) Paragraph 2.4.61 of Environmental Statement: Volume 1 Chapter 2: The Proposed Development [APP-035] sets out that "consideration should be given within the design to the management of water run-off such that in an emergency situation, where polluted water may run-off from the facility this can be safely contained and treated, rather than risking pollution of groundwater or local watercourses.".

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	if not managed appropriately that could cause a decrease in water quality if any surface runoff became contaminated. 2) Inserts within the Outline Battery Safety Management Plan [REP3-026] that where a battery storage area is provided external to the BESS unit, that it would be impermeable, covered and bunded, and that battery storage would be confirmed as part of the detailed design and submitted for approval by the EA in writing	Paragraph 9.9.6 of Environmental Statement: Volume 1 Chapter 9: Flood Risk and Surface Water [APP-042] identifies that during the operational phase there is the potential for "Contaminated firewater runoff - The BESS introduces the potential risk of contaminated fire water runoff (in the event of a fire)." where mitigation is not applied. 2) The Applicant is not committing at this stage to providing a separate battery storage area, as this may not be necessary, depending on the detailed design of the BESS Compound and the safety measures (including in respect of battery disposal). Ultimately, the Applicant's approach to this issue (and battery storage more generally) will be signed off by CWCC, CFRS and the EA as part of the process of approving the BSMP. This has been made clearer in paragraph 3.2.17 of the OBSMP submitted at Deadline 5.
2.4.8	**Skylark mitigation area (SMA)** In your response to ISH2 action points [REP4-055] you state that: '*The SMA is not presented as replacing the entirety of 21 recorded (possible to probable breeding) territories across the Order Limits. Rather, it provides higher-quality breeding habitat (managed meadow grassland tailored to the species-specific needs) than the existing baseline sub-optimal arable land, thereby supporting improved breeding productivity per pair (which will breed several times across the breeding period). The focus of the SMA is maintenance of*	See comments below.

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	ecological and ornithological function and enhancement of breeding output successes'. In ES Chapter 8: Ornithology section 8.8.40 [APP-041] you state that: *'Breeding skylark and lapwing would be permanently displaced from breeding within the SADA, depending on the time of year that construction works are undertaken. Skylarks will be temporarily displaced from nesting within the NBBMA but are likely to return once grassland establishes. It should be noted that, although skylarks are assumed to be permanently displaced from solar farms for nesting, skylark will still use operational solar farms, including as 'nursery' habitat for their fledged young (Fox, 2022). Areas of suitable nesting habitat will however remain available in retained open habitats onsite.'* In ES Chapter 8: Ornithology section 8.8.45 [APP-041] you state that: *'Skylarks are considered likely to continue to utilise marginal habitats and areas between solar panels in the SADA for foraging, and larger gaps between panelled areas are also potentially suitable for nesting birds. The enhancement works within the NBBMA will also provide suitable breeding habitat for skylark (c. 34 ha of grassland), so the skylark*	

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	population would be maintained at similar levels to pre-development conditions.' In ES Chapter 8: section 8.8.48 [APP-041] you state that: *The construction of the Proposed Development is therefore anticipated to result in minor adverse effects on skylark and lapwing, which is not significant.'* 1) If the SMA would not replace the entirely of the 21 recorded skylark territories area, how many skylark territories is it anticipated to mitigate for? What evidence is there that this improvement in quality of habitat would be sufficient to mitigate for said number of skylark territories?	1) The SMA is not intended to replace 21 displaced skylark territories, rather to increase breeding productivity of pairs which currently nest in arable farmland. There is strong research evidence that skylarks produce more broods or higher productivity in grassland / fallow / spring crops than in intensive winter arable crops, which are typical of modern farm-scapes. For example, Kragten *et al.* (2008) (abstract provided in Appendix F) concluded that more diverse cropping (including grass leys and spring crops) extended the breeding season and allowed more nesting attempts. As such the SMA is designed to increase breeding productivity per pair which use it, and adjacent land, by increased food resource and suitable conditions. This in turn will assist in maintaining the conservation status of the species at any meaningful conservation scale. It is the Applicant's position that neither NPPF or local policy requires mitigation on a like-for-like number of pairs/individuals basis, and that such a metric is not applied to other species of identical status. 2) As outlined in 1) above, the approach to mitigation is not based on numbers of pairs but rather breeding productivity and fledgling success.

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	2) How many skylark territories are anticipated to be mitigated by the: a. NBBMA. Justify the number skylark territories anticipated to be mitigated given the habitat within the NBBMA would not be tailored to the species specific needs and maintained in the same way as the SMA. b. The marginal habitats, areas between solar panels and larger gaps. What area does this amount to? Justify the number of skylark territories anticipated to be mitigated given the habitat within these areas would not be tailored to the species-specific	a. The Applicant acknowledges that breeding skylarks will not utilise wet grassland but consider that skylarks will continue to breed within drier parts of the NBBMA, using the grazed grassland areas. Grazing of the NBBMA will be managed by the appointed conservation organisation for conservation purposes, rather than for food production, as is currently the case. Conservation grazing is implemented at lower densities, and livestock are typically removed (or very low densities retained) during the bird breeding season. Conservation grazing leads to a more diverse grassland sward and resources which is favourable to both breeding waders and skylarks. Based on published criteria (Fox, 2022) (abstract provided at Appendix F), the grassland within the NBBMA could be expected to support between 6 and 9 breeding pairs. As stated in the prototype methodology coined by Fox (2022), the above is based on assumptions and is without monitoring data. b. Marginal habitats will provide foraging habitat for skylarks breeding on nearby arable land. Research indicates that breeding pairs will forage up to 200m into a solar farm from adjacent nesting habitat. As such use of a solar farm is not evenly distributed, and the number of pairs within this distance of the solar area will vary annually depending on crop-type (as this changes between crops). Large gaps between panels, where these are more than 50m in width, are also likely to be used for breeding based on typical habitat usage by the species. Such gaps are required on Cell 1 (to provide an easement width to existing pipelines), as shown on

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	needs and maintained in the same way as the SMA.	Figure A1.3 of Appendix A (Illustrative Environmental Masterplan) of the Outline Landscape and Ecology Management Plan [REP3-014] and Work No. 1of the Works Plans [AS-007]. When considered together, the number of breeding pairs using the solar area is estimated as likely to be between 2 and 4. As with the SMA, there are areas within the SADA which will generally be managed favourably for foraging skylarks, with reduced chemical input and increased botanical diversity (meadow grassland), as set out in Section 6.7 of the oLEMP [as updated alongside this submission]. As such these retained pairs can be expected to produce higher numbers of young than birds using intensive arable land, as currently dominates the eastern SADA.
	3) Clearly explain why the proposed SMA, NBBMA and other areas (marginal habitats, areas between solar panels and larger gaps) would be adequate to mitigate the construction and operational effects of the proposed development to skylark.	3) The overall number of pairs of skylarks which can be reasonably expected within the Order Limits (SADA, NBBMA and SMA) is between 9 and 11 pairs. When benefited pairs (through improved foraging habitat) in adjacent land are included, that number is estimated to increases to between 12 and 15 pairs. Overall breeding productivity of these pairs can be reasonably anticipated to increase above existing levels and therefore adequate, and proportionate mitigation relative to the abundance of a widespread species, is provided and the conservation status at a meaningful ecological level (i.e. District Level or above) is highly unlikely to be affected. Construction impacts will be avoided in Table 5-2 of the Outline Construction Environmental Management Plan [REP4-026]. It should be noted that skylarks

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		are very short-lived birds (typically a 2-3 year lifespan) and are highly mobile (forming winter flocks) and must adapt to farm crop rotations. As such, all skylark mitigation strategies are predicated on providing adequate breeding habitat for colonisation and on-going use, rather than a requirement to persuade current pairs to move to a new area. 4) See point 2 b) and 3), above. Whilst the SMA will be managed to optimised breeding productivity, other areas will continue to function for skylarks and provide valuable habitats. Fox, 2022, sets-out how skylark densities vary between habitat (crop) types, which is based on assumptions. The SMA is intended to offer additional mitigation for skylarks as the Applicant recognises that, in the absence of the dedicated SMA, the numbers of retained breeding skylark pairs is likely to be less than 50% of the current population within the Order Limits.
	4) You stated in response to questioning at ISH2 [REP4-057] agenda item 3f ii e regarding the adequacy of long-term management and monitoring for skylark, that: *'…success is primarily about maintaining the quality of the grassland habitat through the oLEMP management regime. He stated that there is no proposal for routine skylark nest surveys because locating nests is difficult and population counts can be variable; however, the measures proposed are widely adopted and well researched for conservation outcomes, and the Applicant has a high degree of confidence provided habitat quality is maintained.'* Can you explain how you can be confident adequate mitigation would be provided when	

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	significant sections of land incorporated to mitigate for the 21 skylark territories identified would not be managed to the same quality of grassland habitat as the SMA, which you have stated would not mitigate for the 21 territories alone? 5) The ExA is not currently convinced the difficulty and scientific uncertainty cited by the applicant are sufficient reasons to exempt the need for monitoring. The ExA suggests the applicant incorporates a monitoring and reporting regime into the proposals to be able to evaluate whether or not the proposed development had provided sufficient mitigation for skylark if it were to be constructed, along with an adaptive management proposal including any necessary triggers, to be enacted if it were shown not to have been adequate. The ExA would like the applicant to clarify which organisation would undertake the monitoring and suggests that a sensible solution could be for the skylark mitigation monitoring to be part of the monitoring undertaken by the organisation responsible for the long-term management of the NBBMA. The ExA would like to point out to the applicant that monitoring, reporting and adaptive management measures were included by the Secretary of State in requirement (25) for	5) The Applicant refers to research by Fox, and as outlined above in point 1) (Kragten et al., 2008), that skylark habitat relationships are poorly understood and are weakly studied, and it can therefore be confidently concluded that the measures proposed will provide for skylarks. However, given the ExA's position, the Applicant has updated the OLEMP to commit to monitoring and adaptive management in respect of skylarks. Such monitoring would be committed to as part of the overarching monitoring proposals set out in the OLEMP. The Applicant considers that monitoring and management in respect of skylarks should be considered as part of the general ecological management of the Proposed Development (noting that this will include considering how skylarks are using areas in and around the solar panels and the effectiveness of the SMA), as compared to the NBBMA, which will perform a specific function and be managed similar to a wetland reserve. As such, it would be managed pursuant to the arrangements set out in sections 7 of the OLEMP. However, this would not preclude an organisation such as RSPB taking such additional responsibilities on, if that would be their preference In respect of Five Estuaries, the Applicant notes its submissions on that project in its response to the ISH2 Action Points [REP2-055]. The farmland bird Requirement was imposed by the Secretary of State (not proposed by the Applicant), and related to the delivery of offsite compensation proposals. Its starting point is therefore entirely different from the Proposed Development, and it is considered that monitoring was required

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	farmland bird compensation in the Five Estuaries Offshore Wind Farm made DCO The Five Estuaries Offshore Wind Farm Order 2025.	there, because compliance with that Requirement would involve off-site land, likely outside of that Applicant's control, where monitoring would be needed to ensure that the compensation was actually compensating for the identified impact of that scheme.
2.4.10	**Mitigation for wintering wader species including golden plover, lapwing and curlew** CWCC's representation at ISH2 [REP4-074] highlighted ongoing concerns regarding mitigation proposals for wintering wader species including golden plover, lapwing and curlew. Can the applicant explain how sufficient mitigation would be provided for these species?	The Applicant accepts that there is no qualitative way of demonstrating that they physical area (ha) provided in the NBBMA is sufficient, and therefore a qualitative assessment is required, which was an approach also advocated by Natural England through on-going consultation. The Applicant's approach to mitigation for these species has always been through a combination of: - Creation of higher quality habitats which, in summary, can retain water and therefore offer optimal foraging (wet grassland/muddy conditions) favoured by these species and which is not currently provided (nor can be under the existing Frodsham Wind Farm planning conditions) - Provision of adaptive management by a conservation body. This will ensure that optimal conditions are continually provided (primarily by changing grazing densities, regular control of water levels, assessing recreational activities; but not limited to) of up to 40 years. In addition to the benefits this will provide, it will also extend the seasonal availability of such conditions to cover the entire non-breeding season (passage and winter) which is not currently the case as water levels are dependent on unpredictable levels of rainfall (whereas the NBBMA will deliver improved water retention and secondary water sources which can be controlled and managed).

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		The above is detailed in Table 8-1 of REP3-006, and more specifically in Table 8-2, which considers each species individually. With the provision of these measures, the Applicant considers that sufficient mitigation is provided for these species, along with additional benefits and safeguarding for other SPA species.
5. Habitats Regulations Assessment		
2.5.3	**NBBMA and the mitigation hierarchy** 1) In light of the positions held by some interested parties that Cell 2 should be used for mitigation rather than as part of the solar array development area, can you state whether using all or part of Cell 2 for mitigation would or would not render the proposed development commercially unviable? If you consider it would, provide financial evidence to justify this position. 2) The latter part of paragraph 4.2.24 of NPS EN-1 states: *'There may be exceptional circumstances where the mitigation could have a significant benefit and warrant a small reduction in generation capacity and function. In these circumstances, the Secretary of State may decide that the benefits of the mitigation to*	1) Using all or part of Cell 2 for mitigation would not render to Proposed Development commercially unviable. However, the Applicant has sought to maximise the generating capacity of the Site in accordance with the principles set out in paragraph 4.2.21 of NPS EN-1, whilst ensuring that, where possible, significant adverse effects are avoided and, in relation to the Mersey Estuary SPA and Ramsar site, that the Proposed Development does not give rise to an adverse effect on the integrity of the site. The Applicant has worked closely with the Statutory Nature Conservation Body (SNCB), Natural England, to reach a position where it could conclude that the Proposed Development will not give rise to an adverse effect on the integrity of the Mersey Estuary SPA and Ramsar site. This is the approach advocated by NPS EN-1 at paragraph 4.2.11 to ensure that the mitigation hierarchy is applied. As such the Applicant has sought to achieve the balance of delivering the urgent need for new electricity generating capacity to meet our energy objectives established in paragraph 1.1.1 of NPS EN-3 and the need to support healthy well-functioning ecosystems and establish coherent ecological networks, with more and better places for nature for the benefit of wildlife and people as set out in paragraph 5.4.2 of NPS-EN1.

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	reduce the effects outweigh the marginal loss of function'. Would the use of Cell 2 for mitigation fit this definition? Justify your answer.	2) As set out above the Applicant has followed national policy and has worked with the SNCB to deliver a comprehensive mitigation package which would avoid adverse effects on the integrity of the Mersey Estuary SPA and Ramsar site, and other significant adverse effects on ecological assets. Paragraph 4.2.24 of NPS EN-1 is clear that this policy refers to exceptional circumstances where the mitigation could have a significant benefit and warrant a small reduction in generation capacity (our emphasis). In this case, the Applicant does not believe the removal of solar on Cell 2 constitutes an exceptional circumstance, as the mitigation package currently proposed has been demonstrated to adequately mitigate the effects of the Proposed Development. Removal of Cell 2 is not regarded as providing significant benefit, given the substantial enhancement measures proposed for Cell 3, which are designed to mitigate, in part, for the loss of habitat in Cell 2. Removing Cell 2 would lead to a reduction in generating capacity of approximately 13MW, enough to power for approximately 4000 homes. Considering the urgent need to meet climate change commitments and enhance energy security, this is not regarded as a 'small' reduction, particularly in the context of the overall generation of the Proposed Scheme.
2.5.4	**Without prejudice derogations case** If agreement between the applicant, NE, RSPB, CWCC and the Cheshire Wildlife Trust cannot be reached on the potential for AEoI to the Mersey Estuary SPA and Ramsar site, the ExA requests that you submit a without prejudice derogation case into the examination by deadline 5 to satisfy the	The Applicant firstly notes that there is no requirement in policy or legal terms for a scheme promoter to gain the agreement of the local planning authority, wildlife trust, or RPSB to the proposals to mitigate impacts to European Sites. Pursuant to the Habitats Regulations, the suitability of the mitigation measures is a question for the Government's nature conservation

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
	requirements of the HRA in the circumstance that the Secretary of State (SoS) decides there could be AEoI to the Mersey Estuary SPA and Ramsar from the proposed development. Interested parties would then be required to comment on the without prejudice derogation case at deadline 6 (22 April 2026) and the applicant would have the right of reply at deadline 7 (29 April 2026).	advisor (Natural England), with the Secretary of State to then make a decision taking account of that advice. It is further noted that neither CWCC or Chesire Wildlife Trust have suggested that their evidence is presented as ornithologists, as opposed to ecologists more generally, compared to the Applicant's 30 year qualified ornithologist who has also has extensive local experience, and Natural England's advice being provided by ornithologists. The Applicant therefore strongly resists any suggestion that agreement with the other parties should be a pre-requisite for the ExA to able to come to a Recommendation that mitigation measures are suitable. Notwithstanding this, it remains the Applicant's position that it will not be submitting a without prejudice derogation solution, for the following reasons: • if the ExA is of the view that the removal of Cell 2 would sufficiently mitigate impacts such that no adverse effects on integrity could be concluded, notwithstanding the impacts on impacts to energy generation, then clearly it would also consider that there is an 'alternative solution' to a scheme that moves on the derogation stage that includes Cell 2 and so would recommend that that part of the derogation test is not made out; and • at this stage in the process, it is not possible to identify clearly what measures would constitute 'compensatory measures', particularly in the context that the Proposed Development is not impacting upon the protected features of the SPA directly.

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
		It is the Applicant's position that the fundamental question for the ExA is whether it agrees with the position of the Applicant's expert and the statutory nature conservation advisor that its mitigation proposals, as currently proposed, are sufficient. If it considers that they are not, and that Cell 2 also needs to be removed (as RSPB has indicated that this would be sufficient) then the Applicant has indicated how the ExA can recommend/the SoS can decide the DCO to give effect to that. In either scenario, there is no need to move on to submit a derogation case as mitigation would be in place to ensure that a conclusion of no adverse effects on integrity can be reached.
2.5.6	**Adaptive management approach to the NBBMA** Do you consider it likely that the AMP would be adequately flexible to provide the required mitigation? If this was not shown to be the case, what would the implications be and how could this be rectified?	The Applicant is confident that the final AMP will be adequately flexible to provide the required mitigation which would be agreed with the relevant bodies. In practice, the AMP will be very similar to the regular management of a wetland nature reserve. The RSPB response to the Examining Authority's Request for further information, 4 [REP4-067] includes (as Annex 1) examples of their work in highly comparable locations and for (broadly) the same species, all of which regularly support significant numbers of wetland birds (SPA species). As such, it is possible to be confident of the outcomes and therefore remedial measures are exceptionally unlikely. However, in response to the ExA's question, such measures would likely include the alteration of water levels or grazing regime (detailed in paragraphs 4.4.5-4.4.9 of REP3-014. Realistically, however, such measures would be continually checked and 'fine-tuned' under the AMP, hence the Applicant's commitment to management of the NBBMA by a suitably experienced conservation organisation.

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
		See also the response to question 2.2.9 above. Through paragraph 4.4.5 of the NBBMS, the Applicant has left open all options for how the NBBMA could be adapted to ensure effects are mitigated, and through the involvement of RSPB and the steering group, this would be done to the satisfaction of all relevant parties.
2.5.8	**NBBMA mitigation verses compensation positions** The ExA acknowledges the applicant's deadline 4 submissions justifying why it believes the NBBMA would be classified as mitigation and not compensation [REP4-055]. CWCC has raised in its various representations that as Cell 3 would be lost and then reinstated this makes it compensation. Could you respond to this statement please.	The Applicant maintains its position. Whilst habitats will be temporarily lost, which will be short term, reversible and carefully managed. It is the Applicant's position it is an incorrect interpretation of compensation in the context of the Habitats Regulations to suggest that reinstatement, outside of the highly sensitive season at which qualifying species rely on, thereby avoiding any adverse impact on the sites integrity, can be considered to be compensation. This is because the integrity of the Mersey Estuary SPA will not be adversely impacted, or impacted at all, by the creation of the NBBMA as it is i) located entirely outside the SPA, ii) there are no direct losses; iii) works will be undertaken entirely, or almost entirely, outside the seasons for which the SPA is designated and iv) the reinstatement of habitats ensures that any temporary disturbance is fully reversible and does not give rise to a permanent or residual effect.. Furthermore, the NBBMA is located entirely within the Order Limits, and therefore should not be considered as an 'off-site' location. It is also noted that CWCC's concern does not change the thrust of the position established by the case law set out in REP4-055 – the NBBMA is not within the European site and there is therefore no 'loss' (even if that was accepted to be the case) of the European Site to be compensated.

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
		For these reasons, the Applicant considers that the NBBMA is appropriately characterised as mitigation, and the interpretation advanced by CWCC is not consistent with the Habitats Regulations framework, nor is it supported by Natural England.
2.5.9	**NBBMA long-term management** To give reassurance to the SoS that there would be an alternative if the RSPB were to withdraw its interest in long-term management of the NBBMA, can the applicant state whether it has spoken to any other organisations who would be suitable to act as a nature conservation body for the long-term management of the NBBMA? If so, is the applicant in a position to name any of the other reserve organisations it has spoken to? If the applicant has not spoken to any other organisations specifically, could the applicant name any organisations that could be potential candidates?	There has been no engagement with any other nature conservation organisations to date, as discussions have consistently been undertaken with the RSPB and it is the Applicants intention, subject to agreement, that the RSPB are appointed to undertake this role. However, the Applicant remains open to engaging with other suitable and equally experienced nature conservation bodies, including (but not limited to) the Cheshire Wildlife Trust, the Wildfowl and Wetlands Trust, or organisations with comparable expertise to the RSPB. It should be noted that the body responsible for managing the NBBMA will be agreed with Natural England and CwCC and that the confirmed position will be set out in the detailed oNBBMS which must be submitted for approval prior to commencement of the authorised development. The ExA can therefore be reassured that a suitable body will be in place prior to any impacts being caused that could cause an adverse effect to integrity.
2.5.10	**NBBMS and funds** Can the applicant confirm, in light of the RSPB's submission [REP4-067], that there would be a mechanism and security within the NBBMS for the payment of a "financial package" to the RSPB that	This commitment is already set out in paragraph 4.4.3 of the Outline NBBMS. To make this even clearer, that paragraph has been modified alongside this submission to include reference to the undertaking of any works and undertaking the prescribed management measures in relation to the costs of the management organisation that will be covered by the Applicant.

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	ensures the long-term success of the mitigation measures? If such a package is going to be paid for by the applicant (and bearing in mind the NBBMA is said to be mitigation for impacts the proposed development would have) should this be secured by a legal agreement or development consent obligation?	This commitment is therefore secured by the DCO and does not need to be secured via development consent obligation. This approach aligns with precedent such as Sunnica, where the Applicant made a commitment to pay the costs of a steering group required by that project's LEMP, with the secured OLEMP. Practically, it is likely that the Applicant and RSPB/another organisation would enter into a legal agreement in relation to management of the NBBMS, but the overarching commitment to meet all of these costs is secured via the DCO.
2.5.11	**RSPB requirements** In light of the RSPB's list of requirements and stipulations [REP4-067], will the NBBMS, the extent of the NBBMA or the scope of the Works Plans be updated in any way? If you are not going to act upon the RSPB's requests, set out a detailed justification as to why not and set out clearly why the SoS should trust in your position?	• In relation to the question of the extent of the NBBMA and its relationship with the Works Plans please see the response to question 2.2.9 and 2.5.4 above. The Applicant considers that the extent of the NBBMA is sufficient. The reasons for this have been set out in previous submissions but be summarised as: there is a qualitative enhancement of habitat through re-engineering, hydrological management and control, rather than scale, which has been developed taking account of all available data and in engagement with Natural England; • there will be significantly improved safeguarding of the area as habitat, including increased reliance, functionality and governance of mitigation of up to 40 years; • there will be an enhancement of temporal availability of suitable habitat which extends across the entirety of the non-breeding period; and

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
		• there is a demonstrable betterment over the existing baseline conditions (as also supported by the RSPB). In relation to RSPB's other requirements: • the Adaptive Management Plan is secured via the ONBBMS; • predator fencing is provided for in the ONBBMS; • sufficient freshwater will be present, as per Annex 4 of the ONBBMS; and • the requirements for periodic drying of wet features to enable rotational refresh will be able to be agreed as part of the agreement of detailed management measures pursuant to Requirement 9. The Applicant also welcomes the indicative design proposed by the RSPB, but considers it is not necessary to update the NBBMS at this time, as, just like the layout in Figure 3 currently in the ONBBMS, any illustration at this stage is indicative. The key point to be secured is outcomes, and the Applicant does not rely on Figure 3 in considering that its mitigation proposals are sufficient. The outcomes are set out in section 4 of the ONBBMS. As noted there, to achieve the outcomes the Applicant intends to, for example. create a 'network' of water features and there will be a 'minimum of 9.5ha of managed wet grassland, but the exact details will be 'informed through input from the appointed managing nature conservation body' (i.e.

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
		hopefully RSPB but noting that they are in any event noted as a consultee for the oNBBMS). Ultimately, the outcomes are secured via the DCO, and the detailed design will need to ensure it meets them to ensure compliance with the DCO.
2.5.13	**Flight lines** Provide comment on CWCC's position [REP4-074] that flight paths would be disrupted through Cells 2 and 5 down to Cell 6, which CWCC states is a favoured cell by the birds.	The Applicant disagrees entirely with CWCC on this point. There is no evidence to indicate that flight paths could in any way be disrupted by the solar array, and full flight line access (primarily between the Mersey Estuary SPA and Cell 6, outside the Order Limits) will be maintained, which is also evident by the existing operational wind farm. There will be continuous habitat for SPA birds between the SPA and Cell 6, across Cell 3 (the NBBMA), which will provide improved habitat conditions for SPA species to current. To suggest that flight lines would be interrupted suggests a lack of understanding of wetland birds and their behaviours. Such species are highly mobile and continually adapt to changing tidal states and disturbance events (e.g. raptors) and consequently do not follow consistent flight lines. These species are (mostly) also inter-continental migrants which have evolved for long-distance migration. It is therefore unrealistic to suggest that solar panels could affect flight lines and, even if they did by the small distances involved, would not have any impact on the birds' fitness levels, overall health and (or) populations. As stated in the [REP4-067], the RSPB suggests that the proposed NBBMA is expected to improve the overall health. The Applicant further refers to its response 'Applicant Comments on Interested Party ExAQ1 Submissions' response 4.6.4 [AS-038].
2.5.14	**Timing and delivery**	Construction of the NBBMA (Work No. 6C; AS-007) will commence outside of the highly sensitive non-breeding bird period (March-October,

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
	CWCC has identified that the NBBMA would take 6 to 9 months to deliver, but the applicant has committed to providing the NBBMA outside of the sensitive 6-month season [REP4-057]. Explain how the NBBMA delivery would be timetabled and the sequence of delivery works, and how these would avoid the sensitive seasons for birdlife.	inclusive) as stated in REP4-026, Table 4-1 and paragraphs 2.4.3-2.4.6 – which totals to eight months. As detailed in the HRA, peak bird activity and abundance is largely within the core non-breeding period and begins to reduce in the shoulder months (October and March) and further within the extended shoulder months (September and April), such that the 1% threshold exceedance becomes ornithological unmeaningful. It is important to note that all month's that sit within passage and the core non-breeding period are regarded as sensitive months, however the level of sensitivity is not uniform which is assessed in 8.2.40 to 8.2.51 of in REP4-026. The Applicant notes that there are and there will be occasional exceedances which is typical of interannual variation, however an Ecological Clerk of Works will oversee the works during the construction period and will adaptively manage whilst the works progress i.e. changes to sequencing, acoustic barriers if applicable and to advise where appropriate, as stated on Page 48 of REP3-021. Fundamentally, it is noted that construction will not commence until all works within the NBBMA are completed, as secured via paragraph 2.4.5 of the OCEMP.
2.5.16	**Effect of any required unexploded ordnance (UXO) detonations** During ISH2 the applicant confirmed that it would restrict any required UXO detonations to a time that was not sensitive to birds. The ExA would like this to be explained in some more detail to understand how this would work in practice alongside health and safety considerations for workers on the site and	1) Delaying a controlled and planned UXO detonation for the benefit of ecological receptors is unlikely to be practicable or deliver meaningful ecological benefit. By definition, such detonations are one-off, short-duration events with highly localised and transient effects. Ecological receptors, particularly ornithological species, are known to respond to acute disturbance (e.g. noise or vibration) through temporary displacement. Evidence indicates that birds typically exhibit an avoidance response by fleeing the immediate area during the disturbance but return

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
	users of nearby public rights of way. The ExA considers there would likely be a need to make the UXO safe as soon as possible, without delay, regardless of the time of year. 1) Explain how delaying any controlled planned UXO detonation for the benefit of ecological receptors would be practicable and realistic. 2) Explain in more detail what is meant in section 8.2.66 of the Information to Inform the HRA [REP4-012] that any planned detonations would take account of sensitive receptors. 3) Explain the apparent inconsistency between whether UXO detonations would be unplanned, accidental or planned events, stated in the first and last lines of section 8.2.66 of the Information to Inform the HRA [REP4-012]: *'a UXO detonation would represent an unplanned and (or) accidental event',* but then 'a *UXO specialist overseeing the works at all times during the construction phase and ensure that any planned detonations take account of sensitive receptors'.* The ExA expects that the UXO Management Plan which would accompany the final Construction	once the stimulus has ceased. As such, the impact is short-lived and does not result in long-term habitat loss or sustained disturbance. Noise thresholds associated with behavioural disturbance in birds (i.e. fleeing behaviour) are commonly referenced around 75 dB+ (and is typically capped at this for audible disturbing events); however, even where this threshold is exceeded, the response is generally temporary and reversible. Given the brief nature of a controlled detonation, exposure duration is minimal and unlikely to lead to significant ecological effects. In this context, delaying detonation (e.g. to avoid certain seasons or times of day) would not materially reduce impact. Therefore, such delays would not represent a realistic or proportionate mitigation measure. 2) Consideration of timings i.e. Where it is safe and practicable to do so, the timing of a planned detonation may be adjusted (e.g. time of day) to reduce potential disturbance (during low tide). However, this flexibility is limited and secondary to safety requirements. Further to this, the ability to modify the timing, method, or location of a detonation to account for ecological receptors is therefore limited. As such, "taking account of sensitive receptors" does not imply that detonations can be significantly delayed or altered where this would conflict with safety requirements. while ecological sensitivities (SPA birds) are considered as part of the planning process, there is limited scope for substantive mitigation through alteration of the detonation itself.

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
	Environmental Management Plan must include sufficient mitigation to render the accidental detonation of a UXO as close to zero as possible, for the safety of personnel.	3)The Applicant notes this and the wording in Section 8.2.66 is acknowledged to be unclear and conflates two distinct UXO risk scenarios. The intention was to differentiate between: Unplanned: a worst-case scenario, which the UXO Management Plan is specifically designed to avoid through appropriate mitigation measures (e.g. risk assessment, Magnetometer Surveys, UXO specialist supervision, and adherence to safe systems of work). Planned: Where a UXO item is identified and cannot be safely avoided or removed, a controlled detonation may be required as part of standard UXO risk management procedures. To avoid confusion, the HRA has been updated at Deadline 5 to clearly distinguish between accidental and controlled detonation scenarios.
2.5.18	**HRA in-combination effects** Please see the questions in section 2.9 of this document.	Please see responses given there.
8. The water environment		
Flood Risk		
2.8.2	**EA issue 'EA007' relating to the position of bridge abutments and soffit levels**	1) The Applicant is continuing to discuss the approach taken to CP22 with the Environment Agency and whether it is necessary to raise the bridge to achieve the requested freeboard, and if so what the

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
	The EA's deadline 4 submission [REP4-071] states clear actions that could be taken by the applicant to resolve issue EA007. Therefore, the ExA requests the applicant to: 1) Update the design of CP22 to include a 300mm freeboard above the design flood level of Ince and Frodsham fluvial model. 2) Submit the following documents into the examination: a. Integrity of New Bridges in Flood Event. Document 14740-WCD-XX-XX-TN-S-001 b. The bridge design drawings: Proposed Crossing CP14 Elevation & Sections drawing 14740-WCD-XX-XX-SK-S-002 c. Proposed Crossing CP22 Elevation & Sections drawing 14740-WCD-XX-XX-SK-S-003 d. Proposed Crossing CP14 & CP22 Existing Sections drawing 14740- WCD-XX-XX-SK-S-004 e. Proposed Crossing CP17 Elevation & Sections drawing 14740-WCD-XX-XX-SK-S-005	implications of this will be on the need to alter ground levels on the approach to the crossing. The Applicant will work with the Environment Agency to ensure a resolution is found before Deadline 6. 2) All of the documents listed were submitted into the examination at Procedural Deadline B as follows: a. Integrity of New Bridges in Flood Event. Document 14740-WCD-XX-XX-TN-S-001 **- Appendix B - Response to Local Planning Authority and Statutory Environmental Body Relevant Representations [PD2-027]** b. The bridge design drawings 14740- WCD-XX-XX-SK-S-002 to 14740- WCD-XX-XX-SK-S-005 - **Appendix A - Response to Local Planning Authority and Statutory Environmental Body Relevant Representations [PD2-027]**

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
	If the applicant chooses not to undertake the above, please provide a clear justification as to why not.	
2.8.3	**EA issue 'EA010' relating to flood risk** The EA's deadline 4 submission [REP4-071] states clear actions that could be taken by the applicant to resolve issue EA010. Therefore, the ExA requests the applicant to: 1) Include the following wording within the outline Construction Environmental Management Plan (oCEMP), Commitment Register or draft DCO: *'the height of the bridge deck will not fall below 5.3m AOD based on current data, with designs to be refined for approval in writing by the EA at the detailed design stage'.* 2) Should the applicant include wording that outlines if at detail design stage the deck height would fall below 5.30AOD, then the wording within the oCEMP, Commitment Register or draft DCO should also include a commitment that an updated technical note 'Integrity of New Bridges in Flood Event' must be completed at the new deck	The oCEMP [as updated alongside this submission] has been revised to include the proposed wording.

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
	height and submitted for approval by the EA in writing. If the applicant chooses not to undertake the above, please provide a clear justification as to why not.	
9. Other planning matters		
Green Belt		
2.9.3	**CWCC's Green Belt Assessment** CWCC has noted that this document is expected to be published for consideration by its Scrutiny Committee on 27 April 2026. The ExA assumes that, in accordance with the Local Government Act 1972, the draft would be published five clear days before the Committee meeting. If so, and given that the examination is scheduled to close on 30 April 2026: 1) could CWCC provide a copy of this draft document to the applicant as soon as it is published and to the ExA at deadline 6 (Wednesday 22 April 2026); 2) could CWCC and the applicant provide any observations on the draft document (insofar as it relates to the application site or the	The Applicant agrees that it will provide observations on any draft document if put forward before the end of Examination.

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
	arguments that they have put forward) at deadline 7 (Wednesday 29 April 2026); and 3) could CWCC provide details of the Scrutiny Committee's decision in respect of the draft document at deadline 7?	
Human health, fire risk, safety and security		
2.9.5	**CFRS** 1) Please provide a response to all matters addressed to CFRS in [EV10-024]. 2) Could the CFRS read Appendix D of the applicant's submission at deadline 4 [REP4-055] and provide comment as to whether chemical concentrations of those recorded are of concern to CFRS in relation to a battery fire? 3) Could CFRS read the applicant's response to action point 42 on pages 28 to 30 [REP4-055] and respond as to whether it has any residual concerns about responding to a battery fire at the BESS in light of this information.	The Applicant held a meeting with CFRS on the 19th March to discuss the points raised by the ExA. CFRS did not raise any concerns in relation to the matters identified. CFRS has subsequently written to the Applicant, and this letter is provided at Appendix F. The letter confirms that: - CFRS have no concerns regarding the project proposals. - CFRS have suitable operational and tactical plans in place to manage a fire within the BESS site. - CFRS have no specific concerns in relation to the chemicals identified that could be a risk to human health. - In regard to action point 42, CFRS have no specific concerns at this stage of the project.

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
Socio-economics and public rights of way		
2.9.7	**Maintenance of Public Rights of Way (PRoW) during the construction and operational phases** Given comments from National Highways (NH) at deadline 4 [REP4-070] that any resurfacing of a bridge which forms part of the PRoW may impact the structure beneath, including compromising the waterproofing layer which sits just below the surface layer, the ExA requests that the applicant includes NH as a consultee in the outline Public Rights of Way Management Plan and named in Requirement 15 of the draft DCO as a consultee.	No resurfacing of either of the National Highways bridges is proposed as a result of the Applicant's proposals in respect of PRoW status upgrades. In any event, pursuant to the changes agreed with National Highways to their Protective Provisions, no such change can happen without their agreement, and if they require it following a safety assessment, works to the bridges, which National Highways must approve. They therefore do not need to be added as a consultee to the PROWMP for these reasons (which, in any event, is about managing impacts to users of public rights of way from the Proposed Development, not impacts of changes to access provision). However, in light of National Highways' comments in paragraph 2.3 of their Deadline 4 submission, they have been added as a consultee in light of the concerns raised in that paragraph.
2.9.8	**Closure of the River Weaver** The applicant sets out six organisations that use the Weaver Navigation or the River Weaver in ES Chapter 12: Tourism and Recreation [APP-045]. The applicant confirms in section 12.8.65, that only two of these organisations use the section of the River Weaver adjacent to the site of the proposed development, Frodsham Kayaking and the Weaver	1) The Applicant spoke to the proprietor of Frodsham Watersports on 13th May 2025 to discuss their use of the River Weaver, the following feedback was provided: *Frodsham Water Sports is a small business offering access to the River Weaver for jet skis and motor-boats as well as hire of jet skis. The business uses the slipways located at Frodsham Watersports Centre (Bridge Lane). From the slipways, users of jet skis must turn right heading away from the*

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
	Sailing and Ski Club. The applicant states in section 12.8.20 of ES Chapter 12 [APP-045] that construction works are not expected to have an impact on the activities of the Runcorn Rowing Club, the Danny Steamship, Mersey Ferries and Frodsham Water Sports which take place on the Weaver Navigation, the Manchester Ship Canal or upstream on the River Weaver. 1) The ExA notes the information in Table 12-4 of ES Chapter 12 regarding engagement activities, but for completeness could the applicant confirm the consultation it undertook in relation to the proposed closure of the River Weaver with the Weaver Sailing and Ski Club and Frodsham Kayaking, including dates this occurred and the details of the proposed closure that were conveyed? Could the applicant confirm if any specific objections or concerns were received from these organisations regarding the temporary closure of the River Weaver? 2) Again, the ExA notes the information in Table 12-4 of ES Chapter 12 [APP-045], but for completeness, could the applicant confirm the consultation it has undertaken in relation to the proposed closure of the River Weaver with these organisations to determine this conclusion, including dates this occurred and the details of the proposed closure that were	*Sutton Causeway Bridge and towards the Sutton Sluice Gates. For clarity, the customers of Frodsham Water Sports do not use the section of the River Weaver that passes the Site of the Proposed Development and the owner confirmed that his activities would therefore be unaffected by a temporary closure or indeed the ongoing operation of the site.* There is also a separate business called Frodsham Kayaking that also operates from the slipway at the Frodsham Watersports Centre. This business offers access to the river for kayaks, paddleboards and pedal boats as well as hire of such equipment. These non-motorised activities use the section of the River Weaver that passes the site of the Proposed Development. Despite efforts, the Applicant was unable to make contact with the proprietor of Frodsham Kayaking to discuss any temporary closure, but we were told by the proprietor of Frodsham Water Sports that Frodsham Kayaking only operates at weekends and so would not be affected by the closure of the river. The Applicant contacted the Commodore of the Weaver Sailing Club, by email on 16th July 2024 to outline the project and to invite him to discuss the project on the phone. The Commodore preferred to communicate via email and made the following comments: *"I don't feel any benefit in attending a meeting, on behalf of WSC, regarding tourist impact of the Solar array. It won't have any impact on our Club & we fully support Solar energy, having installed 52 panels on our roof & being 100% self sufficient, with a back up battery & EV charging. Local tourism has no impact on our Members Club & I'm sure Frodsham, as a village, will continue to flourish."* The Applicant followed up on 16th August 2024 to ask if the club could share any information on usage of the River Weaver and numbers:

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
	conveyed? If the applicant's attempts to contact any of the above organisation was not successful, as is stated in section 12.4.5 of ES Chapter 12 published in May 2025, has the applicant made any subsequent attempts to contact them since then? Did the applicant receive any objections or concerns from any of these organisations regarding the proposed closure of the River Weaver?	*"At WSC we have 88 Members who partake in sailing, waterskiing, canoeing, kayaking & SUP. Our establishment is open 24/7 as Members have keys & we are a non for profit organisation with no employees, but very much part of Frodsham in our role as a Community Club. The Club is used most days, always at weekends but is seasonal (April - October), although we are open all year. The River Weaver is an essential amenity for the area of Frodsham, both for ourselves & Frodsham Watersports."* It was estimated that, on average, the members use the facility less than once a week. The specific details of closures were not discussed during these exchanges. However, both organisations were consulted (either as specific s.47 recipient (in the case of Weaver Sailing and Ski Club) or by being in the Core Consultation Zone (in the case of Frodsham Kayaking) on the Preliminary Environmental Information Report which included details of the need to temporarily close a short section of the River Weaver to allow the stringing of the cables. No comments were received from either organisation. The Runcorn Rowing Club was contacted on the 16th August 2024. The Applicant tried unsuccessfully to contact the Danny Steamship on a number of occasions during the pre-application period. No attempt was made to contact Mersey Ferries. However it is noted that the Runcorn Rowing Club, the Danny Steamship and the Mersey Ferries do not use the River Weaver and would therefore be unaffected by the temporary closure for the stringing of the cables.
2.9.9	**Proposed closure of the River Weaver** Is either the applicant or CWCC aware of any commercial use of the River Weaver that could be	The Applicant is not aware of any commercial use of the River Weaver that could be impacted by the proposed closure. The River Weaver is used by the recreational businesses of Frodsham Water Sports and Frodsham Kayaking as described in Table 12-4 of Environmental

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	impacted by the proposed closure? If yes, has the applicant undertaken a socio-economic assessment of the potential impact of said closure on that commercial use? If not, why not.	Statement: Volume 1 Chapter 12: Tourism and Recreation [APP-045]. As noted in the table the owner of Frodsham Water Sports confirmed that the business would be unaffected and Frodsham Kayaking only operates at weekends, and so again would be unaffected.
Traffic, transport and access		
2.9.10	**Planned emergency use of Brook Furlong bridge and Weaver Lane bridge** The ExA notes that the Outline Operational Environmental Management Plan [REP4-028] refers to access to the Site for emergency vehicles from Frodsham in section 2.2 page 7. A qualification of that is then provided within sections 2.4.18 and 2.4.19. Can the applicant review section 2.2 and consider if clarification on emergency access should also be made there?	To avoid any ambiguity, paragraph 2.2.3 of the oOEMP [as updated alongside this submission] has been revised to include reference to National Highways approval for the use of the M56 overbridges by emergency vehicles. It is noted that within the response received from CFRS (Appendix F), that a BESS site, i.e. the compound for the BESS, should have at least two separate access points to account for opposite wind conditions/direction. As set out in response to action point 6 of Applicant's Response to ISH2 Action Points [REP4-055] it is possible to approach the BESS compound from different directions due to the existing wind farm access tracks that have been integrated in to the design of the Proposed Development and proposed additional internal access roads, both of which are served by the Main Access Route into the Site from the west. As such the Applicant does not consider that a second emergency access route into the Site via Brooks Furlong/Weaver Lane needs to be prescribed in the oBSMP. As a result, surveys of these bridges to check their suitability for emergency vehicles is not a necessity at this stage.

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		The relevant emergency plan will be prepared at the detailed design stage to show how the BESS site can be approached from two angles the Main Access Route into the Site from the west.
2.9.11	**Delivery of the car park on Moorditch Lane** 1) Given the updates to the Outline Operational Environmental Management Plan [REP4-028] which reduces the possibility of a car park being delivered at all, can the applicant confirm whether this change has any impacts of the conclusions of ES Chapter 12: Tourism and Recreation [APP-045]? 2) ES Chapter 12 [APP-045] section 12.8.53 states that 'formal car parking area(s) would also be provided…'). Could the applicant explain whether this refers only to the proposed car park for Moorditch Lane or whether there are other potential car parking areas proposed?	1) The Applicant considers that the principal recreational and access benefits of the Proposed Development arise from the provision of additional permissive paths across the Site, the use of which are not dependent of the provision of the car park. These paths will facilitate a range of interconnected routes, thereby enhancing opportunities for public use. They will also improve accessibility for a wider variety of user groups compared to the existing Public Rights of Way (PRoW). In addition, the Applicant is committed to improving the condition of the existing PRoW within the Site. These enhancements, together with other recreational measures, such as the provision of information boards, viewing areas overlooking areas of nature conservation interest, seating, and improved signage, will collectively contribute to the positive effects on local tourism and recreation identified in the chapter conclusions. The Applicant acknowledges that the inclusion of a car park would represent an additional benefit of the Proposed Development. However, should this element not be delivered due to a requirement by National Highways for strengthening works to Book Furlong Bridge, this would not alter the overall conclusions of the assessment. The assessment identifies negligible to minor beneficial effects arising from enhancements to the PRoW network, National Cycle Network (NCN), and the wider environment, which are expected to support increased recreational use,

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		including walking, cycling, and birdwatching. These effects would arise irrespective of the implementation of the car park. 2) The plural reference at 12.8.53 is an error. Elsewhere in the chapter (paragraph 12.7.13, 12.8.42, 12.12.3) reference is made to car park in the singular when referring to the potential provision of a car park on Moorditch Lane (noting also that the reference to 'would' be provided, without caveat, is also an error).
Waste		
2.9.12	**Major replacement works** In [REP2-003, Q9.6.3] and in response to the Local Impact Report [REP3-042, point 23.9] you state that major replacement work campaigns (plural) would take place every 10-15 years. It was stated at ISH2 that only one major replacement campaign would take place over the lifetime of the project (for solar panels), in accordance with the table 2-13 in ES Chapter 2 [APP-035]. The ExA requests that either ES Chapter 2, or the Technical Note on Major Replacement Works or the dDCO are amended to make it crystal clear on the situation regarding major replacement works and their frequency. The applicant is also advised to submit a separate contextualised response with	Q9.6.3 of REP2-003 is directed to the Council. Although REP2-003 includes a reference to "campaigns" in the plural at Q9.4.3, that wording appears in the Examining Authority's question rather than in the Applicant's response. Replacement campaigns are discussed in response to Q9.6.2 but the response refers to a replacement campaign in the singular. Similarly, paragraph 23.9 of REP3-042 contains a reference to "campaigns" in the plural, but this appears in the Council's text rather than that of the Applicant. A further plural reference is made in the Applicant's response to LIR_CWACC3.2, paragraphs 3.6–3.8. However, in that context the term is used in a general sense to refer to replacement campaigns, rather than to indicate that more than one major replacement campaign is anticipated. The Applicant can confirm that as set out at ISH2 and described in Table 2-13 that the indicative operational lifespan of the panels is 15 – 30

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	regard to how the approach to major replacement works would accord with the waste management policies and expectations of NPS EN-1 and NPS EN-3.	years and it is assumed that there would be a single replacement made per installed panel with a 10% contingency. In relation to BESS units and associated power conversion units it is anticipated there would be replacement of BESS units every 10 – 20 years, with a 50% replacement contingency due to potential defects. The Applicant has presented the Scheme Description in Chapter 2 of the Environmental Statement on a set of reasonable assumptions. On the basis of a single replacement per installed panel with a 10% contingency the Applicant only anticipates a single major replacement campaign to occur. However, should more than one major replacement campaign be required the Applicant has described the nature of the impacts arising from these works, concluding that these effects would not be significant and would be less than the impacts experienced during construction. The outline Operational Management Plan describes a series of mitigation measures that would avoid, reduce or control impacts and the Applicant has provided further safeguards by requiring a notification to be submitted to Cheshire West and Chester Council for approval with details of the management measures that are proposed to be put in place for any major replacement campaign. In respect of a contextual response to policy. the Applicant wishes to first emphasise that, in its submissions, it has not sought to design a scheme that requires replacement. However, notwithstanding the policy intentions of NPS EN-1, the Applicant has also been cognisant of the current 'state of the art' in respect of the design life of solar panels, and that, currently, they are less than the secured lifetime of the Proposed Development. As such, an assessment has needed to be put forward to take account of the fact that replacement is likely and therefore needs to be taken into account in the ES and HRA.

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		In relation to how the carrying out of major replacement works would accord with the waste management policies and expectations of NPS EN-1 and NPS EN-3 Section 5.15 of NPS EN1 sets out the policies in relation to resource and waste management. It requires development proposals to demonstrate that waste will be managed in accordance with the waste hierarchy, with priority given to prevention, reuse and recycling, and disposal only as a last resort. It also expects applicants to set out robust arrangements to enable the sustainable management of hazardous and non-hazardous waste across construction, operation and decommissioning, to maximise resource efficiency and circular economy outcomes, and to demonstrate that waste arisings can be managed without unacceptable effects on existing waste infrastructure. In relation to the major replacement campaigns the Applicant has set out in its S51 Acceptance Cover Letter [AS-001] the operational waste phase waste arising estimates and the anticipated fate of these materials. These figures have been derived using the indicative operational lifespan of the Proposed Development Components set out in Table 2-13 of the ES. The Applicant has then gone onto review the Cheshire West & Chester Waste Need Assessment 2023 to establish the capacity of waste facilities in the local authority area and the region. The policy sets out that waste management regulation ensures that waste is disposed of in a way that is least damaging to the environment and human health. In relation to the management of solar panel waste and other electrical waste such as cabling, BESS units, transformers and inverters the Waste Electrical and Electronic Equipment (WEEE) Regulations 2013 require that waste electrical and electronic equipment is separately collected and sent to authorised treatment facilities for recycling or recovery. In order to facilitate this the Applicant has included provisions with the outline Operational Environmental Management Plan

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
		(paragraphs 4.1.56 – 4.1.57 and Table 5-11) to require a Waste Management Plan (WMP) to be prepared to ensure compliance with the Waste Hierarchy (prevention, re-use, recycling, recovery, and disposal as a last resort). As set out in the oOEMP the waste hierarchy must be applied by any person who produces, keeps or manages waste per the duty of care set out in Section 34 of the Environmental Protection Act 1990 and Regulation 12 of the Waste (England and Wales) Regulations 2011. In relation to the main waste stream arising from major replacement campaigns, redundant solar PV panels, the Applicant considers that there is a strong and credible basis to conclude that, as the solar market matures, the waste management sector will respond to meet the demand for end-of-life solar PV panel recycling. This is supported, in part, by the policy and legislative framework established under the Waste (England and Wales) Regulations 2011, which require the achievement of recycling and recovery targets and place obligations on waste planning authorities to facilitate the provision of appropriate waste management infrastructure across municipal, commercial and industrial waste streams. These requirements are reinforced by Our Waste, Our Resources: A Strategy for England (2018), which embeds circular economy principles within national policy and promotes the treatment of waste as a valuable resource. In the case of solar PV panels, end-of-life panels contain a high proportion of recyclable materials, typically in the order of 85–95%, including glass, aluminium and silicon. As volumes of decommissioned panels increase over time, this will create a consistent and scalable waste stream with inherent material value, providing a clear commercial incentive for investment in recycling infrastructure. Similarly, BESS units, transformers and inverter units contain a high proportion of recyclable materials and

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
		therefore contain an end-of-life value realised through either re-use or recycling. The Applicant considers that two principal drivers are likely to underpin the expansion of the recycling market. First, the economic case for recovering valuable materials from a large and predictable supply of end-of-life panels is expected to strengthen as deployment increases. Secondly, government policy has demonstrated its ability to stimulate infrastructure delivery where required. By way of example, the introduction of the Plastic Packaging Tax has directly supported investment in new recycling facilities, including new recycling facilities in Cheshire West and Chester at Protos, illustrating how targeted policy interventions can accelerate market response. This position is further supported by Solar Roadmap: United Kingdom powered by solar, which includes a specific commitment (Action 70) to review the availability of existing and emerging solar panel recycling practices. This demonstrates ongoing government engagement with, and support for, the development of the sector. On the basis of the above, the Applicant considers that it has demonstrated compliance with the waste management policy framework set out in NPS EN-1 and NPS EN-3 (noting that EN-3 does not include solar-specific waste or resource policies). In particular, the Applicant has identified the likely types and volumes of waste arising during a replacement campaign, described the mechanisms by which such waste would be managed, and demonstrated that sufficient local and regional capacity exists to accommodate these arisings without giving rise to unacceptable effects on existing waste infrastructure.

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		In respect of future capacity, the Applicant recognises that the solar PV recycling market will need to expand over time to respond to increased volumes of end-of-life panels. However, there is a clear and credible basis to conclude that such capacity will be delivered. The current limited provision of dedicated solar PV recycling facilities reflects the present low levels of demand, and it is neither unexpected nor unreasonable that infrastructure has not yet developed at the scale that may be required in the future. As the market matures, and a greater number of utility-scale solar farms approach panel replacement, it is anticipated that both market forces and policy drivers will facilitate the timely provision of appropriate recycling infrastructure. The Applicant also notes its position in respect of NPS paragraph 5.15.8 (i.e. providing an assessment of waste capacity, as it did in AS-001] and 5.5.14 (i.e. the need for replacement is as set out above, and not as set out in [REP2-003] and so, alongside the measures set out in the OCEMP and OOEMP to consider decommissioning throughout the lifetime of the Proposed Development, the Applicant has sought to minimise waste arisings set out in its summary of submissions at ISH2 [REP4-057]. The Applicant also notes its position on waste matters set out in the Policy Compliance Document [APP-129].
2.9.13	**Post-project management** At deadline 3 [REP3-047, page 18], CWCC raised a concern that there was reliance on private agreements with landowners in respect to the situation at, and immediately after, decommissioning.	The Applicant notes that paragraph 2.4.9 of the Outline DEMP provides for a plan to be provided with the detailed DEMP to show how any infrastructure that will be left in place pursuant to paragraph 2.4.2 of the outline DEMP and the landscaping and access provisions which remain at the point the land is to be returned to the landowners. Such a plan could only be prepared by the Applicant on the basis of discussions with landowners as to how they are expecting the land to be returned to them.

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	1) Could CWCC elaborate on its concerns and whether they are fundamental or cause conflict with any national policy statement? 2) Applicant, are you able to comment on this matter at all or, if possible, provide an extract of the heads of terms you have agreed with landowners that could give some clarity or comfort in this regard?	The options held with the landowners all include terms which require the Applicant (as tenant) to: • leave the property in the same condition as on entry (by reference to a schedule of condition taken at the time the lease is entered into); • remove all equipment and signage; and • make good any damage caused. Fundamentally, however, the Proposed Development is temporary. The Council will have the opportunity to see and approve that plan as part of the detailed DEMP. Ultimately, however, when the land is returned, it is in the control of the landowners, just as it is now, and should be managed in accordance with the planning system in the usual way.
2.9.14	**Waste Management Plan** CWCC [REP4-074] has requested certain stipulations be added into the waste management plan, including an adaptive approach to deal with future waste streams. Incorporate these requests accordingly or, if not, explain with reasons.	REP4-074 does not set out any stipulations to be added into the waste management plan. However, the Applicant recognises the need for the operational waste management plan to adapt to advances in recycling technologies, changes in market capacity, and relevant legislative or policy updates. As such the oOEMP has been updated to recognise this.
Cumulative and inter-related effects		
2.9.15	**Tripartite memorandum of understanding**	The Applicant has met with CWCC and Liverpool Bay CCS Ltd (LBCCS) to discuss the preparation of a joint statement setting out a clear pathway to

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	With respect to the Runcorn Spur, the three bodies named in this question are requested to submit a joint statement setting out a clear pathway to resolving the approach to the cumulative effects assessment that, without prejudice to any party, accords with the Habitats Regulations and ensures an Adverse Effect on the Integrity of the Mersey Estuary Special Protection Area (and its functionally-linked land) could be ruled out.	resolving the approach to the cumulative effects assessment. Following discussions with the parties the Applicant has prepared a draft Memorandum of Understanding which is contained at Appendix D. The draft text has been agreed with LBCCS and the Applicant is awaiting comments from CWCC. CWCC suggested a potential option within its covering letter to Deadline 4 of introducing a requirement into the DCO to restrict any development other than the authorised development, for a period in the order of 24 months following implementation of the NBBMA. The Applicant does not consider it appropriate for either the DCO or the TCPA planning permission to include requirements or conditions which would limit or restrict other development not authorised by that consent and therefore does not support this suggestion. Furthermore, it is not clear how this approach would actually deal with the matters of concern, as if the pipeline was built after 24 months without any mitigation controls, the impacts to integrity could still be caused. The key is ensuring that there are controls on the works, if they take place after the NBBMA is established. Furthermore, CWCC has previously proposed a tripartite private agreement between the parties as a method for impacts to be controlled. As set out at ISH2, the Applicant does not agree that a private agreement is an appropriate method to control a planning matter, particularly in the context where conditions can be applied. The Applicant acknowledges that the ExA has requested a joint statement to resolve this issue, and we will continue to work with CWCC and LBCCS. However, we understand that CWCC and LBCCS are currently discussing the Runcorn Spur CO2 Pipeline application and LBCCS is awaiting feedback from CWCC and Natural England regarding ecological impacts. This is preventing them from discussing and agreeing on potential conditions.

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		Nonetheless, the Applicant has unilaterally drafted a set of potential conditions to demonstrate that, in the Applicant's view, there are conditions that can be applied which are legally sound and meet the tests set out in paragraph 57 of the NPPF, and which would ensure that the in-combination effects of the two developments that have been assessed are managed in line with the terms of the two applications. The Applicant considers that these draft conditions demonstrate that it is possible to apply policy and legally compliant controls to the planning permission for the Runcorn Spur CO2 pipeline application (should it be granted permission) such that an Adverse Effect on the Integrity of the Mersey Estuary Special Protection Area, including its functionally linked land, could be ruled out in respect of in-combination effects with Frodsham Solar. This is also on the basis that other planning conditions are also imposed, including controls relating to the submission and approval of a Construction Environmental Management Plan, and a requirement for Liverpool Bay CCS Ltd to participate in a working group with other projects carrying out construction at the same time on Frodsham Marshes, reflecting the controls which are proposed for inclusion in the DCO for Frodsham Solar. However, in proposing these conditions, the Applicant acknowledges that the Council must follow due process in determining the application. The Applicant understands the Council has reservations about drafting conditions before completing its consultation process and considering all relevant matters related to the application's determination. Nonetheless, the Applicant believes that identifying potential conditions for a prospective approval, particularly in relation to this matter, would not affect the ability for the Council to make a decision to refuse the application, or mean that it would be considered it has pre-determined the application if it ultimately did

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
		grant consent – any comments/proposals on conditions could be clearly stated as being without prejudice to the final decision. **Option 1:** The development hereby permitted shall be undertaken in accordance with the programme set out in Table 3-3 of Habitat Regulations Assessment - Report of Information to Inform an Appropriate Assessment (Document reference RU.4.4 Rev A dated July 2025). *Reason: To ensure that there will be no adverse effects on the integrity of any site protected under the Conservation of Habitats and Species Regulations 2017, as a result of the Runcorn Spur Pipeline Proposed Development, alone or in-combination with other plans or projects.* **Option 2:** The construction of the section of the development hereby permitted which crosses Cell 3 (as illustrated in ES Figure 3.4 - Manchester Ship Canal Deposit Grounds, drawing number 70116228-RU.3.4-ES) shall be undertaken in accordance with the programme set out in Table 3-3 of Habitat Regulations Assessment - Report of Information to Inform an Appropriate Assessment (Document reference RU.4.4 Rev A dated July 2025). *Reason: To ensure that there will be no adverse effects on the integrity of any site protected under the Conservation of Habitats and Species*

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
		Regulations 2017, as a result of the Runcorn Spur Pipeline Proposed Development, alone or in-combination with other plans or projects. **Option 3:** The [development OR the section of the development hereby permitted which crosses Cell 3 (as illustrated in ES Figure 3.4 - Manchester Ship Canal Deposit Grounds, drawing number 70116228-RU.3.4-ES)] hereby permitted shall be undertaken in accordance with the programme set out in Table 3-3 of Habitat Regulations Assessment - Report of Information to Inform an Appropriate Assessment (Document reference RU.4.4 Rev A dated July 2025) unless: • an updated Habitat Regulations Assessment - Report of Information to Inform an Appropriate Assessment is submitted to the Local Planning Authority which assesses the effects resulting from any change in that programme, alone or in-combination with other plans and projects and which either must reach a conclusion that there are no adverse effects on integrity to any Site protected pursuant to the Conservation of Habitats and Species Regulations 2017 ('Habitats Regulations') or set out its case for why the Local Planning Authority can conclude that the tests under Regulations 64 and 68 of the Habitats Regulations are met in respect of the development; and • following consultation with Natural England, the Local Planning Authority has given a decision in writing that it considers that, taking account of the proposed change in that programme:

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
		○ Regulation 63(5) of the Habitats Regulations is made out in respect of the development; or ○ that the tests in Regulations 64 and 68 of the Habitats Regulations are met in respect of the development. Following the decision of the Local Planning Authority, the development shall be carried out in complete accordance with the updated Habitat Regulations Assessment - Report of Information to Inform an Appropriate Assessment. *Reason: To ensure that there will be no adverse effects on the integrity of any site protected under the Conservation of Habitats and Species Regulations 2017, as a result of the Runcorn Spur Pipeline Proposed Development, alone or in-combination with other plans or projects*
2.9.17	**NBBMA +** The ExA is slightly confused by the applicant's position that, in the 'after scenario', the proposed development plus the NBBMA would not lead to a cumulative effect as indicated [REP1-041]: *"As such, in the After Scenario, the NBBMA will be an ecological future baseline for the Runcorn Spur Pipeline to consider. Put another way, there can be no 'Runcorn Spur Pipeline plus NBBMA' cumulative/ in-combination effect, as the NBBMA does not cause effects."*	1) The Applicant has provided an assessment of the after scenario in REP4-053. The key point is that the Runcorn Spur pipeline is proposed to be routed through the NBBMA. The NBBMA does not, in and of itself, cause impacts to the birds, as it is providing habitat for them. The 'surrounding' land of the SADA will be in-situ, and does not, by its mere presence, cause an impact to the birds, as they will be using the NBBMA. If the pipeline comes along and causes an impact to that NBBMA that habitat is temporarily lost to the birds – the Applicant acknowledges that in those circumstances the birds would not then be able to walk on the SADA. However, that is not an impact of the Proposed Development, but an indirect impact of the pipeline, that has driven the birds away from the quality habitat that now exists.

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
	1) As the ExA understands it, the cumulative effect is upon the birds, first by being displaced and re-provided for by the proposed development on the NBBMA, only then to be disturbed and potentially displaced from the NBBMA by construction activities by the Runcorn Spur. Should then consideration be given to the cumulative effect of the proposed development plus the Runcorn Spur upon SPA bird mitigation features? If not, why not? 2) Once the NBBMA is established and a conservation body (potentially the RSPB) takes over long term management and maintenance of the feature, would the applicant retain any interest, responsibility or liability over the NBBMA or the success of it as effective mitigation? If so, then would it not be the applicant responsible for restoring the NBBMA to its original condition prior to the Runcorn Spur being laid? If not, then which organisation would be responsible for restoring the NBBMA?	In any event, even if this position is disagreed with, and that is considered a cumulative impact, it does not change the underlying position – the only party that can mitigate that impact is LBCCS, and it is for the Council to require them to do so. 2) The Applicant does not fully understand all aspects of this question, as it would not be 'restoring the NBBMA to its original condition prior to the Runcorn Spur being laid' – the NBBMA will be in place for at least the lifetime of the Proposed Development, so it will be in place if the pipeline comes after its installation. The Applicant is ultimately responsible for ensuring there is compliance with the approved NBBMS. Whilst it is has set out that it will put in place RSPB or another nature conservation body to manage the NBBMA, ultimately the 'buck' stops with the Applicant, in line with the provisions of the DCO and section 161 of the Planning Act 2008. If the pipeline is to come after the NBBMA is installed, then as set out in the Applicant's other submissions to this Examination, for a lawful consent to be given for the pipeline, it must be assumed that some form of control would be put in place to ensure that the pipeline does not damage the NBBMA to avoid adverse effects on integrity to the SPA.
10.		
Compulsory acquisition and related matters		

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
2.10.1	**Justification for CA of Land** Paragraph 1.1.6 of the Statement of Reasons (SoR) [APP-018] states that the current design for the proposed development would enable the generation of approximately 147 megawatts (MW) of electricity, that the precise generating capacity and storage capacity will be subject to detailed design, but that at present the grid connection offer from the District Network Operator (DNO) is for 100 MW export and 50 MW import. Paragraph 1.1.3 of the SoR says that a private wire electricity connection would provide *"the opportunity"* to supply renewable energy generated by the proposed development directly to nearby industrial businesses. In that context: 1) is Plot 3-36 (Cheshire Green Property Ltd) likely to be needed to achieve the 100 MW of electricity for export to the grid? 2) with reference to paragraph 3.15 of [REP4-056], is Plot 3-36 needed to achieve the applicant's expected grid connection date? 3) are there any agreements in place for the supply of energy to nearby industrial businesses? If yes, for how many MW of electricity?	1) At this stage, it is not the case that plot 3-36 is not specifically needed, in and of itself, to achieve the 100MW of electricity for export of the grid. However, as noted at ISH2, it may be needed to secure that outcome if (a) some other areas of the SADA turn out be undevelopable, whether through unknown constraints or discussions with statutory undertakers and/or (b) even if all parts of the SADA are able to be developed, to enable that 100MW connection to be serviced alongside a private wire connection. It is also noted that removing Plot 3-36 would lead to a reduction in generating capacity of approximately 4.3MW, enough to power over 1,200 homes. 2) As per (1), at this stage it is not proposed to be required to meet the grid connection date, but it could be, depending on the rest of the SADA and the timeliness of any private wire connection brought forward. 3) No agreements are yet in place to supply energy to nearby industrial businesses. 4) The vast majority of solar DCOs consented to date have incorporated overplanting in its proposals and supported that overplanting with underlying compulsory acquisition proposals (exceptions to this known immediately to the Applicant being Helios and Little Crow). In each case the maximum extent of their solar development areas has been shown as being subject to compulsory acquisition, and their application has explained/demonstrated that that extent includes for overplanting, noting

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
	4) please provide any examples of where overplanting has been accepted as a justification for the compulsory acquisition of land.	that this is supported by EN-3. Examples of this include Oaklands, Mallard Pass, West Burton, Sunnica, Gate Burton, Cottam, Fenwick, East Yorkshire and Longfield solar farms.
2.10.2	**Critical National Priority** In your opinion, where Critical National Priority (CNP) Infrastructure is proposed, does the CNP status alone mean that compulsory acquisition of all land within the order limits should be confirmed? If yes, please set out your justification and any policy or guidance that supports your position. If no, please explain the other considerations that should be taken into account.	Section 6.2 of the Statement of Reasons [APP-018] sets out the reasons why the Applicant considers that there is a compelling case in the public interest for compulsory acquisition powers to be granted, which the Applicant recognises is the key policy test that applies to the question of whether such powers should be granted. The Applicant would suggest that it would be difficult to argue that the Government's consideration that low carbon technologies such as the Proposed Development to be a 'Critical National Priority' for the UK, for all the reasons set out in section 3 of EN-1 would not be a compelling case. In any event, however, it is the Proposed Development's alignment with those reasons for CNP status being given by the Government that underlines that compelling case, specifically that: • the Government recognises that low carbon projects are needed to meet its Net Zero commitments. This should be seen in the context meeting the challenges of climate change is existential to the survival of humanity on Earth - the Proposed Development contributes to the UK's ability to meeting that challenge both in terms of numbers and meeting the urgency of the need; and • the Government recognises that low carbon projects are needed so that the UK needs to develop its own energy security,

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
		something even more pressing in light of recent events in the Gulf - this is something that the Proposed Development contributes to by providing homegrown electricity. Both of these factors are both why such projects are critical national priority, but also why they are clearly matters of public interest, and the ability of the Proposed Development to meet them is a compelling case in that interest. Given this, and the localised economic, social and environmental benefits delivered by the Proposed Development, as summarised in the Statement of Reasons, the Applicant considers that there is no doubt that there is a compelling case in the public interest for compulsory acquisition powers to be granted. The Applicant also notes the variety of other statutory and policy tests that need to be met for compulsory acquisition powers to be granted, these are set out, alongside the Proposed Development's compliance with them, in the Statement of Reasons.
2.10.3	**Option Agreement and Deed of Easement** Please provide an update on negotiations in respect of INOVYN Chlorvinyls Limited's interests.	Negotiations remain ongoing between the parties. The Applicant has received revised draft documentation from Inovyn and intends to review, revise and return the documents over the coming days. Positive progress is being made and that, at this next turn of the documents, it is anticipated that there will only be a handful of commercial points left remaining to be agreed.

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
11. The draft Development Consent Order (DCO)		
General matters		
2.11.3	**Permitted preliminary works** The explanatory memorandum [REP3-004] states the drafting for permitted preliminary works takes inspiration from the Cory Decarbonisation Project Order 2025. It is noted that at deadline 4 [REP4-052], it is stated that the applicant's approach is "well precedented". Provide the names of other orders where such wording has been tested by the SoS and incorporated into a made DCO. In addition, CWCC's concern regarding item (k) of the permitted preliminary works extends beyond site clearance and demolition of the vent shafts, referring as well to disturbance to wildlife. This aspect does not appear to have been commented on in your response [REP4-052]. Explain the implications accordingly.	The definition of *"permitted preliminary works"* in the dDCO is well precedented in recent made Development Consent Orders. As demonstrated in the comparison table at **Appendix G**, the Frodsham definitions align closely with the approach adopted in a number of recently made Orders, including: • The Byers Gill Solar Order 2025 • The Tillbridge Solar Order 2025 • The Stonestreet Green Solar Order 2025 • The Cory Decarbonisation Project Order 2025 • The Oaklands Farm Solar Park Order 2025 • The Fenwick Solar Farm Order 2026 • The Heckington Fen Solar Park Order 2025 • The East Yorkshire Solar Farm Order 2025 When compared against Frodsham, the scope of permitted preliminary works across these Orders is broadly consistent. The majority include environmental surveys and investigations, site clearance (including vegetation removal and demolition), above-ground preparation for temporary contractor facilities, remediation of contamination or adverse ground conditions, diversion and laying of apparatus, the provision of temporary site security, and the display of site notices or advertisements.

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
		Where the wording is not completely consistent, the table sets out the exact drafting from the relevant made Order, but the Applicant considers that little turns on the differences in wording. The Applicant therefore considers the drafting to be consistent with Orders tested by the SoS and incorporated into a made DCO. The two drafting distinctions is that the Frodsham definition expressly links certain activities to approved plans and management mechanisms secured through the requirements (including the CEMP, archaeological mitigation strategy and ground conditions investigations and assessments strategy), which is not replicated in the comparator Orders. The second is that sub-paragraph (l) is an exception, as it does not appear in the comparator Orders. However, its inclusion is considered appropriate in this case because the works are limited in scope and would take place on an existing road. **CWCC concern regarding item (k) and wildlife disturbance** In respect of CWCC's concern regarding disturbance to wildlife arising from item (k) (site clearance), all permitted preliminary works are subject to Requirement 12 (Construction Environmental Management Plan). No site clearance may take place unless a CEMP has been approved, which will secure appropriate mitigation measures for effects on wildlife. Any potential disturbance is therefore appropriately controlled through the requirements framework.
Articles		

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
2.11.4	**Article 39 Hedgerows to be removed** CWCC suggested a pragmatic approach of recording tree losses by canopy area to assist with assessing the actual loss, and that tree canopy area information be provided as a useful metric. Could the applicant respond to this suggestion?	The Applicant notes that controls in respect of hedgerows come from the application of Requirement 9 and the OLEMP, not article 39 itself, which is the power to remove hedgerows. The Applicant has responded previously to the point relating to measurement of canopy losses at Procedural Deadline B, specifically CWACC6.13 within Response to Local Planning Authority and Statutory Environmental Body Relevant Representations [PD2-027]. The Applicant has set out that some of the trees were recorded under an 'Area' category to reflect the fact that there are large areas of the Site where trees are present but they fall outside areas that would be impacted by the Proposed Development noting the provisions set out within the oLEMP at paragraph 4.4.3 which sets out the buffers that will be adopted in the final design of the scheme to protect key environmental features. This includes a 6m buffer to hedgerows and areas of substantial vegetation e.g. groups of trees. Retention of trees and creation of greater areas of trees and hedgerow is a fundamental component of the oLEMP. Section 6.6 provides various details about the species mix, provenance and planting densities for the planting of trees, shrubs and hedgerows. The landscaping sets out in the oLEMP, and shown on the Illustrative Environmental Masterplan at Appendix A provides for approximately: • 2.2 hectares of new native woodland, • 0.87 hectares of native mixed scrub, • 2.5 km of new native hedgerow, and • 5 km of new belts of native trees and shrubs.

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
		It is therefore considered that the measures set out within the oLEMP will not only safeguard the existing tree resource on Site but will also deliver a net enhancement. On this basis, the approach adopted to the arboricultural assessment is proportionate and provides sufficient information to enable a thorough understanding of the likely tree losses associated with the Proposed Development. When considered in conjunction with the above planting commitments set out within the oLEMP, secured through Requirement 9 of the draft DCO, it is evident that the overall impact on the Site's tree resource would be limited. Furthermore, the outline Construction Environmental Management Plan (oCEMP) [as updated alongside this submission], has been revised to clarify that, prior to the commencement of construction within each phase, a BS 5837:2012 survey will be undertaken. This shall identify all tree losses and specify the location of tree protection measures to be implemented, with details to be secured through the final CEMP. This will then be read alongside the final LEMP for that phase which will detail specific planting proposed for the that phase.
2.11.5	**Disapplication of Flood Risk Activity Permits (FRAP)** Following the submission from the EA regarding the continued lack of technical detail [REP4-071], the ExA requests that you remove the disapplication of FRAP from the Order and update associated documents.	The Applicant does not propose to make this change as it is considered that an agreed position with the EA will be able to be agreed, if not by the end of Examination, then before the Secretary of State's decision. If section 150 consent is not provided by the EA, then the amendments to the DCO will be simple – the removal of article 7(1)(d) and (e) and Schedule 25.
Requirements		

ExA Q2 Ref.	ExA Q2 Question	Applicant's Response
2.11.8	**Permissive Paths** The arguments against having a new requirement for permissive paths is noted. However, could the oLEMP be amended so as to include the provisions cited by CWCC, giving reassurance that paths would be open and available for the requisite time periods?	The oLEMP [as updated alongside this submission] has been revised to include the provision requested by CWaCC, including that permissive paths shall be kept open for a minimum of 301 days each year.

Appendix A: Frodsham Wind Farm Preliminary Site Investigation, March 2014

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WASTE RESOURCE MANAGEMENT

PEEL WIND FARMS (FRODSHAM) LIMITED

Frodsham Wind Farm

Preliminary Site Investigation
Including Foundation and Engineering Construction Assessment

March 2014

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REPORT NUMBER: **0003**

PEEL WIND FARMS (FRODSHAM) LIMITED

FRODSHAM WIND FARM

PRELIMINARY SITE INVESTIGATION
INCLUDING FOUNDATION AND ENGINEERING CONSTRUCTION ASSESSMENT

MARCH 2014

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WASTE RESOURCE MANAGEMENT

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Appendix 2 "Factual Ground Investigation Report", Van Elle, January 2014 including Static CPT (Cone Penetration Tests) Report
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Provisional Construction Cost Estimate – Access Roads and Turbine Foundations etc

EXECUTIVE SUMMARY

Background

The report presents the results of a preliminary intrusive ground investigation at the proposed Frodsham Wind Farm, which is situated on a site of approximately 450Ha, in an area known as the Frodsham and Helsby Marshes. This is an area of low lying land close to the southern boundary of the River Mersey estuary, and adjacent to the Manchester Ship Canal (MSC).

The majority of the site is a dredging deposit ground, used for the deposition of sand with some gravel, silt and clay material dredged from the MSC. The dredging grounds are owned and operated by the Manchester Ship Canal Company (MSCC), part of the Peel Group. Large retaining bunds/embankments dominate the site topography, being generally approximately 12m above ordnance datum (AOD), around 8m higher than the surrounding ground level. The area surrounding the deposit ground is largely flat, typically at around 3.5-5.5m AOD.

The development proposal comprises 19 No. wind turbines. Sixteen turbines are located on the dredging deposits, with a further 3 turbines located immediately to the south on natural ground. A meteorological mast is also to be erected.

The report assesses the engineering implications of the geo-environmental and geotechnical properties of the site and suggests possible engineering solutions to identified problems. A separate Annex Report provides a provisional construction cost estimate of turbine foundations, access roads and related miscellaneous items for the wind farm and associated infrastructure.

A contamination assessment has been undertaken given the nature of the previous land use. An initial consultation meeting was held with Cheshire West and Chester (CWaC) Council and the Environment Agency (EA) at the commencement of the study to inform all parties of the nature and scope of the preliminary site investigation. As part of this process a written statement to address Planning Condition 37 (Items a and b) was submitted to CWaC in advance of the site works commencing.

Several buried services cross the site, and the site is situated close to a bomb decoy site developed during World War 2, due to the close proximity of the Stanlow Oil Refinery and a

(now Kemira GrowHow) chemical works. An unexploded ordnance risk assessment and survey has been required as a Planning Condition, and the assessment concluded that there is a "High risk from unexploded ordnance at the site". To address this a down-hole magnetometer survey took place in advance at all the intrusive investigation locations. No evidence of unexploded ordnance was identified at any of the investigation locations.

The preliminary site investigation was undertaken between September and October 2013 involving 45 No. location points. Combined groundwater and gas monitoring standpipes were installed in the five shell and auger boreholes.

An assessment of the magnitude and significance of the potential risks to human health, surface water, groundwater, ecological receptors and buildings from contaminated soil and groundwater has been undertaken. An earlier preliminary conceptual site model (CSM) (2010) indicated that Made Ground (dredged materials) at the site may potentially contain contamination that presents a low to moderate risk to the both current and future site users, as well as to the Controlled Waters environment.

The results of all the 2013 contamination testing have been assessed against screening values for a commercial end-use, and indicate little or no risk to human health. Groundwater and leachability samples taken from the site have generally identified moderate groundwater quality. Surface water sampling and analysis of the adjacent watercourses has not been carried out as part of this study. However, such sampling is routinely undertaken on behalf of MSCC for the active dredging disposal, as required under the EA licensing regime, and these do not indicate any significant problems associated with surface water discharges from the site.

Ground Conditions

The site investigation has identified a significant thickness of Made Ground, up to 9.95m, in the locations of the MSCC dredging lagoon cells. No Made Ground was identified in areas outside of the cells. The Made Ground was of extremely low strength with an undrained shear strength as low as 5kN/m^2. A desiccated surface crust is present across the surface of the Made Ground of the dredging deposits which allows limited trafficking of light plant.

Below the Made Ground, alluvial clay and peat was identified to a maximum depth of 16.50m bgl (base of unit), which is also of extremely low strength with an undrained shear strength of approximately 20 kN/m^2.

A "transitional zone" has been identified below the alluvial material in parts of the site, which generally comprise clay with sand and silt. Where present, this was typically firm and around 2m in overall thickness.

Below the transitional zone there is a thick layer of fluvio-glacial soil, generally comprising medium dense to very dense sand, the base of which was to a maximum depth of 24.60m bgl.

Glacial till (boulder clay) underlies the fluvio-glacial soil, comprising stiff or very stiff clay with occasional gravel. This was identified to range in thickness from 8.70m to >19.80m at depths between 29.20m bgl in the west and greater than 43.45m bgl in the east of the site.

The bedrock underlying the site comprises sandstone of the Sherwood Sandstone Group; a principal aquifer.

Stability of Lagoons

Slope stability of the external edges of the lagoons is marginal, and as such it is recommended that a minimum stand-off distance of 35m should be maintained between the crest of any bund slope, where a significant height difference exists from one side to the other, and any permanent structure or construction activities. These bunds should not be relied upon to support plant or vehicle loads unless strengthening works are undertaken. It is recommended that Turbines 1, 6, 14 and 18 need to be repositioned away from the bunds. To allow for the base diameter and working room, the turbine centres should be a minimum of 12m outside the standoff zone shown on Drawing No. ST13418-005. Access roads will also require a similar standoff distance to facilitate their construction safely away from the external bund walls.

Foundations

Turbines

Due to the variable nature and low strength of the Made Ground and alluvial clay and peat, neither of these will provide a suitable founding horizon. The foundation solution is to

adopt piled foundations extended through to bear on either the fluvio-glacial sands or the glacial till (boulder clay), both of which provide suitable bearing strata.

Driven cast-in-place concrete piles of 600mm diameter with depths varying of between 14-29m across the site, are likely to be most suitable; although alternate options may be feasible. The foundation requirements will however, vary according to the actual turbine adopted.

Based on manufacturer's data, it is suggested that a ring of 24 No. piles shall be required per turbine, arranged at a radius of 8.00m from the turbine centre. Above the piles, the turbine foundation is expected to comprise a circular reinforced concrete base to a depth of around 3m.

The current extent of the preliminary ground investigation may be suitable for the initial anticipated pile types and depths to be largely defined. However, further ground investigation should form part of the detailed design, and the requirements will depend on the contractor's proposals, including the piling system adopted and the contractor's temporary works proposals. As a minimum, it is recommended that one cable percussion borehole is drilled at each turbine location to 5m below the anticipated piling depth.

Temporary Works

A substantial piling mat will be required at each turbine location, at least comprising c.1m of compacted granular material reinforced with 2 layers of geogrid, laid on a geotextile. In addition, ground improvement (eg lime or cement stabilisation) should be considered in the turbine working areas which would improve the stability for temporary excavations. Excavations for the turbine base will require support, probably by sheet piling.

Crane Pads and Bases

The loads imposed by cranes during construction will be significant and the Made Ground and alluvial materials are not suitable to support these loads. It is recommended that crane bases will require piled foundations, founded in the fluvio-glacial sand. Similar 600mm diameter piles to that adopted for the turbine foundations are anticipated, but with reduced pile lengths varying from 11-17m across the site. Alternatively, the use of smaller pre-cast concrete driven piles may be suitable. Furthermore, the crane pad areas will require a reinforced granular mattress to provide a running surface and laydown area.

Access Roads

The desiccated crust of the lagoon infill material may allow construction of access roads without additional support. It is anticipated that the overall construction thickness of access roads in lagoons shall be 1m, including a geotextile and geogrid reinforcement.

Access roads should be located a minimum stand-off distance of 35m from the external bunds of the lagoons as already noted above. Existing access roads off the dredging lagoon areas may require some widening or upgrading.

An access ramp(s) will need to be constructed to gain access to the top of the lagoons. This is likely to be in the order of 7 to 9m high and founded on the alluvium. Further ground investigations should be undertaken at the proposed embankment location(s) to provide additional information for design purposes.

Ancillary Buildings

Ground investigations should be undertaken at the location of the sub-station and control building to confirm the foundation requirements.

Soil Contamination

The results of contamination analysis of soil samples assessed against conventional commercial end-use screening values, indicate that there is little or no risk to human health from contamination at the site, with only lead exceeding the screening value at two locations. In addition several samples exceeded the solubility saturation limit for aliphatic C_{12} – C_{16} range hydrocarbons. None of the analysis identified significant gross contamination and hence there is no evidence that remedial measures would be required from a human health perspective.

Preliminary screening has identified asbestos in 6 samples, of which 4 were near to the ground surface. Additional asbestos quantification testing did not identify the presence of asbestos above the limit of detection and this is not considered to pose a significant risk.

Ground Gas

Ground gas monitoring has been carried out on two occasions, which has identified significantly elevated levels of ground gas, with methane being recorded to a maximum

concentration of 86.7%. This will need to be accounted for in the design, construction and operation phases of the wind farm development.

Groundwater Contamination and Controlled Waters

Analysis of groundwater samples on a single occasion has identified moderate groundwater quality with consistently elevated levels of boron, chromium, copper, selenium, zinc, sulphates, PAHs and TPH being present. The anticipated source of this contamination is the dredging deposits. The majority of metals identified at the site are potentially leachable.

The Principal Aquifer (the Sherwood Sandstone Group), underlies a significant thickness of glacial till (boulder clay) which represents a substantial barrier to the downward transmissivity of contamination from the Made Ground dredging deposits above. The tidal nature of the surrounding surface waters are such that the limited contamination identified on site will not have a significant impact on their quality. Nevertheless, it is recognised that the groundwater at the site is likely to be in direct hydraulic continuity with the surface waters. Hence the design of any piled foundations should consider the nature of the site's contamination and CSM, such that pathways are not created for contaminated groundwater to flow from the Made Ground to the Principal Aquifer.

Contamination Risk Assessment

The contamination analysis carried out indicates that it is unlikely that soil or groundwater remediation will be required in specific regard to the proposed wind farm development. However, this would need to be agreed in consultation with the CWaC and the EA, possibly requiring additional analysis and assessment to further assess the risk of contamination to the underlying Principal Aquifer and adjacent surface waters.

Conclusions

A number of significant, but not unexpected, constraints have been identified which shall require to be addressed prior to construction. Whilst some of the solutions required may be costly, the constraints can be dealt with by the implementation of engineering design solutions and appropriate mitigation measures.

1 INTRODUCTION

1.1 This report has been produced in accordance with Wardell Armstrong's letter proposal dated 15 April 2013, together with supplementary correspondence, and the subsequent verbal instructions from Stephen Snowdon, Development Manager (Planning), of Peel Energy in July 2013.

1.2 The report presents the results of a preliminary intrusive ground investigation at the site of the proposed Frodsham Wind Farm, together with a geotechnical interpretation addressing foundation options and an engineering construction assessment. A contamination assessment has been undertaken given the nature of the previous land use. The site investigation utilised windowless sampling/dynamic probing, cone penetration testing, shell and auger drilling and shallow hand dug excavations to investigate the underlying ground condition**s** of the site. In-situ laboratory testing was undertaken to determine the geotechnical and geochemical properties of the ground.

1.3 In the preparation of this report the following information has been considered:

Pre-feasibility Assessment, Scott Wilson 2007;

Phase 1 Geo-Environmental Desk Study Report, Scott Wilson 2010;

Information provided by Manchester Ship Canal Company (MSCC) during a visit to its archives in August 2013;

A site walk-over during July 2013;

Historic borehole logs obtained from the British Geological Survey (BGS) website.

1.4 An initial consultation meeting was held with Cheshire West and Chester (CWaC) Council and the Environment Agency at the commencement of the study on 16 August 2013, to inform all parties of the nature and scope of the preliminary site investigation. As part of this process a written statement to address Planning Condition 37 (Items a and b) was submitted to CWaC in advance of site works commencing.

1.5 The report has been prepared to present and assess the results of the ground investigation, to identify the likely development constraints and any environmental liabilities in regard to the construction of a wind farm on the site.

1.6 The report assesses the engineering implications of the geo-environmental and geotechnical properties of the site and suggests possible engineering solutions to identified problems.

1.7 A separate Annex Report provides a provisional construction cost estimate of foundations, access roads and related miscellaneous items for the wind farm and associated infrastructure.

2 SITE SETTING

Background

2.1 Information about the site is contained in documents prepared in support of the planning application process, namely:

Scott Wilson report entitled "Frodsham Wind Farm – Pre-feasibility Assessment", dated November 2007;

A desk top study by Scott Wilson entitled "Frodsham Wind Farm Draft Phase 1 Geo-environmental Desk Study", dated draft February 2010;

2.2 The above documents include full details on the site setting including the site description, site history and geological/geo-environmental setting. A summary of this information is presented below.

Site Description

2.3 The site is elongated in shape; 3.5km long by 1.3km wide with an area of approximately 450Ha, in the administrative Borough of CWaC. The site location is shown in Drawing No. ST13418-004.

2.4 The site is within the area known as the Frodsham and Helsby Marshes. This is an area of low lying land close to the southern boundary of the River Mersey estuary.

2.5 The site is bounded to the north by a strip of marshland with ponds and subsequently the Manchester Ship Canal (MSC). To the east is generally flat agricultural land, mainly used for sheep grazing and subsequently the River Weaver. To the south is a significant expanse of agricultural land used for arable and grazing purposes. There are generally no structures in this area with the exception of occasional farm buildings. The M56 is located approximately 1km to the south of the site. The land to the west is also mostly agricultural with limited farm structures, with the exception of the Kemira GrowHow chemical plant directly to the southwest of the site off Marsh Lane. Some residential buildings are located c.1.5km to the west, and further to the west is the Stanlow Oil Refinery.

2.6 The majority of the site is used for the deposition of material dredged from the MSC. The dredging grounds are owned and operated by the Manchester Ship Canal Company (MSCC), a part of the Peel Ports division of the Peel Group. The remainder of the site comprises agricultural land for pasture and occasional arable use.

2.7 The deposit grounds are separated into distinct areas known as cells, which are delineated by retaining bunds. The location of the cells is shown on Drawing No. ST13418-003. The dredging deposits have raised the level of the land above the natural level of the marshland. One cell (Cell 6) is in active use for the deposition of dredged material and is authorised for this use under an Environment Permit in place since 1995, issued and regulated by the Environment Agency (EA). This Cell 6 is outside of the site. The land comprising the old full cells is partly used as grazing land, but some areas remain unused and have reverted to semi-natural vegetation, such as reed bed or scrub.

2.8 Large embankments dominate the site topography. For example, the top of the Cell 6 embankment is at approximately 12m above ordnance datum (AOD), around 8m higher than the surrounding ground level. This is reflective of the deposit grounds generally. The area surrounding the deposit ground is largely flat, typically at around 3.5-5.5m AOD, being situated immediately adjacent to the Mersey Estuary.

2.9 The deposit grounds receive dredged sediment from the MSC. The dredged material ranges from sand with some gravel, to silt and clay. De-canted water is returned via draw-off towers to nearby waterways, for which MSCC have existing consent to discharge.

Summary of Ground Conditions

2.10 The BGS 1:50,000 scale map (Sheet 97 Runcorn) indicates that the site is underlain by drift deposits of Marine and Estuarine Alluvium overlying Glacial Till. The drift deposits are underlain by Sandstones of Triassic age belonging to the Sherwood Sandstone Group.

2.11 Geophysical information obtained from a resistivity survey of two transects of the site undertaken by Scott Wilson in 2008, infers rock head contours ranging from 20-40m and 40-60mbgl. Rockhead is shown to be deepest to the southwest and north-east of the site, owing to the presence of deep (buried) valleys now occupied by Hornsmill Brook and the River Weaver respectively.

2.12 A north-south trending fault, which is shown to have a down throw to the east, runs parallel to the eastern site boundary and a bifurcation of the same fault crosses in a north-south direction through the western portion of the site.

2.13 The Scott Wilson 2010 Desk Study report presented a Conceptual Site Model (CSM) on which the site investigation was based. A summary of the CSM can be found below in Table 2.1.

Table 2.1
Summary of Conceptual Site Model (after Scott Wilson)

Source	Pathway	Receptor
On-Site Sources		
Asbestos from demolished small structures and WW2 decoy sites	Inhalation	Human Health
Soil and groundwater contamination associated with possible Made Ground including that from the demolition of site structures and the dredging deposit grounds.	Dermal Ingestion Inhalation	Human Health
	Plant Root uptake	Flora
	Direct Contact/leaching	Building infrastructure, Flora, Fauna
	Leaching	Surface water – River Weaver, Hornsmill Brook, Manchester Ship Canal, Mersey Estuary and Groundwater – Minor aquifers of alluvium and glacial till deposits and Sherwood Sandstone major aquifer.
Ground gas generation from Made Ground primarily from the deposit grounds and minor structures and from alluvium/peat.	Asphyxiation Explosion	Human Health Building Infrastructure
Off-Site Sources		
Ground gas generation from Made Ground primarily from the deposit grounds and minor structures and from alluvium/peat.	Asphyxiation Explosion	Human Health Building Infrastructure

Services

2.14 Several buried services cross the site. Of particular note is a high pressure Ethylene pipeline which is located to the north of Cells 3 and 4, adjacent to the MSC and crosses Cells 1 and 2 in an east-west direction. The location of this is evident across Cell 1 where it is largely above ground but is buried at all other locations and only marked occasionally by pipeline markers. Other services include, inter alia, electricity and water supplies to the dredging wharf to the north of Cell 3 and to the farm to the north of Cell 2. The indicative location of known services are shown on Drawing No. ST13418-005.

Historical Records

2.15 In addition to the above information, historic ship canal archive records are held by MSCC at its Runcorn Dock offices, and the two Scott Wilson reports (Pre-Feasibility Assessment, November 2007 and Phase 1 Geo-environmental Desk Study Report, draft November 2010). These earlier reports and the records held by MSCC have been reviewed by Wardell Armstrong to develop the Scope of the preliminary site

investigation. Table 2.2 below provides a summary of the reviewed historical information.

Table 2.2
Summary of Reviewed Historical Information

Source	Author	Report	Date
MSCC Archives	Edge Consultants	Frodsham Deposit Ground No. 6 WML Regulation	15-Aug-1998
		Frodsham Deposit Ground No. 6 Embankment Raising 2002, Trial Pit Investigation Report	Jan-2002
		Annual Report	2004
	Rotary Test Drilling	Site Investigation Factual Report for Frodsham No. 6 Site	May-1992
	Exploration Associates (for Manstock)	Frodsham No. 6 Lagoon Volume 1 Factual Report on Ground Investigation	Apr-1990
	Geochem	Manchester Ship Canal – Analysis of Sludge Samples	May-1994
	Fugro McCelland Ltd (for Manstock)	Soil Investigation Static Cone Penetration Tests Lagoon No. 6 Frodsham	Jan-1990
	Osiris Seaway Ltd	Mersey South Banks Study, Frodsham Deposit Grounds Site Investigation	1985
	Canestoga – Rovers and Associates	Final Report Draft Review and Baseline Assessment. Dioxin Risk Assessment, Frodsham Marshes.	Mar-2002
	Peak Associates	A Review of Dioxin and Furan Levels Along Footpath Associated with Former and Existing Dredging Lagoons in the Vicinity of Frodsham Marshes, Borough of Vale Royal	May-1998
	Soil Mechanics Ltd	Site Investigation Report 4: Frodsham	1951
		Site Investigation Report 6: Frodsham II	1952
		Site Investigation for Proposed Lay-by 20:	1957
		Site investigation at Deposit Ground No3. Frodsham, Cheshire 26:	1961
		MSCC: Reconstruction of Tidal Openings at Runcorn, Weaver and Ellesmere Report on Site Investigation	1963
	Ramboll	Annual Environmental Report	2010
		Bi-annual Monitoring	23-Jul-2010
		Annual Environment Report	Dec-2008
		Hydrological Risk Assessment	May-2011
		Embankment Raising (Phase 2) Verification Report	Sep-2011
	Coffey Geotechnics	Annual Report	2007
Peel Energy	Scott Wilson	Phase 1 Geo-Environmental Desk Study	Feb-2010
		Frodsham Wind farm Pre-Feasibility Assessment	Nov-2007
	Landmark (From Scott Wilson Report)	Envirocheck Report – BGS Boreholes, Agency and Hydrological, Sensitive Land Uses, Waste, Hazardous Substances, Historical Mapping and Geological data sets	16-Oct-2007

2.16 The referenced reports include data on the strength and composition of the dredging deposits, including geotechnical test results, which indicates that the material comprises very soft clays and silts to sands. The Edge Consultants report, dated January 2002, recommends the use of lime to stabilise the lagoon material for use in

raising the bund walls. Along with the geotechnical parameters, this information has been used to design the site investigation and geotechnical testing schedule.

2.17 A number of the reports are issued annually to satisfy the conditions of the waste management licence for Cell 6 and give information on the contamination of the soils in the Cell and the groundwater. They mostly show that contaminants remain within acceptable ranges apart from a few isolated exceedances in the groundwater being recorded, which have been put down to individual loads of dredgings as the contaminant levels go back to normal in the following sets of data. This data has been used to design the geochemical testing regime used during the site investigation. Several of the reports refer to potential dioxin contamination of the site over which concern has been raised locally. A report by Peak Associates, dated 1998, concludes that the marshes are significantly contaminated by dioxins, however, this mainly focussed on the area around the ICI plant and lagoon situated on the east and west banks of the River Weaver respectively where the contamination is thought to have been sourced. A subsequent report from 2002 by Canestoga – Rovers and Associates gave results from wider testing of deposit ground soil and rabbit tissue samples, which indicated that the risk to human health from dioxins is low. This issue of dioxin contamination is addressed further in Section 5 of this report.

2.18 Prior to the site becoming the active dredging deposit grounds it has had limited historic use; only agricultural. However, it is understood that the site was situated close to a bomb decoy site developed during World War 2 (WW2) approximately half a kilometre to the west of the site, due to the close proximity of the refinery and chemical works. The full details can be found in the BACTEC Report (Appendix 1), and a plan showing the locations of these decoy sites is contained as Annex H of the BACTEC report.

Development Proposals

2.19 The development comprises 19 No. wind turbines, the majority of which are within the old deposit grounds for dredgings from the MSC. Sixteen turbines are located on the dredging deposits on land owned by the Manchester Ship Canal Company (MSCC), with a further 3 turbines located immediately to the south on natural

ground. A meteorological mast is also to be erected on the dredging deposits in the north east corner, within Cell 1.

3 SITE INVESTIGATION WORKS

3.1 The need for an unexploded ordnance risk assessment and survey was identified as a Planning Condition. A report has been produced by BACTEC dated August 2013, entitled "Explosive Ordnance Threat Assessment in Respect of Frodsham Wind Farm, Cheshire". The report concluded that there is a "High risk from unexploded ordnance at the site". BACTEC recommended that a down-hole magnetometer survey should take place in advance of any intrusive investigation locations. The BACTEC report is included in Appendix 1.

3.2 A preliminary site investigation was undertaken between 11 September 2013 and 22 October 2013 within the deposit ground. The appointed Contractor was Van Elle Limited. The investigation included the following works:

Twenty windowless sample probe holes advanced further with dynamic probing;

Twenty cone penetration tests (CPT), including magnetometer;

Twenty hand dug pits at each CPT location;

Five cone penetration tests, including magnetometer, ahead of shell and auger drilling;

Five shell and auger boreholes;

Five standpipes for groundwater and gas monitoring installed in the shell and auger boreholes;

Geotechnical testing of soils;

Geochemical testing on soil and groundwater samples;

Gas monitoring of standpipes.

Windowless Sample Probe Holes

3.3 Twenty windowless sample holes were bored along access tracks and cell bund walls to assess their geotechnical properties, the positions of which are shown on Drawing No. ST13418-003. The holes were drilled to a depth of 5m and then advanced beyond 5m up to 10m with dynamic probing to determine further information. SPTs were taken at regular intervals throughout the hole and the returned samples were

logged by a Van Elle engineer. The probe hole logs are contained in the Contractor's factual site investigation report, that is presented in Appendix 2.

3.4 Soil samples were taken from the holes for geotechnical and geochemical testing.

Cone Penetration Testing

3.5 Twenty Cone Penetration Test (CPT) holes were completed on the footprints of each proposed turbine location and at the Met Mast, as shown on Drawing No. ST13418-003. One hole, CPT12 was not completed on the turbine footprint due to current restricted access to this part of the site. It was completed instead on the closest accessible land on the adjacent field, approximately 90m to the south east.

3.6 The CPT rig was used with a combined magnetometer to test for the existence of any nearby unexploded ordnance. This was also repeated at the shell and auger borehole locations prior to drilling. No evidence of unexploded ordnance was identified at any investigation location across the site.

3.7 The holes were advanced to refusal which averaged 16.57m across the site with most of the tests refusing in sand layers. The CPT logs are presented in Appendix 2. The CPT contained a pore water pressure sensor in the U2 position and these results are included within the logs.

Shell and Auger Boreholes

3.8 Five shell and auger boreholes were drilled to correlate strata encountered from the CPTs, and to gain information about the strata beneath the refusal levels of the CPTs. The location of these boreholes is shown on Drawing No. ST13418-003. They have been positioned to be generally equidistant between the adjacent turbine locations, so as to give the most representative view of the materials present underneath the turbine locations. Testing and sampling took place whilst drilling, including SPTs, U100 samples, small disturbed samples and bulk disturbed samples. The samples were sent for laboratory analysis for geotechnical and geochemical testing. All holes were drilled to refusal which, in all but SA2, was bedrock of the Sherwood Sandstone. SA2 terminated in sand.

Groundwater and Gas Monitoring

3.9 Combined groundwater and gas monitoring standpipes were installed in the five shell and auger boreholes. The standpipes in SA2, SA4 and SA5 were installed with a response zone in the dredging materials of the deposit grounds. The standpipe in SA1 was installed with a response zone only in the natural ground, with the dredging materials sealed off. As SA3 was drilled in entirely natural ground the response zone covers the ground from near surface to near bedrock. In all cases where bedrock was encountered this was sealed off with a bentonite seal of a thickness between 1m and up to 2.7m which sealed the ground by a minimum 1m above the sandstone, to protect the below lying sandstone aquifer from any potential contamination. Full details of each installation are included in the borehole logs in Appendix 2, and are summarised in Table 3.1 below.

Table 3.1
Standpipe Response Zones

Borehole No	Response Zone Depth (m)	Strata
SA1	8 – 28.2m	Superficial Deposits (Natural Ground)
SA2	1 – 7.5m	Made Ground (Dredging Deposits)
SA3	1 – 30.8m	Superficial Deposits (Natural Ground)
SA4	1 – 7.5m	Made Ground (Dredging Deposits)
SA5	1 – 6m	Made Ground (Dredging Deposits)

3.10 The shell and auger boreholes were allowed to stabilise and purged in accordance with good practice, with measurements of conductivity, temperature, pH and dissolved oxygen being undertaken on site in addition to groundwater being sampled for laboratory testing.

3.11 The water samples were sent to ALcontrol Laboratories, a UKAS and MCERTS accredited laboratory, and tested for a range of contaminants associated with the past land use of the site including metals, metalloids, organic compounds and inorganic compounds.

3.12 Two rounds of ground gas monitoring were also carried out in order to provide an initial indication of the potential risk to the proposed development from ground gas. These monitoring visits are intended to provide an initial indication of the risks potentially posed by ground gas on the site, and in themselves are not sufficient for the design of any gas mitigation measures required for construction. Further

monitoring over an extended period may be required to facilitate the design of any ground gas mitigation measures.

3.13 The gas was analysed for Methane (CH_4), Carbon Dioxide (CO_2), Oxygen (O_2), Carbon Monoxide (CO), Hydrogen Sulphide (H_2S). The full results are presented in Appendix 3 and are discussed later in this report.

Geotechnical Testing

3.14 Soil samples were collected from the investigation holes, with small disturbed samples being taken, along with bulk samples and U100 samples from the shell and auger holes.

3.15 Forty nine samples were sent for geotechnical properties testing including Plasticity Index, Particle Size Distribution and Tri-axial Shear Strength tests. SPT values were also obtained at regular interval in the investigation holes. The samples were sent to Professional Soils Laboratory, a UKAS accredited laboratory.

3.16 The samples were selected from representative and geotechnically significant strata from the investigation boreholes.

3.17 The laboratory results are presented as Appendix 2, and are discussed later in this report.

Geochemical Soils and Groundwater Testing

3.18 Soil samples were taken from selected strata in the investigation boreholes and also from near surface hand dug pits at each of the CPT locations. The samples were sent to Alcontrol Laboratories, a UKAS and MCERTS accredited laboratory.

3.19 Forty nine soil samples were sent for geochemical testing and were tested for the following suites of contaminants: Metals, Cyanide, Sulphate, Sulphide, Sulphur, PAHs, Phenols, Thiocyanate, PCBs, Asbestos, TPHCWG, BRE SD1, pH level and total organic content. Solid samples were tested along with selected leachability tests.

3.20 Groundwater samples were taken from all five of the shell and auger boreholes on a single occasion and tested for metals, metalloids and organic compounds.

3.21 The full results of the laboratory analysis are presented as Appendix 4.

Results of Site Investigation

3.22 The geology as encountered in the investigation boreholes and inferred from the CPTs can be split into six categories: Made Ground (Lagoon Infill and Bund Materials), Alluvium (Clays) and Peat, Transitional Zone (Silts and Sands), Fluvio-Glacial Sands, Glacial Till (Boulder Clay) and Sandstone.

3.23 The natural geology underlying the site consists of alluvial/tidal clays, underlain by alluvial sand and silts over sands and gravels. This is in turn underlain by glacial till (boulder clay) which lies on top of the bedrock of the Sherwood Sandstone Group.

3.24 Table 3.2 below gives a brief summary of the geology encountered from the CPT holes and shell and auger boreholes. The geology is represented on the geological cross sections on Drawing No. ST13418-006.

Table 3.2
Summary of Encountered Geology

Geology	Depths From	Depths To	Thickness
Topsoil and subsoil	0.00m	0.10 – 1.10m	0.00 – 1.10m
Made Ground (Lagoon Infill and Bund Materials) – Dark brown to grey sand, silts and clays.	0.10 – 1.10m	5.90 – 9.95m	0.00 – 9.40m
Alluvial Clay – Dark brown silty clay, occasional fine sand beds.	0.30 – 9.95m	1.90 – 16.00m	0.00 – 7.50m
Peat	1.90 – 16.00m	2.80 – 16.50m	0.00 – 2.80m
Transition Zone - Sand and silts – Light grey, brown sandy silts/ silty sands, occasional clays.	2.80 – 16.50m	7.60 – 18.10m	0.00 – 8.20m
Fluvio-Glacial Sands – Dark brown gravelly sand, fine to medium.	7.60 – 18.10m	16.95 – 24.60m	3.40 – 10.20m[2]
Glacial Till (Boulder Clay) – Dark brown silty clay, occasional gravels and sand lenses.	16.95 – 24.60m	29.20 – >43.45m[1]	8.70 – >19.80m[2]
Sherwood Sandstone – Reddish brown sandstone.	29.20 – >43.45m[1]	unknown	Unknown

[1] Sherwood Sandstone not encountered, depth inferred to be greater than 43.45m.
[2] Sherwood Sandstone not encountered, thickness of Glacial Till inferred to be greater than 19.80m.

Topsoil and Subsoil

3.25 Topsoil was encountered on the natural ground outside of the dredging cells and on the older of the cells which have been used for pasture. On the natural ground as observed in surface soil samples and in SA3, the soil consisted of a brown to orangey/reddish brown, firm, occasionally slightly sandy, silty CLAY with a high organic content and rootlets overlain by turf. In Cells 1 and 5 where topsoil/subsoil was also encountered, it occurred as a thin 0.10-0.20m thick unit underneath the turf consisting of a dark brown soft to firm, slightly sandy, very silty CLAY with a high organic content and frequent rootlets.

Made Ground

3.26 Made Ground was encountered in the dredging deposit cells and also in the cell bunds and associated access tracks. The dredging deposits vary spatially across each deposition cell with coarser material of sands closer to the original dredging outfall pipe and finer material found at the opposite end of the cell closest to the drainage decant outflow. This was most keenly observed in Cell 4 where coarser material was found towards the eastern end of the cell nearer to the dredging outfall pipe and finer material towards the western end nearer to the drainage decant towers. The finer material mainly consisted of dark brown, mottled grey, very soft, silty CLAY with an occasional hydrocarbon odour and organic fragments found mainly in SA1 and at CPT1, 2, 6 and 7. The coarser dredging material consisted of orangey brown, loose, slightly silty fine SAND.

3.27 The deposits within the cells range in thickness from approximately 7.00m to 9.50m thick. The thickest deposits are within Cell 1 and the thinnest occur at the western end of Cell 4. SPT N values through the dredging deposits were very low ranging from N=0 to 1. A dried surface crust is present across all of the cells to a depth of approximately 1.00m, which increases the inherent strength of the Made Ground to this limited depth.

3.28 Some of the window sampling holes were drilled through the cell bunds, and recorded the structure and construction of the bunds. The bunds varied in composition but broadly followed the same construction. This generally comprised a crust of a sandy silt of varying thickness underlain by varying horizons of clay and sand which appear to have the same composition as the dredging materials found

within the cells. SPT values through the bund walls varied widely across the site with some windowless sampling locations recording N values of N=0 to 2 (e.g. WS12) and others recording much higher N values of N=13 to 31 (e.g. WS10).

3.29 The remaining windowless sampling holes were drilled through the road material of the access tracks, namely Lordship Lane, Moorditch Lane and Brook Furlong. The materials forming the road base were found to comprise of sand, gravel and sandy silt in varying thicknesses from 0.50m to 1.50m. The SPT N values, where recorded in the road materials, ranged from N=9 to 17.

Alluvial Clay

3.30 Clay thought to be from an alluvial/tidal origin, occur across the whole site in varying thicknesses from 0.00 to 7.50m thick from surface to 16.00m bgl. The clays are typified as consisting of dark brown, silty CLAY with occasional fine sand bands. SPT N values in these clays ranged from N=1 to 5.

Peat

3.31 A peat layer was encountered in most locations ranging in thickness from 0.00 to 3.00m at a depth of 2.80 to 16.15m bgl. This was encountered as a loose, dark brown silty PEAT. The peat layer is thinnest in the west of the site, recorded in SA1 as being 0.50m thick and thickest in the east, recorded in SA4 as 3.00m thick. It was not identified in SA5, which may be due to the close proximity of the River Weaver, having eroded it away at some point in the past. SPT N values in the peat ranged from N= 0 to 8.

Transitional Zone - Alluvial Sand and Silts

3.32 Beneath the peat layer is a sequence of sands and silts ranging from 0.00 to 8.20m thick at depths of between 7.60 to 18.10m bgl. The thickness of these deposits varies greatly across the site and it may be gradational with the underlying sands and gravels, meaning that it was not picked up on the CPT logs. Where encountered they are described as light grey to brown, sandy silt to silty sand with occasional clay.

Fluvio-Glacial Sands

3.33 The alluvial sand and silts grade into the underlying Fluvio-Glacial sands. These sediments can be found down to depth of 16.95 to 24.60m bgl at a thickness of 3.40 to 10.20m. The sand was broadly encountered as medium dense to very dense,

brown/orangey brown, silty, occasionally gravelly, fine to coarse SAND. Gravels are fine to medium, sub-rounded to sub-angular. SPT N values range from N=13 towards the top of the sand in SA1 to N≥50 towards the base.

Glacial Till

3.34 Underlying the sand is a unit of glacial till (boulder clay) ranging in thickness from 8.70m to >19.80m at a depth of between 29.20m and >43.45m. The thickest deposit of glacial till was encountered in SA5, which is closest to the River Weaver and could represent an infilled channel/valley of the ancient river system. The glacial till is typified by sequences of stiff, dark brown, silty CLAY with rare fine gravels and occasional sand lenses/layers (up to 0.5m thick). SPT N values in the glacial till range from N=20 to 34.

Sandstone

3.35 Sandstone of the Sherwood Sandstone Group forms the bedrock underneath the site. This was encountered at depths between 29.20m bgl in the west of the site at SA1 and inferred to be at a depth of greater than 43.45m bgl in the east of the site at SA5. The sandstone was encountered in all of the shell and auger holes apart from SA2, which terminated at 20.45m bgl in sand and SA5, where drilling was terminated at 43.45m bgl still within the glacial till unit. Where encountered, it comprised a reddish brown SANDSTONE with SPT N values of between N=44 and N=50/50mm.

4 GEOTECHNICAL ASSESSMENT AND DISCUSSION

4.1 The ground conditions described in the previous Section of this report can be summarised into the following geotechnical materials, which are spacially generally consistent across the site:

Lagoon Infill and Bund Materials (Made Ground);

Alluvium;

Transition Zone (between Alluvium and underlying Glacial and Fluvio-glacial soils);

Fluvio-Glacial Soil;

Glacial Till;

Sandstone.

Lagoon Infill and Bund Material

4.2 The infill materials to the lagoons comprise material dredged from the MSC and consist mainly of very soft silty clay, sometimes sandy.

4.3 The CPT results indicate that, over most of the lagoon area, there is a desiccated surface crust of the order of 1m thick, with an undrained shear strength of the order of 20kN/m^2. This crust generally allows some trafficking of the surface of the infill by light plant, but repeated trafficking appears to cause rapid deterioration of the fill surface.

4.4 Below this surface crust, there is a marked reduction of strength, with undrained shear strength (c_u) as low as 5kN/m^2 over much of the lagoon area. There is some improvement in depth, with c_u being typically of the order of 15kN/m^2 towards the base of the deposit. There are indications that the lagoon infill may be under-consolidated, i.e. with excess pore pressures remaining within the body of the fill, which implies that the shear strength is very low, load bearing capacity will be severely limited and there will also be some potential for settlement. The engineering implications are discussed later in this report.

4.5 Effective stress shear strength tests have not been undertaken, but based on a typical plasticity index of 40, the angle of shearing resistance φ' for the infill materials is estimated to be 22°. An apparent cohesion c' of 5kN/m2 may be assumed for the desiccated crust, but otherwise c' should be assumed to be zero.

4.6 The containing bunds around the perimeter of the lagoon cells are constructed from very soft silty clays of similar composition to the lagoon infill, intermixed with layers or lenses of silt and silty sand. The shear strength of this material is similar to the desiccated crust on the main lagoon dredging area.

Alluvium and Peat

4.7 The lagoon infill material is underlain by natural alluvium comprising silty clay with layers of silty peat. The top of the deposit is marked by a distinct layer of material of higher strength representing a desiccated crust below the former natural land surface. A similar desiccated crust is present within 1m of ground level in the areas outside the limits of the dredging lagoons.

4.8 The CPT results indicate a characteristic c_u of around 40kN/m2 for the desiccated crust. Below this, the characteristic strength of the remainder of the alluvium is significantly lower, but with some slight increase in strength with depth. The characteristic c_u for the alluvium (other than the desiccated crust) may be taken as 20kN/m^2 based on the CPT results.

4.9 Effective stress shear strength tests have not been undertaken, but based on a typical plasticity index of 40, the angle of shearing resistance φ' for the alluvium is conservatively estimated to be 22°. An apparent cohesion c' of 5kN/m2 may be assumed for the desiccated crust, but otherwise c' should be assumed to be zero.

Transition Zone

4.10 Between the alluvium and the fluvio-glacial soil there is a layer of firm clay, intermixed with silt and sand layers or lenses, typically around 2m in overall thickness. On the CPT records, the top of this layer is indicated by a marked increase in the interpreted c_u. The origin of this material is unclear: it is noticeably stronger than the overlying alluvium, but does not appear to have properties typical of a glacial till.

4.11 Based on the CPT data, a characteristic c_u of 50kN/m2 has been assessed for this material, although in places the strength of this layer is significantly higher than this value.

4.12 Effective stress shear strength tests have not been undertaken, but based on a plasticity index of 17, the angle of shearing resistance φ' is conservatively estimated to be 29°. An apparent cohesion c' of 0 may be assumed.

Fluvio-Glacial Soil

4.13 Beneath the transition zone, there is a thick layer of medium dense to very dense sand, interpreted to be fluvio-glacial sand. The particle size analysis results indicate that this material is uniformly graded, with most particles being in the fine sand range and with only small amounts (less than 10%) of silt or gravel sized material.

4.14 The CPT results show that the relative density of this material is mainly in the range 50% to 75%, with 60% being a characteristic value. No clear pattern of spatial

variation is discernable from the test data. On this basis, the peak angle of shearing resistance φ'_p is assessed to be 36°. The critical state angle of shearing resistance φ'_{cv} is assessed to be 30°.

Glacial Till

4.15 The fluvio-glacial sands are underlain by glacial till, comprising stiff or very stiff silty clay with occasional gravel.

4.16 The CPT results indicate a characteristic undrained shear strength c_u of 125kN/m^2 for the glacial till. The results of unconsolidated undrained triaxial tests indicate slightly lower values, but it should be noted that these test results may under-estimate strength as a result of sampling disturbance.

Sandstone

4.17 The glacial till is underlain by reddish brown sandstone. Coring and testing of the sandstone has not been undertaken.

Stability of Lagoons

4.18 The results of slope stability analysis indicate that the stability of the bunds enclosing the external edges of the lagoons is marginal, implying a risk of failure. Therefore the external bunds should not be relied upon to support plant or vehicle loads and thus should not be used as temporary or permanent access routes unless strengthening or stabilisation works are undertaken, the implications of which are discussed later in this report. External bunds refers to any bund wall where a significant height difference exists from one side to the other. As Cell 6 is not currently full then the apparent internal bund walls surrounding it should be counted as external bund walls. Also Cell 5 is built up more than the adjacent Cells 1 and 3 meaning this should also be considered as an external wall.

4.19 From the results of stability analysis, it is recommended that a minimum stand-off distance of 35m is maintained between the crest of the external bund slope and the edge of any permanent structure, access road, crane pad or temporary working area, to ensure that loadings imposed by structures, plant, heavy vehicles and construction operations does not surcharge or destabilise the external bunds. This buffer is shown on Drawing No. ST13418-005. Where this stand-off cannot be

maintained, buttressing works or ground treatment (such as stabilisation with cement and/or lime) should be considered to improve the stability of the bunds. On this basis, specific adjustment of access road alignments may be required as part of the detailed scheme final design for all locations where roads and structures are present within this 35m buffer. It will be for the wind farm designer to determine where the best and most cost efficient location for each turbine and associated tracks will be, taking the above advice on ground stabilisation into account. However, micrositing may be the preferred option as stabilisation of the bund walls is likely to be expensive. It is suggested that Turbines 1, 6, 14 and 18 need to be moved away from the bunds. To allow for the base diameter and working room, the turbine centres should be a minimum of 12m outside the standoff zone shown on Drawing No. ST13418-005. Access roads will also require a similar standoff distance to facilitate their construction safely away from the external bund walls. Currently the access track along the eastern and northern bund walls around Cell 6 is proposed to be used to access the lagoons and turbine locations. This would result in strengthening works to a long section of bund wall, approximately 2.5km, which may prove to be prohibitively expensive. A route along the current Lordship Lane may be preferred.

4.20 From the site investigation works, it is apparent that, in general, the surface of the lagoons can be trafficked occasionally by light plant with care, although localised softer areas may be present. However, the site investigation was carried out after a very dry summer period (2013) and the trafficability may deteriorate significantly in wetter periods. Given the extremely low strength of the lagoon infill materials below the surface desiccated crust, the surface should not be relied upon to directly support plant or vehicles except were such is essential in order to carry out investigations and to construct access roads and the like. All temporary and permanent access routes and working areas will require the provision of a granular mat or surface, and specific area may require ground improvement, as discussed in the following sections.

Turbine Foundations

4.21 There are various options of wind turbine systems being considered for the development. Potential illustrative types include:

Vestas V90 3MW;

Enercon E-82 3MW.

4.22 The foundation requirements and loads will vary according to the type and size of turbine adopted. The information given below should be viewed as indicative only, and the wind farm designer is responsible for confirming the actual loads and foundation requirements for the particular turbine configuration selected.

4.23 Given the substantial thickness of weak lagoon infill materials and/or alluvium beneath the proposed turbine locations, all turbines will require piled foundations. In accordance with conventional practice, these foundations are expected to comprise a circular reinforced concrete base set below ground level to a depth of the order of 3m, supported on a ring of large diameter (>450mm) piles. Based on typical manufacturer's data, a ring of 24No. piles arranged at a radius of 8m from the turbine centre, with loads of the order of 1500-1600kN in compression and 400kN in tension are anticipated for a typical 3MW turbine with a hub height of the order of 80m and rotor diameter of the order of 80m. Alternatively a smaller number of higher capacity piles may be adopted.

4.24 The fluvio-glacial sands and the glacial till are both suitable bearing strata for piled foundations. The former will give higher end bearing resistance, but substantial penetration into the bearing stratum will be required to achieve sufficient shaft friction to resist tension loads. At the western end of the site, where the thickness of the fluvio-glacial sands is least, piling into the glacial till may be required. At the eastern end of the site, piling into the fluvio-glacial sands may be sufficient.

4.25 It is considered that driven cast-in-place concrete piles are likely to be most suitable for the ground conditions, but bored cast-in-place piles or driven tubular steel piles may also be feasible options.

4.26 Preliminary pile design calculations for the pile loads stated above indicate that, for 600mm diameter driven cast-in-place piles, the depths (from original ground level) of the following order may be required:

Turbines 1 to 10: 29m deep;

Turbines 11 to 13: 26m deep;

Turbines 14 & 15: 14m deep;

Turbines 16 to 19: 16m deep;

Met Mast: 14m deep.

4.27 The above depths should be viewed as illustrative, and different depths will apply for differing combinations of working load, pile size and pile type. Also, further ground investigations may be required to confirm ground conditions at individual turbine locations, and the actual pile depths may vary between individual turbine locations. The potential requirements for further ground investigation is discussed later in this report contained within Section 6.

Temporary Works for Construction of Turbine Foundations

4.28 A substantial piling mat will be required at each turbine location. There are considerable variations in the loads imposed by different piling plant and it is not possible to give definitive recommendations for the piling mat requirements, which will also depend on the ground treatment adopted by the contractor. The requirements will vary according to the type of piling equipment used and the anticipated plant loadings, and will need to be designed by the wind farm designer in liaison with the piling specialist. Nevertheless, preliminary recommendations are presented later in this report, which includes a 1m thick compacted granular piling mat reinforced with 2 layers of geogrid, laid on a geotextile.

4.29 As a minimum requirement, a running surface comprising compacted, well graded granular material reinforced with geogrids and laid on a geotextile separator will be required. However, given the very low strength of the lagoon infill material within the cells, the potential for disturbance of the desiccated crust caused by piling operations, and the potential for damage to geogrid installations, such a reinforced granular mattress may not be sufficient.

4.30 It is therefore recommended that consideration is also given to ground improvement within the turbine working areas, such as stabilisation with lime or cement (either as columns or by a mix-in-place method) to create a zone of improved ground covering at least the area of the base and the associated excavations, whichever is greater to meet the stated objectives. This may also be used to improve the stability of

temporary excavations and to provide a stable base for construction of the reinforced concrete base structure.

4.31 It is also expected that the excavations for the turbine base will require temporary support, probably by sheet piling. It is possible that this may be used to form part of the permanent foundation.

Crane Pads and Bases

4.32 The crane pad areas will require a reinforced granular mattress to provide a running surface for plant and equipment, and a laydown area for materials and components. It is anticipated that this will be a similar 1m thickness and construction to the piling mat and access roads, although additional requirements may apply depending on the plant selected by the contractor for piling operations for the crane bases.

4.33 The lagoon infill materials and alluvium are not considered to be suitable to support the loads likely to be imposed by cranes during assembly of the wind turbines, and therefore piled crane bases will be required. As these will be loaded in compression only, end-bearing piles founded in the fluvio-glacial sand are expected to be sufficient at all locations. Similar piles adopted for the turbine foundations are likely to be suitable, but with reduced pile lengths, but the use of smaller pre-cast concrete driven piles may be more economical.

4.34 For indication purposes only, assuming 600mm diameter driven cast-in-place piles, crane base pile depths of the following order may be required:

Turbines 1 to 10: 17m deep;
Turbines 11 to 13: 11m deep;
Turbines 14 & 15: 14m deep;
Turbines 16 to 19: 16m deep;
Met Mast: 14m deep.

Access Roads

4.35 It is considered that the desiccated crust at the surface of the lagoon infill material may allow construction of access roads on the lagoon surface without additional support or ground improvement, provided that the recommended stand-off distances of 35m from the external bunds are observed (see Drawing No. ST13418-

005). However, the access road construction will need to include a geotextile separator membrane at the base and 2 layers of geogrid reinforcement. It is anticipated that an overall construction thickness of 1m may be required.

4.36 Off the dredging lagoon areas, it is anticipated that existing access roads will be used as far as practicable, but these may require widening or upgrading for construction traffic. Conventional granular fill construction on a geotextile separator membrane is expected to be sufficient for new access roads, but these should be designed for a CBR value of less than 2%. The precise thickness will depend on whether the contractor elects to use geogrid reinforcement and what materials are used. It is currently envisaged that 150mm Type 1 sub-base and 350mm Class 6F2 capping layer may be suitable.

4.37 An access ramp will be required to be constructed to provide an access route onto the top of the lagoons. This will require construction of an embankment of the order of 7 to 9m high founded on the alluvium. Slope stability analysis indicates that, in order to construct this embankment, staged construction or a restricted filling rate will be required to limit the excess pore water pressures generated in the alluvium by embankment loading to ensure stability. Ground improvement, such as the installation of vertical band drains, is likely to be necessary to accelerate consolidation of the alluvium. The embankment design will also need to allow for substantial settlements under embankment loading. Consideration should also be given to ground treatment including the use of cement and/or lime or the placement of fill buttresses to improve the stability of the existing bunds where these adjoin the access ramp embankment locations. The latter of which is expected to be more economic where space permits.

4.38 Further ground investigations should be undertaken at the proposed embankment location, including boreholes, effective stress triaxial testing and oedometer testing, to confirm ground conditions and to provide additional information for design purposes.

Ancillary Buildings

4.39 Piled foundations are also likely to be required for the sub-station and control building. Driven pre-cast concrete piles founded in the fluvio-glacial sand are likely to be most appropriate for this purpose. A further investigation is anticipated to be required to confirm ground conditions at this location.

5 CONTAMINATION ASSESSMENT AND DISCUSSION

5.1 The following section assesses the magnitude and significance of the potential risks to human health, surface water, groundwater, ecological receptors and buildings from contaminated soil and groundwater; providing information and assessment in accordance with UK best practice.

General Soil Contamination Guidance

5.2 An initial assessment of the risk to human health from potentially contaminated soils can be undertaken by comparison of analysed concentrations of contaminants within those soils with soil guideline values (SGVs), derived using the Environment Agency Contaminated Land Exposure Assessment (CLEA) model. In 2008 the EA updated their recommended approach on undertaking human health risk assessments in the UK and have published their revised CLEA model. In addition, they have released updated versions of CLR9 and CLR10 (known as Science Reports (SC050021/SR2 and SC050021/SR3 respectively) along with a new CLEA Model (Version 1.06) to calculate new guidance values. They have withdrawn the former guidance CLR7, CLR8, CLR9 and CLR10 and all of the SGV reports as they no longer reflect the revised approach. At the time of writing, updated SGVs that are reflective of the new approach have been published for a number of potential contaminants (i.e. benzene, ethylbenzene, toluene, xylene, phenol, mercury, selenium, arsenic, nickel, cadmium and dioxins).

5.3 Land Quality Management (LQM) Ltd and the Chartered Institute of Environmental Health (CIEH) have released a set of Generic Assessment Criteria (GAC) based on the same modelling framework used to produce the published SGVs. Similarly, a collaboration between the Environmental Industries Commission (EIC), Contaminated Land: Applications in Real Environments (CL:AIRE) and the Association of Geotechnical and Geo-environmental Specialists (AGS) have also published a set of GACs using this approach. These third party values provide GACs for common contaminants for which there are currently no published SGVs and as such are useful

for risk assessment purposes. The LQM/ CIEH and EIC values have therefore been used as assessment criteria where possible as a measure of significance for contamination where SGVs are not available.

5.4 These criteria provide an initial screening test, whereby the presence of results below the SGV / GAC indicates that there is very unlikely to be a significant potential human health risk, whilst results in excess of the SGV / GAC indicate the requirement for a more detailed risk assessment.

5.5 Neither an SGV nor a GAC is available for lead. Lead formerly had a published SGV, which was withdrawn (along with all other pre-August 2008 SGVs) as part of updates to the CLEA framework in August 2008. However, unlike the other SGVs (which have now largely been updated), the lead SGV was determined using a model produced by the Society for Environmental Geochemistry and Health, rather than CLEA. Accordingly, it is considered that the pre-August 2008 SGV retains validity as a generic assessment criterion. Until the publication of an updated SGV (or toxicological data to allow for SGV derivation), it is considered to be the most appropriate assessment criterion available for lead. The health assessment criteria are presented in Table 5.1.

5.6 The preliminary conceptual site model presented in the Scott Wilson Desk Study report (2010) indicated that Made Ground (dredged materials) at the site may potentially contain contamination that presents a low to moderate risk to the both current and future site users, as well as to the Controlled Waters environment.

Human Health Risk Assessment

5.7 A summary of the soil analysis is presented in Table 5.1 below:

Table 5.1
Human Health Risk Assessment Criteria

Contaminant	No. of Samples	Range of Results (units same as Assessment Criteria)		Assessment Criteria (SGV/GAC) (mg/kg unless stated)[1]	Number of Exceedances	Locations of Exceedances
		Minimum	Maximum			
Arsenic	33	3.41	62.8	640	0	
Beryllium (diss.filt)	5	0	0	420	0	
Boron (diss.filt)	5	40.2	1700	192000	0	
Cadmium	33	0.0741	3.28	230	0	
Chromium	33	7.87	193	8840	0	
Copper	33	6.61	184	71700	0	
Lead	33	8.85	6410	750	2	CPT7, SA4
Mercury	33	0.149	32.3	3600	0	
Nickel	33	6.53	64	1800	0	
Selenium	33	1.04	1.92	13000	0	
Vanadium (diss.filt)	5	0.368	15.8	3160	0	
Zinc	33	46.3	972	665000	0	
Chromium, Hexavalent	38	0	0	35	0	
Phenol	33	0	0	3200(2)	0	
Benzene	34	28.5	147	95(2)	1	SA1 (B9)
Toluene	34	2.34	7.3	4400	0	
Ethylbenzene	34	15.4	15.4	2800	0	
m,p-Xylene	34	0	0	3200	0	
o-Xylene	34	0	0	3200	0	
Aliphatics >C5-C6	30	18	97.9	6200000[(2,3)] µg/kg	0	
Aliphatics >C6-C8	30	14	6470	18000000[(2,2)] µg/kg	0	
Aliphatics >C8-C10	30	10.3	30800	5100000[(2,3)] µg/kg	0	
Aliphatics >C10-C12	30	10.3	18900	24000000[(2,3)] µg/kg	0	
Aliphatics >C12-C16	25	140	547000	83000000[(2,3)] µg/kg	0	
Aliphatics >C16-C21	25	204	818000	1800000000[(2,3)] µg/kg	0	
Aliphatics >C21-C35	25	643	1720000	1800000000[(2,3)] µg/kg	0	
Aromatics >EC5-EC7	30	28.5	38.4	49000000[(2,3)] µg/kg	0	
Aromatics >EC7-EC8	30	0	0	110000000[(2,3)] µg/kg	0	
Aromatics >EC8-EC10	30	17	20600	8600000[(2,3)] µg/kg	0	
Aromatics >EC10-EC12	30	27	12600	29000000[(2,3)] µg/kg	0	
Aromatics >EC12-EC16	25	189	116000	37000000[(2,3)] µg/kg	0	
Aromatics >EC16-EC21	25	219	441000	28000000[(2,3)] µg/kg	0	
Aromatics >EC21-EC35	25	1810	931000	28000000[(2,3)] µg/kg	0	
Aromatics >EC35-EC44	25	774	249000	28000000[(2,3)] µg/kg	0	
Naphthalene	33	21.5	885	480000[(2)] µg/kg	0	
Acenaphthylene	33	32.1	416	97000000[(2)]µg/kg	0	
Acenaphthene	33	20.5	313	98000000[(2)] µg/kg	0	

Table 5.1 (continued)
Human Health Risk Assessment Criteria

Contaminant	No. of Samples	Range of Results (units same as Assessment Criteria)		Assessment Criteria (SGV/GAC) (mg/kg unless stated)[1]	Number of Exceedances	Locations of Exceedances
		Minimum	Maximum			
Fluorene	33	20.5	418	69000000[(2)]µg/kg	0	
Phenanthrene	33	27.3	3480	22000000[(2)] µg/kg	0	
Anthracene	33	99.7	4080	540000000[(2)] µg/kg	0	
Fluoranthene	33	36	6740	23000000[(2)] µg/kg	0	
Pyrene	33	30.8	5090	140000[(2)] µg/kg	0	
Benz(a)anthracene	33	16.5	2580	100000[(2)] µg/kg	0	
Chrysene	33	23.7	2640	140000[(2)] µg/kg	0	
Benzo(b)fluoranthene	33	31.7	3340	14000[(2)] µg/kg	0	
Benzo(k)fluoranthene	33	17.5	1260	61000[(2)] µg/kg	0	
Benzo(a)pyrene	33	26	2680	13000[(2)] µg/kg	0	
Indeno(1,2,3-cd)pyrene	33	22.6	1360	660000[(2)] µg/kg	0	
Dibenzo(a,h)anthracene	33	46.8	423	140000[(2)] µg/kg	0	
Benzo(g,h,i)perylene	33	32	1770	100000[(2)] µg/kg	0	

SGV = Soil Guideline Value
GAC = CIEH Generic Assessment Criteria
[1] Where assessment criteria vary depending on soil organic matter (SOM) content, values have been selected based on a conservative SOM of 2.5%.
[2] Pre-2008 lead SGV, as discussed above.
[3]. Assessment criteria assume an absence of free product. Where concentrations exceed theoretical solubility / vapour saturation limits, further consideration of potential risks may be required.

5.8 The results of all the 2013 contamination testing undertaken on the site have been assessed against screening values for a commercial end-use. The majority of the results indicate that there is little or no risk to human health from contamination at the site, with only lead exceeding the adopted screening value at two locations (SA4 and CPT7).

5.9 Speciated hydrocarbon analysis has been undertaken on 25 samples, several of which were targeted due to the report of hydrocarbon odours. The majority of the TPH bands do not exceed the screening values. No evidence of free product was identified during the site investigation and subsequent monitoring works. The results however, indicate that there are several samples which exceed the solubility saturation limit of the aliphatic C_{12}-C_{16} range.

5.10 The use of screening values for a commercial end-use is considered a conservative approach, as it assumes that employees will be present within a building on the site for around 8 hours each day throughout the duration of their working life. The proposed wind farm development will not involve the construction or subsequent

daily use of office buildings, thereby breaking the indoor inhalation pathway which is the most significant pathway for aliphatic hydrocarbons up to C_{12}-C_{16} band.

5.11 Polychlorinated Biphenols (PCBs) testing revealed the presence of several congeners at concentrations above the limit of detection. The results were assessed using the EA Dioxins site-specific worksheet which identified that none of the detected congeners would present a significant risk to human health. The worksheet analysis is presented in Appendix 5.

Asbestos

5.12 Asbestos screening and identification was undertaken on 32 soil samples, primarily from shallow (<1m) depths. Some deeper samples were tested in order to provide an overview of the material and allow assessment should offsite disposal of any arising be required.

5.13 A total of six samples were noted to contain either loose fibres or a trace of asbestos (both chrysotile and amosite). Four of these samples were taken from near surface materials, while the remaining two were taken from greater depth. Quantification testing was carried out on the four near surface samples. The results of this quantification testing did not identify the presence of asbestos above the limit of detection of 0.001%/wt, and therefore the risk from asbestos is considered minimal.

Ground Gas

5.14 Reference to the following best practice documents with regards to gas risk assessment is considered appropriate:

CIRIA C665 ‘Assessing risk posed by hazardous ground gases to buildings’;

BS8485:2007 ‘Code of practice for the characterisation and remediation of ground gas in affected development.

5.15 The structure of the wind turbines involves a steel tower which provides access to the nacelle at the top where the blades and turbines are located. The hollow tower is lit with power supplied by an internal unit. The turbine can be controlled both remotely and locally from within the tower.

5.16 In addition to the turbine installations, there are ancillary structures which include a control building, sub-station and metrological mast. Of these only the met mast is located on dredging material, and has hence been investigated as part of this preliminary site investigation.

5.17 The potential ground gas sources at the site (Made Ground (dredging material) and superficial deposits) are considered to have moderate to high gas generation potential. An initial two monitoring visits have been undertaken on 8 and 18 November 2013 in order to allow design of a further investigation/monitoring programme if required. The results are presented in Appendix 3 and summarised in Table 5.2 below. The potential requirements for further gas monitoring is discussed later in this report.

Table 5.2
Summary of Gas Monitoring Results (November 2013)

BH No	Methane (%v/v)		Carbon Dioxide (%v/v)		Oxygen (%v/v)		Carbon Monoxide (ppm)		Hydrogen Sulphide (ppm)	
	8 Nov	18 Nov	8 Nov	18 Nov	8 Nov	18 Nov	8 Nov	18 Nov	8 Nov	18 Nov
SA1	NM	85.70	NM	14.60	NM	<0.10	NM	<0.10	NM	<0.10
SA2	27.70	86.70	6.60	12.70	12.60	0.50	<0.10	<0.10	<0.10	<0.10
SA3	<0.10	0.40	0.20	0.20	19.50	19.30	1.00	<0.10	<0.10	<0.10
SA4	17.70	40.20	6.30	7.10	14.70	11.60	<0.10	<0.10	<0.10	<0.10
SA5	66.50	13.00	9.90	4.50	2.70	15.40	<0.10	<0.10	<0.10	<0.10
NM: Not monitored on this occasion due to access difficulty.										

5.18 Elevated concentrations of methane of between 13%v/v (SA5) and 86.7%v/v (SA2) were detected in four of the five monitoring points, with the exception being SA3 where a maximum of 0.4%v/v was detected.

5.19 Concentrations of carbon dioxide varied between 0.2%v/v (SA3) and 14.6%v/v (SA1) over the course of the two visits. Oxygen concentrations were slightly to heavily depleted in SA1, SA2, SA4 and SA5 with those recorded in SA3 being around atmospheric concentrations.

5.20 Flow rates were also recorded to vary considerably during the monitoring visits, with the highest value being noted in SA1 at >120l/hr and the lowest value being 0.1l/hr in SA5.

5.21 Carbon monoxide was recorded on one occasion in SA3 at a concentration of 1ppm and no hydrogen sulphide was recorded during either visit.

5.22 A comparison of the logs at each monitoring point does not indicate a significant difference in the underlying materials from a gas source point of view. However, monitoring points SA1, SA2, SA4 and SA5 are all located within the dredging lagoon cells, with only SA3 being located outside the area of the MSC dredgings. It is likely that the elevated methane and carbon dioxide concentrations are a consequence of the nature of the materials within the cells, and the underlying alluvium and peat deposits.

5.23 The results of the gas monitoring indicate that there is the potential for gas generation across the site and this should be taken into account when designing, constructing and operating the wind farm. Measures to prevent or ventilate gas accumulations and the incorporation of gas protection, should be included in the development. Liaison with the wind turbine manufacturer is recommended to allow the design of an appropriate solution.

5.24 Further gas monitoring is advised in order to allow a full assessment of the ground gas regime at the site and to establish the most appropriate protection measures to be installed. Such measures should be addressed in the Construction Works Plan, for the protection of workers and plant.

Controlled Waters Risk Assessment

5.25 Groundwater and leachability samples taken from the site have been tested for a range of contaminants. The EA preferred methodology for testing leachability samples was used as described in BS EN 12457 with a 2:1 liquid / solid ratio. Where the moisture content is too high or there is insufficient sample, alternative methods have been used, namely CEN 10:1, 8:1 or the NRA methodology.

5.26 The primary groundwater receptors have been identified as the underlying Secondary A Aquifer of the alluvium and Principal Aquifer of the Sherwood Sandstone Group. The nearest surface waters to the site are the River Weaver, Hornsmill Brook, Manchester Ship Canal and the Mersey Estuary.

5.27 There are no drinking water abstractions within the vicinity of the site, hence the results of the laboratory analyses have been compared to Environmental Quality Standards (EQS). These are detailed within the River Basin Districts Typology, Standards and Groundwater Threshold Values (Water Framework Directive) (England and Wales) Directions 2009, which came into force in December 2009, as an initial screening value.

5.28 Where these are not available reference has been made to the UK Drinking Water Standards (UKDWS) or World Health Organisation Guidelines for Drinking Water Quality (WHO) as an initial screening value.

Screening Analysis of Results

5.29 Elevated concentrations of heavy metals and inorganic determinands were detected in a number of monitoring locations across the site. The laboratory results are presented in Appendix 4 and summarised in the Table 5.3 below.

Table 5.3
Summary of Controlled Waters and Leachability Testing

Determinand	Adopted Screening Value (g/l)	Range of Water Results (g/l)	Range of Leachate Results (g/l)	Location of highest value. GW, *Leachate*
Arsenic	50[1]	4.05 – **89.9**	0.929 – 35.1	SA1
Barium	NA	65.1 - 920	64.6 – 223.5	
Beryllium	NA	<0.7	NT	
Boron	1000[2]	40.2 - **1700**	84.9 - **1130**	SA4, *WS1-1*
Cadmium	<0.08[1][3]	<0.1	<0.1 – **0.421**	*CPT14*
Chromium	4.7[1]	0.944 – **25.8**	<0.1 – **5.91**	SA1, *SA4/B13*
Copper	1[1][3]	<0.85 – **8.57**	**1.51 - 103**	SA5, *CPT16*
Mercury	0.05[1]	<0.01 – 0.019	<0.01 – **0.683**	*CPT16*
Nickel	20[1]	0.638 – 18.2	0.454 – **20.1**	*SA2/B6*
Lead	7.2[1]	0.059 – 3.9	0.131 – **53.9**	*SA2/B6*
Selenium	10[2]	<0.39 – **35.6**	0.692 – **24.33**	SA1
Vanadium	20[1]	0.368 – 15.8	NT	
Zinc	8[1][3]	**9.66 – 44.1**	0.847 – **278.3**	SA4, *SA2/B6*
Sulphate	250,000[2]	12900- **306000**	26600 - **910200**	SA4, *SA2/B6*
Cr VI	3.4	<30	NT	
Sulphide	0.25[1]	<10	<10	
Tot CN	1[1]	<50	<50	
Free CN	NA	<50	<50	
Phenol	7.7[1]	<16	<2.0 - <16	

Table 5.3
Summary of Controlled Waters and Leachability Testing

Determinand	Adopted Screening Value (g/l)	Range of Water Results (g/l)	Range of Leachate Results (g/l)	Location of highest value. GW, *Leachate*
Naphthalene	2.4(1)	<0.1	NT	
Benzo(b)fluoranthene	0.03(1)	<0.05 – **5.72**	NT	SA5
Benzo(k)fluoranthene				
Benzo(a)pyrene	0.05(1)	0.0171 - **3.74**	NT	SA5
Benzo(ghi)perylene	0.002(1)	<0.03– **5.31**	NT	SA5
Indeno(123cd)pyrene				
TPH	10(2)	**142 – 2440**	NT	SA1

Notes:
Values prefixed "<" are laboratory method limit of detection for that determinand.
Bold indicates exceedance of the screening value.
(1) Environmental Quality Standards (EQS).
(2) Drinking Water Standards (UKDWS) where no EQS available.
(3) Based on assumed conservative hardness value of the receiving water.
NA: Not applicable
NT: Not tested

Groundwater

5.30 The groundwater samples generally identified moderate groundwater quality, with boron, chromium, copper, selenium, zinc, sulphates and PAHs all being recorded at concentrations above the relevant screening values. Arsenic and naphthalene were elevated at SA1 only.

5.31 Elevated concentrations of petroleum hydrocarbons (TPH) were recorded in all of the groundwater samples at concentrations of between 140 g/l and 2440 g/l.

Leachability

5.32 As discussed earlier, a number of different leachability methods were employed due to the variations in sample size and moisture content. Whilst the different methods will undoubtedly lead to differing results they can be used as a measure of the potential leachability of the contamination and as such have been reviewed together.

5.33 The results indicate that the majority of the metals identified at the site are potentially leachable and it is possible that this is the source of many of the metals detected in the groundwater.

Discussion

5.34 Results of groundwater testing indicate that the shallow groundwater at the site has been impacted by metal and hydrocarbon contamination. The most likely source of the contamination are the dredging deposits. The soils underlying the dredging deposits are laterally consistent and comprise alluvial material (clay) underlain by sandy soils, which is subsequently underlain by a significant thickness of glacial till. The sandy soils are likely to provide little attenuation capacity, such that any contamination leached from the Made Ground may be readily transmitted through it. It is considered that the Principal Aquifer (the Sherwood Sandstone Group) is not at significant risk of contamination from the proposed wind farm development, because the glacial till which directly overlies the Principal Aquifer would present an aquitard, hence protecting the aquifer from the direct transfer of any contamination.

5.35 With regards to the leachability of the contaminants at the site, leachate preparation will be more aggressive than rainwater infiltration. It is therefore likely to over-estimate the leachability of the contaminants in the unsaturated zone.

5.36 Surface water sampling and analysis of the adjacent watercourses has not been carried out as part of this study. However, such sampling is routinely undertaken on behalf of MSCC for the active dredging disposal in Cell 6, which is permitted and undertaken under the EA licensing regime. WA has reviewed the Ramboll monitoring reports undertaken on behalf of MSCC, dated December 2008, January 2010 and July 2010. The results do not indicate any significant problems associated with surface water discharges from the site.

5.37 The dredged water, once deposited in Cell 6 is drained via the drainage decant outflow system into the Helmesley Brook and subsequently directly to the MSC via a permitted discharge. It is reasonable therefore to assume that the Helmsley Brook, the MSC, and the perched water in the cells is in hydraulic continuity. Nevertheless the general tidal nature of the adjacent main surface waterbodies (Mersey Estuary and River Weaver) is such that it is unlikely that the low levels of contamination identified at the site would have a significant impact on their quality.

5.38 It is not considered that any specific remedial measures are required for the proposed wind farm development, in regard to existing contamination, although the

design of any piled foundations should consider the nature of the site's contamination and CSM, such that pathways are not created for contaminated groundwater to flow from the Made Ground to the Principal Aquifer.

5.39 The above assessment is made on the limited groundwater and leachability testing currently available and shall need to be agreed via consultation with CWaC and the EA. This may require further investigation and assessment.

6 RECOMMENDATIONS AND CONCLUSIONS

6.1 A preliminary site investigation has been undertaken to determine the nature of the prevailing ground conditions, to evaluate the ground related constraints and develop outline construction and engineering costs associated with the construction of 19 wind turbines, a meteorological mast and access provisions.

Ground Conditions

6.2 The site investigation has identified that the site is underlain by a significant thickness of Made Ground, up to 9.95m, in the locations of the MSCC dredging lagoon cells. No Made Ground was identified in areas outside of the cells. Where identified, the Made Ground was of extremely low strength with an undrained shear strength as low as 5kN/m^2. There is some improvement with depth, being typically of the order of 15 kN/m^2 towards the base of the deposit. A desiccated surface crust is present across the surface of the Made Ground of the dredging deposits which allows limited trafficking of light plant.

6.3 Below the Made Ground, alluvial clay and peat was identified to a maximum depth of 16.50m bgl (base of unit), which is also of extremely low strength with an undrained shear strength of approximately 20 kN/m^2.

6.4 A "transitional zone" has been identified below the alluvial material in parts of the site, which generally comprise clay with sand and silt. Where present, this was typically firm and around 2m in overall thickness.

6.5 Below the transitional zone there is a thick layer of fluvio-glacial soil, generally comprising medium dense to very dense sand, the base of which was to a maximum depth of 24.60m bgl.

6.6 Glacial till underlies the fluvio-glacial soil, comprising stiff or very stiff clay with occasional gravel. This was identified to range in thickness from 8.70m to >19.80m at depths between 29.20m bgl in the west and greater than 43.45m bgl in the east of the site.

6.7 The bedrock underlying the site comprises sandstone of the Sherwood Sandstone Group; a principal aquifer.

Stability of Lagoons

6.8 Slope stability analysis indicates that the stability of the bunds enclosing the external edges of the lagoons is marginal and as such it is recommended that a minimum stand-off distance of 35m is maintained between the crest of the external bund slope and any permanent structure or construction activities. It is recommended that Turbines 1, 6, 14 and 18 need to be repositioned away from the bunds. To allow for the base diameter and working room, the turbine centres should be a minimum of 12m outside the standoff zone shown on Drawing No. ST13418-005. Access roads will also require a similar standoff distance to facilitate their construction safely away from the external bund walls.

6.9 The external bunds should not be relied upon to support plant or vehicle loads unless strengthening works are undertaken.

Foundations

Turbines

6.10 Due to the variable nature and low strength of the Made Ground and alluvial clay and peat, neither of these will provide a suitable founding horizon. The foundation solution is to adopt piled foundations extended through to bear on either the fluvio-glacial sands or the glacial till, both of which provide suitable bearing strata. Such a foundation option will successfully transmit loads to competent strata, but substantial penetration into the bearing stratum will be required to resist tension loads.

6.11 Driven cast-in-place concrete piles of 600mm diameter are likely to be most suitable; although alternate options may be feasible. The foundation requirements will vary according to the turbine adopted but pile depths of the following order may be

required:

Turbines 1 to 10: 29m deep;

Turbines 11 to 13: 26m deep;

Turbines 14, 15 and Met Mast: 14m deep;

Turbines 16 to 19: 16m deep.

6.12 Based on manufacturer's data, it is suggested that a ring of 24 No. piles shall be required per turbine, arranged at a radius of 8.00m from the turbine centre.

6.13 Above the piles, the turbine foundation is expected to comprise a circular reinforced concrete base to a depth of around 3m.

6.14 The current extent of ground investigation may be suitable for the initial anticipated pile types and depths to be largely defined. However, further ground investigation would form part of the detailed design and the requirements will depend on the contractor's proposals, including the piling system adopted and the contractor's temporary works proposals. As a minimum, it is recommended that one cable percussion borehole is drilled at each turbine location to at least 5m below the anticipated piling depth. This should be coupled with in-situ testing and sampling for further geotechnical testing. The geotechnical testing required will consist of classification testing, including particle size distribution and atterburg limits, and effective shear strength testing. It would be prudent to allow for a shallow groundwater and gas monitoring standpipe at each location.

Table 6.1
Anticipated depths of Cable Percussive boreholes at each turbine location.

Turbine Location Number	Anticipated depth of borehole (m bgl) (10m into Glacial Till)	Anticipated depth of standpipe installation (m)
1	30	8-10
2	30	8-10
3	30	8-10
4	32	8-10
5	34	8-10
6	30	8-10
7	31	8-10
8	31	8-10
9	32	8-10
10	33	8-10
11	25	8-10

Table 6.1
Anticipated depths of Cable Percussive boreholes at each turbine location.

Turbine Location Number	Anticipated depth of borehole (m bgl) (10m into Glacial Till)	Anticipated depth of standpipe installation (m)
12	26	8-10
13	26	8-10
14	34	8-10
15	34	8-10
16	32	8-10
17	33	8-10
18	32	8-10
19	32	8-10

6.15 The recommended investigation is considered to be the minimum necessary to allow detailed design of the works in line with our recommendations. However, it should be noted that there is significant potential for 'value engineering' of the temporary works proposals to provide the most economic solution, which may generate a requirement for additional investigations. This matter is best addressed by, or in discussion with, contractors. In particular, ground treatment is likely to involve the use of proprietary techniques which can only be designed by the specialist contractor as elements of the process may be commercially confidential, and thus the specialist contractor would need to define the additional investigation requirements.

6.16 In advance of the further phase of site investigation, consideration needs to be given to the risk of potential unexploded ordnance. This may necessitate additional unexploded ordnance investigations to facilitate the investigation and construction works.

6.17 It is recommended that the new standpipes and those installed in the first phase of site investigation are fully decommissioned in accordance with the EA guidelines.

Temporary Works

6.18 A substantial piling mat will be required at each turbine location, at least comprising c.1m of compacted granular material reinforced with 2 layers of geogrid, laid on a geotextile. Consideration could be given to ground improvement (e.g. lime or cement stabilisation) in the turbine working areas as an alternate solution, which would also improve stability for temporary excavations. Excavations for the turbine base will require support, probably by sheet piling.

Crane Pads and Bases

6.19 The loads imposed by cranes during construction will be significant and the Made Ground and alluvial materials are not suitable to support these loads. On this basis it is recommended that crane bases will also require piled foundations, founded in the fluvio-glacial sand. Similar piles to that adopted for the turbine foundations are anticipated, but with reduced pile lengths. Alternatively, the use of smaller pre-cast concrete driven piles may be suitable. Furthermore, the crane pad areas will require a reinforced granular mattress to provide a running surface and laydown area.

6.20 The following indicative 600mm diameter driven cast-in-place pile lengths may be suitable for the crane base foundations:

Turbines 1 to 10: 17m deep;
Turbines 11 to 13: 11m deep;
Turbines 14 & 15: 14m deep;
Turbines 16 to 19: 16m deep;
Met Mast: 14m deep.

Access Roads

6.21 The desiccated crust of the lagoon infill material may allow construction of access roads without additional support. It is anticipated that the overall construction thickness of access roads in lagoons shall be 1m including a geotextile and geogrid reinforcement.

6.22 Access roads should be located a minimum stand-off distance of 35m from the external bunds of the lagoons.

6.23 Existing access roads off the dredging lagoon areas may require some widening or upgrading. A CBR value of less than 2% should be allowed for in the design. It is envisaged that 150mm Type 1 sub-base and 350mm Class 6F2 capping layer may be suitable.

6.24 An access ramp(s) will need to be constructed to gain access to the top of the lagoons. This is likely to be in the order of 7 to 9m high and founded on the alluvium.

The design is likely to require some additional investigation and construction may require special measures, such as staged construction/restricted filling rate to limit excess pore water pressures and the installation of band drains to accelerate consolidation.

6.25 Further ground investigations should be undertaken at the proposed embankment location(s) to provide additional information for design purposes.

Ancillary Buildings

6.26 Ground investigations should be undertaken at the location of the sub-station and control building to confirm the foundation requirements.

Soil Contamination

6.27 The results of contamination analysis of soil samples assessed against conventional commercial end-use screening values, indicate that there is little or no risk to human health from contamination at the site, with only lead exceeding the screening value at two locations (SA4 and CPT7). In addition several samples exceeded the solubility saturation limit for aliphatic C_{12} – C_{16} range hydrocarbons. None of the analysis identified significant gross contamination and hence there is no evidence that remedial measures would be required from a human health perspective.

6.28 Preliminary screening has identified asbestos in 6 samples, of which 4 were near to the ground surface. Additional asbestos quantification testing did not identify the presence of asbestos above the limit of detection and this is not considered to pose a significant risk.

Ground Gas

6.29 Ground gas monitoring has been carried out on two occasions, which has identified significantly elevated levels of ground gas, with methane being recorded to a maximum concentration of 86.7%. This will need to be accounted for in the design, construction and operation phases of the wind farm development. This may require the inclusion of adequate ventilation or gas precautions to limit any potential gas build up in temporary works excavations and in the structures.

Groundwater Contamination and Controlled Waters

6.30 Analysis of groundwater samples on a single occasion has identified moderate groundwater quality with consistently elevated levels of boron, chromium, copper, selenium, zinc, sulphates, PAHs and TPH being present. The anticipated source of this contamination is the dredging deposits.

6.31 In addition, leachability analysis of soils has been carried out which has indicated that the majority of metals identified at the site are potentially leachable.

6.32 In regard to the Principal Aquifer (the Sherwood Sandstone Group), this underlies a significant thickness of glacial till which represents a substantial barrier to the downward transmissivity of contamination from the Made Ground dredging deposits above. The tidal nature of the surrounding surface waters are such that the limited contamination identified on site will not have a significant impact on their quality. Nevertheless, it is recognised that the groundwater at the site is likely to be in direct hydraulic continuity with the surface waters.

Contamination Risk Assessment

6.33 The contamination analysis carried out indicates that it is unlikely that soil or groundwater remediation will be required in specific regard to the proposed wind farm development. However, this would need to be agreed in consultation with the CWaC and the EA, possibly requiring additional analysis and assessment to further assess the risk of contamination to the underlying Principal Aquifer and adjacent surface waters.

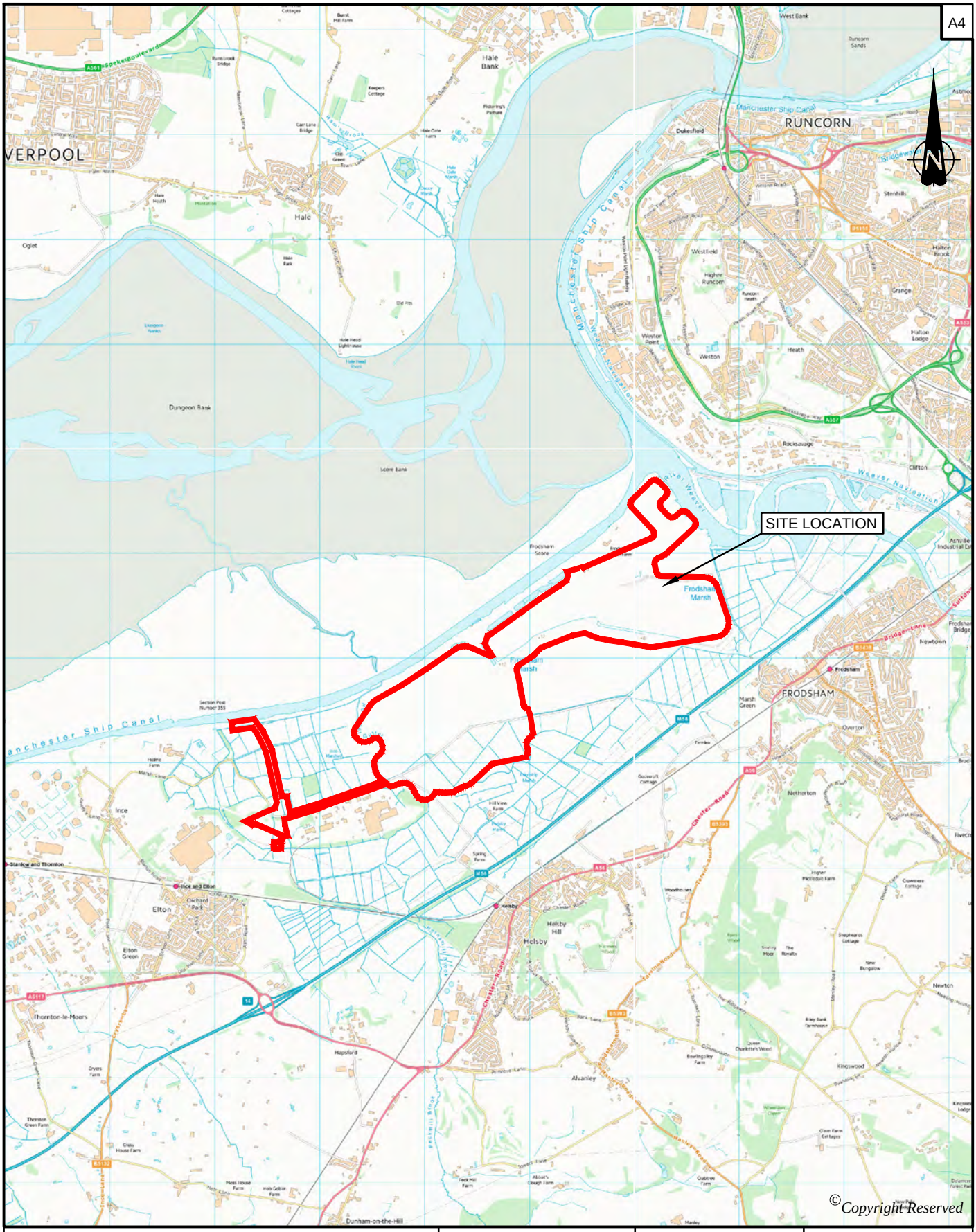
Conclusions

6.34 A number of significant, but not unexpected, constraints have been identified which shall require to be addressed prior to construction. Whilst some of the solutions required may be costly, the constraints can be dealt with by the implementation of engineering design solutions and appropriate mitigation measures.

6.35 It is concluded that there are no overriding geotechnical or geo-environmental constraints that may prevent the development of the Frodsham Wind Farm.

DRAWINGS

A4



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CLIENT: Peel Wind Farm (Frodsham) Ltd	DRG No.: ST13418-004	SCALE: 1:50,000	DATE: 11/12/13
PROJECT: Geo-environmental Assessment Frodsham Wind Farm, Cheshire	DRAWN BY: SJB	CHECKED BY: RB	APPROVED BY: RB
DRAWING TITLE: Site Location	wardell armstrong	your earth our world	

DO NOT SCALE FROM THIS DRAWING | A1

NOTE

1. REPRODUCED FROM ORDNANCE SURVEY DIGITAL MAP DATA (C) CROWN COPYRIGHT 2009. ALL RIGHTS RESERVED. LICENCE NUMBER 100018033

KEY

- PROPOSED ACCESS TRACK
- EXISTING ACCESS TRACK TO BE UPGRADED
- PROPOSD TURBINE LOCATION AND TURBINE NUMBER
- POTENTIAL CRANE PAD LOCATION
- INDICATIVE SUBSTATION LOCATION
- PROPOSED EXPORT CABLE ROUTE
- POSSIBLE CABLE ROUTE
- INDICATIVE SITE COMPOUND
- SITE BOUNDARY
- RESTRICTED BYWAYS
- EXISTING FOOPATH

2013 SITE INVESTIGATION

- CPT 1 CONE PENETRATION TEST
- SA1 SHELL AND AUGER BOREHOLE WITH STANDPIPE
- WS1 WINDOWLESS SAMPLING HOLE/DYNAMIC PROBE

SITE LAYOUT BASED ON SCOTT WILSON.
DRAWING No. D117743/ES/001 REV G DATED 18/07/11

SITE INVESTIGATION LOCATIONS AND CO-ORDINATES

REF.	EASTINGS	NORTHINGS
CPT 1	347434.00	377279.00
CPT 2	347585.00	377504.00
CPT 3	347840.00	377647.00
CPT 4	348080.00	377804.00
CPT 5	348312.00	377964.00
CPT 6	347598.00	376950.00
CPT 7	347864.00	377110.00
CPT 8	348101.00	377288.00
CPT 9	348364.00	377490.00
CPT 10	348652.00	377645.00
CPT 11	348057.00	376779.00
CPT 12	348525.00	377158.00
CPT 13	348868.00	377157.00
CPT 14	350203.00	379638.00
CPT 15	350478.00	379279.00
CPT 16	350243.00	379060.00
CPT 17	350425.00	378519.00
CPT 18	350702.00	378685.00
CPT 19	350387.36	378225.06
CPT 20	350832.00	378302.00
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WS 2	347602.79	377170.80
WS 3	347354.88	377269.60
WS 4	347525.30	377610.56
WS 5	347998.03	377904.89
WS 6	348304.00	378068.99
WS 7	348030.76	377007.85
WS 8	348454.09	377343.90
WS 9	348830.43	377629.89
WS 10	348694.42	377937.73
WS 11	349008.55	378139.57
WS 12	349356.87	378304.73
WS 13	349757.30	378276.24
WS 14	350044.02	378230.53
WS 15	350462.24	378157.14
WS 16	350962.67	378326.54
WS16A	350964.17	378323.49
WS 17	350408.11	378759.54
WS 18	350108.16	378789.07
WS 19	349738.57	378603.45
WS 20	350060.51	379063.24
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SA 3	348741.79	377234.55
SA 4	350566.66	378346.24
SA 5	350215.54	379331.64
MET MAST	350203.00	379638.00

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D
A	First Issue	07/03/14	JD	RB	RB

CLIENT: Peel Wind Farms (Frodsham) Ltd

PROJECT: Frodsham Wind Farm, Cheshire

DRAWING TITLE: Site Investigation Locations

DRG No.	SCALE	DATE
ST13418-003	1:10,000	11/12/13
DRAWN BY: JD	CHECKED BY: RB	APPROVED BY: RB

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CPT 17
CELL 5
CELL 3
WS19
SA4
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CPT 20
WS16
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WS5
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SA2
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CPT 10
WS9
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CPT 3
WS4
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WS8
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WS2
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CPT 7
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SA3
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CPT 13
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CPT 6
WS7
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WS1
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SITE ACCESS

0 0.5 1km

KEY

- SITE BOUNDARY
- PROPOSED ACCESS TRACK
- EXISTING ACCESS TRACK TO BE UPGRADED
- PROPOSD TURBINE LOCATION AND TURBINE NUMBER
- POTENTIAL CRANE PAD LOCATION
- INDICATIVE SUBSTATION LOCATION
- PROPOSED EXPORT CABLE ROUTE
- POSSIBLE CABLE ROUTE
- INDICATIVE SITE COMPOUND
- RESTRICTED BYWAYS
- EXISTING FOOPATH
- INDICATIVE 35m BUND WALL STAND-OFF
- A — A' SECTION LINE (SEE ST13418-006 FOR SECTIONS)

SERVICES TAKEN FROM SCOTT WILSON DRAWING (INDICATIVE ONLY)

- SHELL OIL PIPELINE
- INFERRED POSITION OF SHELL OIL PIPELINE
- OVERHEAD ELECTRICITY CABLE
- BT

2013 SITE INVESTIGATION

- CPT 1 CONE PENETRATION TEST
- SA1 SHELL AND AUGER BOREHOLE WITH STANDPIPE
- WS6 WINDOWLESS SAMPLING HOLE/DYNAMIC PROBE

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D
A	First Issue	14/03/14	JD	RB	RB

CLIENT
Peel Wind Farm (Frodsham) Ltd

PROJECT
Geo-environmental Assessment
Frodsham Wind Farm, Cheshire

DRAWING TITLE
Development Constraints

DRG No.	SCALE	DATE
ST13418-005	1:10,000	20/01/14
DRAWN BY: JD	CHECKED BY: RB	APPROVED BY: RB

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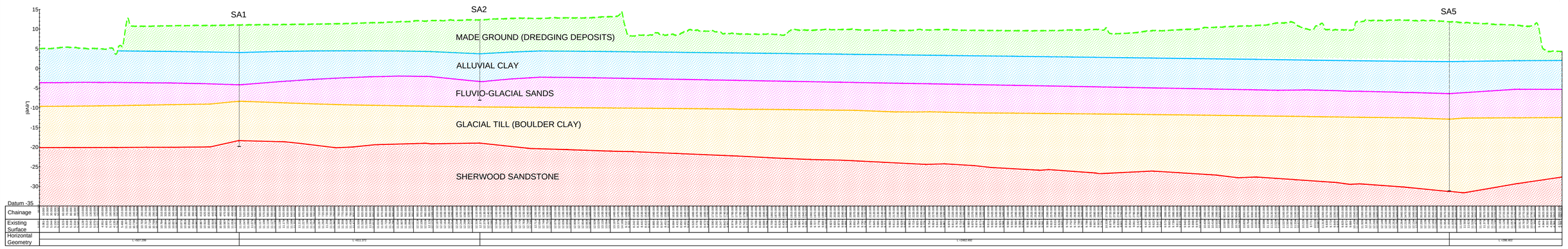

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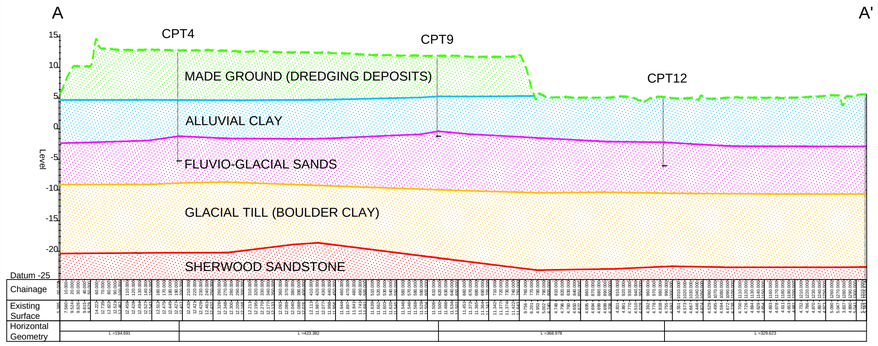

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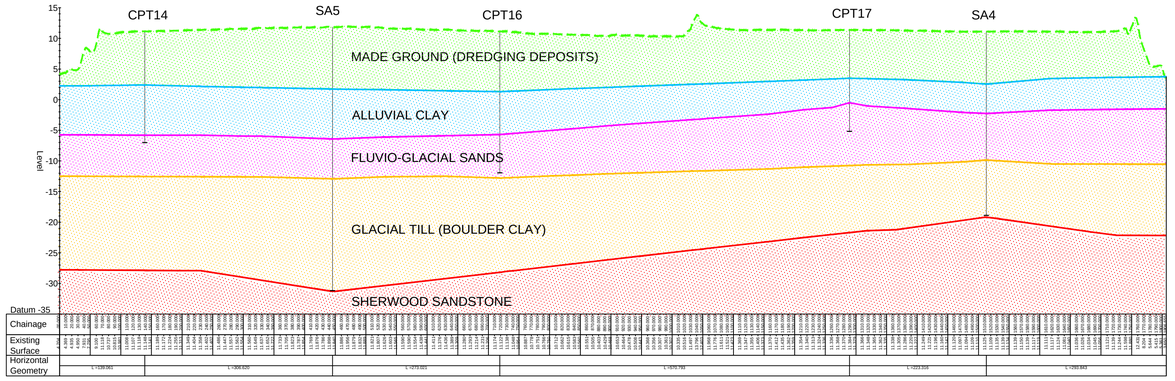

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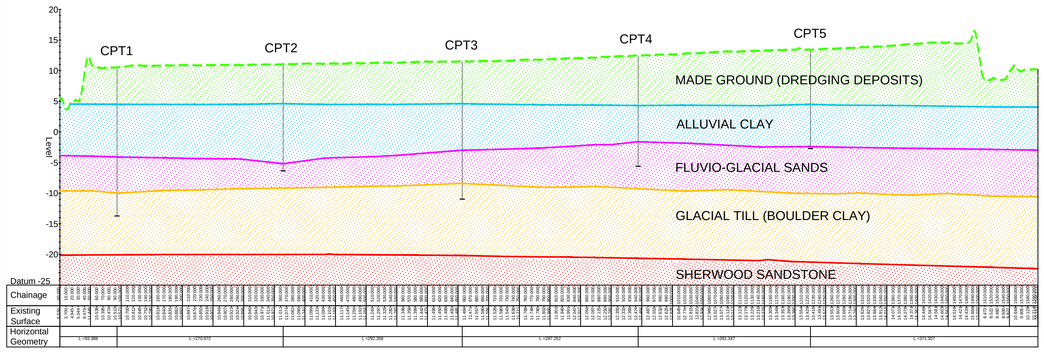

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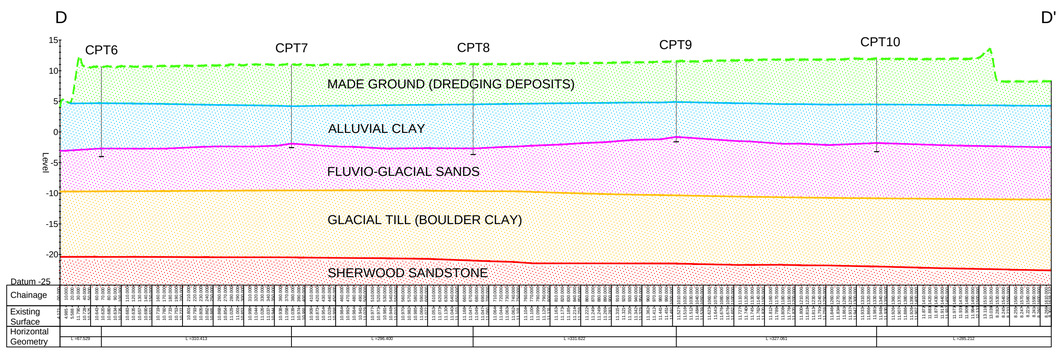

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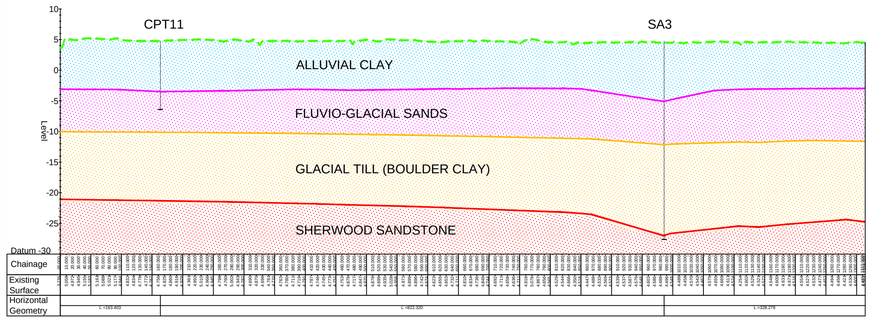

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NOTES

1. LEVELS INFERRED FROM AVAILABLE BOREHOLE DATA AND 3D GEOLOGICAL MODEL
2. LEVELS RELATIVE TO ORDNANCE DATUM
3. SURFACE LEVELS TAKEN FROM LIDAR SURVEY PROVIDED BY PEEL WIND FARM (FRODSHAM) LTD
4. FOR CROSS SECTION LOCATIONS REFER TO DRAWING No ST13418-005
5. ROCKHEAD LEVELS INFERRED FROM LIMITED SITE INVESTIGATION INFORMATION

KEY

- EXISTING GROUND LEVEL
- BASE OF MADE GROUND/TOP OF ALLUVIAL CLAY, PEAT AND TRANSITIONAL ZONE
- TOP OF FLUVIO GLACIAL SANDS
- TOP OF GLACIAL TILL (BOULDER CLAY)
- TOP OF SHERWOOD SANDSTONE (ROCKHEAD)

REVISION	DETAILS	DATE	Drawn	CHK'D	APP'D
A	First Issue	07/03/14	JD	RB	RB

CLIENT: Peel Wind Farms (Frodsham) Ltd

PROJECT: Geo-environmental Assessment
Frodsham Wind Farm, Cheshire

DRAWING TITLE: Geological Cross-Sections

DRG No.	SCALE	DATE
ST13418-006	Horiz 1:5000 Vert 1:500	20/01/14
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APPENDICES

Appendix 1

"Explosive Ordnance Threat Assessment in Respect of Frodsham Wind Farm, Cheshire", BACTEC, August 2013

BACTEC | Globally Trusted
Locally Dependable

Explosive Ordnance Threat Assessment

in respect of

Frodsham Wind Farm, Cheshire

for

Wardell Armstrong

5057TA 5th August 2013

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Date of Issue: 5th August 2013 Copy no. 1

Originator: OTB

This Report has been produced in compliance with the Construction Industry Research and Information Association guidelines for the preparation of Detailed Risk Assessments in the management of UXO risks in the construction industry.

Glossary of Terms

AAA	Anti-Aircraft Artillery
ARP	Air-raid Precautions
BDO	Bomb Disposal Officer
EOD	Explosive Ordnance Disposal (current term for “bomb” disposal)
HE	High Explosive
HG	Home Guard
IB	Incendiary Bomb
kg	Kilogram
LCC	London County Council
LM	Land Mine
LSA	Land Service Ammunition (includes grenades, mortars, etc.)
Luftwaffe	German Air Force
m bgl	Metres Below Ground Level
MoD	Ministry of Defence
OB	Oil Bomb
PM	Parachute Mine
RAF	Royal Air Force
SI	Site Investigation
SAA	Small Arms Ammunition (small calibre cartridges used in rifles & machine guns)
UXB	Unexploded Bomb
UXO	Unexploded Ordnance
V-1	“Doodlebug” the first cruise type missile, used against London from June 1944. Also known as ‘Flying Bomb’.
V-2	The first ballistic missile, used against London from September 1944
WWI	First World War (1914 -1918)
WWII	Second World War (1939 – 1945)

Executive Summary

The Site: The site, centred on the approximate OS Grid Reference 348762, 377792, is situated in Cheshire, immediately south of the Manchester Ship canal between Frodsham to the east and Elton to the west. The Mersey Estuary lies immediately north and the eastern extent of the site is bound by the River Weaver. It can be accessed from the south-east by Brook Furlong. A dirt track, labelled Marsh Lane, is present in the east when leaving Frodsham and becomes Lordship Lane at the western extent, in the vicinity of Ince Chemical Plant.

It is approximately 600 ha in size and mainly consists of six individual cells used to deposit canal dredgings. Each cell is bound by a network of 8-10m tall earth bunds and most cells are now in a state of re-vegetation. Some ponds and lagoons are apparent in the northern part of the study area and steel pipelines are known to cross the site. The north-eastern part of the site is occupied by Frodsham Marsh Farm, with its associated fields, whereas the western extent of the site is centred on sections of roadway.

Proposed Works: A wind farm, comprising 19 turbines, crane pads and bases, access roads, a control building, sub-station and associated cabling, is to be constructed on the site. 16 turbines and a meteorological mast are to be located on the dredging deposits, with a further 3 turbines located immediately to the south on natural ground.

Risk Assessment Methodology: In accordance with CIRIA guidelines this assessment has carried out research, analysed the evidence and considered the risks that the site has been contaminated with unexploded ordnance; that such items remained on site; that they could be encountered during the proposed works and the consequences that could result. Appropriate risk mitigation measures have been proposed.

Explosive Ordnance Risk Assessment: Taking into consideration the findings of this study, BACTEC considers the risk on site to be heterogeneous and can therefore be divided into **Medium-High** and **High Risk Zones**. This is based on the following factors:

- The site was situated approximately 16km from the heavily bombed Liverpool area (which sustained over 300 air raids) and therefore escaped much of the bombing. Consequently it experienced a low density of bombing, as confirmed by official statistics.
- Records indicate that two neighbouring bombing decoy sites were located either side of Lordship Lane, adjacent to the site boundary, in the western portion of the study area. One of these was an SF decoy fire site in the shape of a burning oil facility to lure bombers away from Lobitos Oil Refinery, approximately 3.8km to the west of the site. Original WWII records pertaining to decoy sites were reviewed, however bombing was not recorded and no records associated with individual bombing incidents are known to exist. Therefore the possibility of bombing on site cannot be ruled out, especially given its vast size and indescript nature, making accurate referencing of any such incidents difficult.
- Furthermore, Cheshire and Chester Archives and Local Studies Centre do not hold a comprehensive record of bombing incidents within the Rural District of Runcorn, in which the site was historically located. The nearest recorded incident was a 250kg HE bomb strike approximately 3.7km west of the study area. Note however that 1945 aerial photography of the site exhibits what could be a bomb crater approximately 310m north of the study area.
- BACTEC holds records of one officially registered abandoned bomb on site. This British 3.7" AA Shell is located on Frodsham Marshes, 1.9km north-west of Frodsham. Note however it is not known whether this UXB has since been removed. The site was in range of several WWII anti-aircraft batteries and therefore the possibility of additional AA shell contamination on site cannot be discounted.
- During WWII the site was isolated, almost entirely undeveloped and is unlikely to have been subject to regular or frequent access. Therefore there is an elevated chance of a UXB falling unobserved. Furthermore, had such an incident occurred the resulting impact may not have been easily identifiable or persistent. Note that the entry hole of an SC50 UXB (the most commonly deployed German HE bomb) may have been as little as 20cm in diameter and therefore easily obscured in crops, ploughed soil, peat marsh or dredged silt heaps.
- Council for British Archaeology records plot a WWII pillbox close to the northern site boundary. Although records of Home Guard activities were not routinely kept, this fortification is indicative of a Home Guard presence in the area.
- Experience has shown that the 'housekeeping' of less disciplined/voluntary Home Guard personnel during WWII was often poor with items of faulty/surplus UXO often burnt, buried, misplaced or otherwise discarded in civilian areas. Training exercises often took place in isolated, rural areas and therefore the possibility of land service/small arms ammunition contamination on site cannot be entirely ruled out.
- The site has not been subject to any significant post-WWWII redevelopment works that may have encountered and removed UXO, however large scale earth works and silt deposition associated with dredging activities are known to have occurred. Therefore any WWII-era UXO on site may have been buried to a deeper depth. Also noteworthy is that any additional UXO from the neighbouring canal bed may have been re-deposited on site which involves a dredging and pumping operation.

Although the study area is large, there does not appear to be much variation in its use and type of ground cover during WWII. This, coupled with a fairly even distribution of UXO indicators across the site, means that identification of any Low Risk Zones has not been possible.

Bomb Penetration Assessment: It has been assessed that a 500kg bomb would have had a maximum bomb penetration depth of **12m** below WWII ground level, or shortly after impact with the Sandstone layer, whichever is sooner. The depth at which the Sandstone formation lies is not known. Penetration depth could potentially have been greater if the UXB was larger (though only 4% of German bombs used in WWII over Britain were of that size). Note that UXBs may be found at any depth between just below the WWII ground level and the maximum penetration depth. This assessment has been made using generic geological information.

Risk Mitigation Measures: The following risk mitigation measures are recommended to support the proposed redevelopment works:

All works

- Explosive Ordnance Safety and Awareness Briefings to all personnel conducting intrusive works.
- The Provision of Unexploded Ordnance Site Safety Instructions.

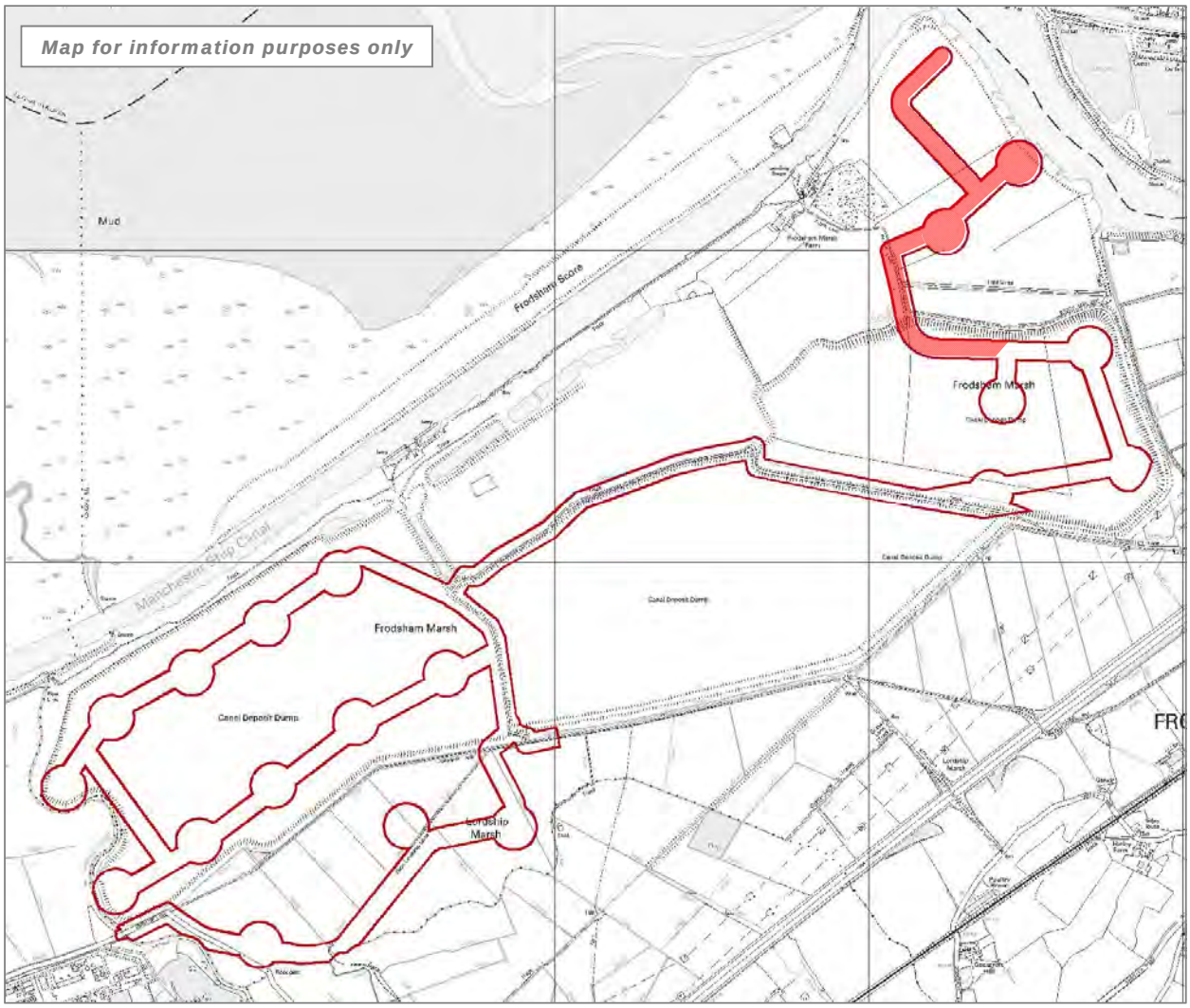
Shallow Intrusive Works

- Non-Intrusive Magnetometer Survey and target investigation ahead of any intrusive works

Deep Intrusive Works

- Down-hole Intrusive Magnetometer Survey of any pile/borehole locations and Target Investigation, if necessary. Investigation of Suspect Anomalies, if required.

Risk Map



High Risk Zone - Danger area containing the suspected abandoned British AA shell

Medium-High Risk Zone – Remainder of the study area

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Explosive Ordnance Threat Assessment

In Respect of

Frodsham Wind Farm, Cheshire

1. Introduction

1.1. Background

Wardell Armstrong has commissioned BACTEC International Limited to conduct an Explosive Ordnance Threat Assessment for the proposed redevelopment works at the Frodsham Wind Farm site, Cheshire.

Unexploded Ordnance presents a significant threat to construction projects in parts of the UK as a result of enemy actions during the two 20th Century World Wars and historic British and Allied military activity.

One of the legacies of this conflict is buried unexploded air-dropped bombs or anti-aircraft projectiles resulting from the failure of a proportion of the weapons to function as designed. It is commonly accepted that the failure rate of these munitions was approximately 10% and, depending on their shape, weight, velocity and ground conditions many penetrated the ground and came to rest at depth. Intensive efforts were made during and after the war to locate and render safe all UXO but, unsurprisingly, not all were found and dealt with. This is evidenced by the regular, ongoing discoveries of unexploded ordnance during construction-related intrusive ground works.

The UK was also bombed during WWI, though to a much lesser extent, and it is thought that a similar proportion of these weapons also malfunctioned. There have been occasional finds of unexploded WWI bombs in recent years but the risk of encountering them today is generally very low.

As a result of a generally increased risk awareness amongst professionals involved in ground engineering works and proactive health and safety measures, the threat to life and limb from unexploded ordnance has been minimised. However even the simple discovery of a suspected device during ongoing works can cause considerable disruption to production and cause unwanted delays and expense.

Such risks can be more fully controlled by a better understanding of the site-specific threat and the implementation of appropriate risk mitigation measures.

2. Construction Industry Duties and Responsibilities

2.1. The UK Regulatory Environment

There is no specific legislation covering the management and control of the UXO risk in the UK construction industry but issues regarding health and safety are addressed under a number of regulatory instruments, as outlined below.

In practice the regulations impose a responsibility on the construction industry to ensure that they discharge their obligations to protect those engaged in ground-intrusive operations (such as archaeology, site investigation, drilling, piling or excavations) from any reasonably foreseeable UXO risk.

2.2. The Health and Safety at Work Act, 1974

The Act places a duty of care on an employer to put in place safe systems of work to address, as far as is reasonably practicable, all risks (to employees and the general public) that are reasonably foreseeable.

2.3. Construction (Design and Management) Regulations 2007

This legislation defines the responsibilities of all parties (primarily the Client, the CDM Co-ordinator, the Designer and the Principal Contractor) involved with works.

Although UXO issues are not specifically addressed the regulations effectively place obligations on all these parties to:

- Ensure that any potential UXO risk is properly assessed
- Put in place appropriate risk mitigation measures if necessary
- Keep all parties affected by the risk fully informed
- Prepare a suitably robust emergency response plan

2.4. Other Legislation

Other relevant legislation includes the “Management of Health and Safety at Work Regulations 1999” and “The Corporate Manslaughter and Corporate Homicide Act 2007”.

3. The Role of the Authorities and Commercial Contractors

3.1. The Authorities

The Police have the responsibilities for co-ordinating the emergency services in the case of an ordnance-related incident on a construction site. They will make an initial assessment (i.e. is there a risk that the find is ordnance or not?) and if they judge necessary impose a safety cordon and/or evacuation and call the military authorities (JSEOD - Joint Services Explosive Ordnance Disposal Operations centre) to arrange for investigation and/or disposal. In the absence of an EOD specialist on site many Police Officers will use the precautionary principle, impose cordon(s)/evacuation and await advice from the JSEOD.

The priority given to the request by JSEOD will depend on their judgement of the nature of the threat (ordnance, location, people and assets at risk) and the availability of resources. They may respond immediately or as resources are freed up. Depending on the on-site risk assessment the item of ordnance may be removed or demolished (by controlled explosion) in-situ. In the latter case additional cordons and/or evacuations may be necessary.

Note that the military authorities will only carry out further investigations or clearances in very high profile or high risk situations. If there are regular ordnance finds on a site the JSEOD may not treat each occurrence as an emergency and will encourage the construction company to put in place alternative procedures (i.e the appointment of a commercial contractor) to manage the situation and relieve pressure from the JSEOD disposal teams.

3.2. Commercial Contractors

In addition to pre-construction site surveys and clearances a commercial contractor is able to provide a reactive service on construction sites. The presence of a qualified EOD Engineer with ordnance recognition skills will avoid unnecessary call-outs to the authorities and the Contractor will be able to arrange for the removal and disposal of low risk ordnance. If high risk ordnance is discovered actions will be co-ordinated with the authorities with the objective of causing the minimum possible disruption to site operations whilst putting immediate, safe and appropriate measures in place.

4. This Report

4.1. Aims and Objectives

The aim of this report is to examine the possibility of encountering any explosive ordnance during the proposed works at the Frodsham Wind Farm site. Risk mitigation measures will be recommended, if deemed necessary, to reduce the threat from explosive ordnance during the envisaged works. The report follows the CIRIA Guidelines.

4.2. Risk Assessment Methodology

The following issues will be addressed in the report:

- The risk that the site was contaminated with unexploded ordnance.
- The risk that unexploded ordnance remains on site.
- The risk that ordnance may be encountered during the proposed works.
- The risk that ordnance may be initiated.
- The consequences of initiating or encountering ordnance.

Risk mitigation measures, appropriate to the assessed level of risk and site conditions, will be recommended if required.

4.3. Approach

In preparing this Explosive Ordnance Threat Assessment Report, BACTEC has considered general and, as far as possible, site specific factors including:

- Evidence of German bombing and delivery of UXBs.
- Site history, occupancy and conditions during WWII.
- The legacy of Allied military activity.
- Details of any known EOD clearance activity.
- The extent of any post war redevelopment.
- Scope of the current proposed works.

4.4. Sources of Information

BACTEC has carried out detailed historical research for this Explosive Ordnance Threat Assessment including accessing military records and archived material held in the public domain and in the MoD.

Material from the following sources has been consulted:

- The National Archives, Kew.
- Cheshire and Chester Archives and Local Studies Centre.
- F!ND Maps.
- English Heritage National Monuments Record.

- Relevant information supplied by Wardell Armstrong.
- Available material from 33 Engineer Regiment (EOD) Archive.
- BACTEC's extensive archives built up over many years of research and hands-on Explosive Ordnance Disposal activities in the UK.
- Open sources such as published books, local historical records and the internet.

4.5. Reliability of Historical Records

4.5.1. General Considerations

This report is based upon research of historical evidence. Whilst every effort has been made to locate all relevant material BACTEC cannot be held responsible for any changes to the assessed level of risk or risk mitigation measures based on documentation or other information that may come to light at a later date.

The accuracy and comprehensiveness of wartime records is frequently difficult or impossible to verify. As a result conclusions as to the exact location, quantity and nature of the ordnance threat can never be definitive but must be based on the accumulation and careful analysis of all accessible evidence. BACTEC cannot be held responsible for inaccuracies or gaps in the available historical information.

4.5.2. Bombing Records

During WWII considerable efforts were expended in recording enemy air raids. Air Raid Precautions (ARP) wardens were responsible for making records of bomb strikes either through direct observation or by post-raid surveys. However their immediate priority was to deal with casualties and limit damage, so it is to be expected that records are often incomplete and sometimes contradictory. Record keeping in the early days of bombing was not comprehensive and details of bombing in the early part of the war were sometimes destroyed in subsequent attacks. Some reports may cover a single attack, others a period of months or the entire war.

Records of raids that took place on sparsely or uninhabited areas were often based upon third party or hearsay information and are not always reliable; records of attacks on military or strategic targets were often maintained separately from the general records and have not always survived.

5. The Site

5.1. Site Location

The site is situated in Cheshire, immediately south of the Manchester Ship canal between Frodsham to the east and Elton to the west. The Mersey Estuary lies immediately north and the eastern extent of the site is bound by the River Weaver. It can be accessed from the south-east by Brook Furlong. A dirt track, labelled Marsh Lane, is present in the east when leaving Frodsham and becomes Lordship Lane at the western extent, in the vicinity of Ince Chemical Plant.

The site is centred on the approximate OS Grid Reference 348762, 377792

Site location maps are presented in Annex A.

5.2. Site Description

The site is approximately 600 ha in size and mainly consists of six individual cells used to deposit canal dredgings. Each cell is bound by a network of 8-10m tall earth bunds and most cells are now in a state of re-vegetation. Some ponds and lagoons are apparent in the northern part of the study area and steel pipelines are known to cross the site. The north-eastern part of the site is occupied by Frodsham Marsh Farm, with its associated fields, whereas the western extent of the site is centred on sections of roadway.

A recent aerial photograph showing the region of the site is presented in Annex B.

6. Scope of the Proposed Works

A wind farm, comprising 19 turbines, crane pads and bases, access roads, a control building, sub-station and associated cabling, is to be constructed on the site. 16 turbines and a meteorological mast are to be located on the dredging deposits, with a further 3 turbines located immediately to the south on natural ground.

The majority of the site is a dredging deposit ground, used for the deposition of sand with some gravel, silt and clay material dredged from the MSC. The dredging grounds are owned and operated by the Manchester Ship Canal Company (MSCC). Large retaining bunds/embankments dominate the site topography, being generally approximately 12m above ordnance datum (AOD), around 8m higher than the surrounding ground level. The area surrounding the deposit ground is largely flat, typically at around 3.5-5.5m AOD.

The turbine foundation requirements will vary according to the type and size of turbine adopted. Given the substantial thickness of weak lagoon infill materials and/or alluvium beneath the proposed turbine locations, all turbines will require piled foundations. It is understood that such foundations are expected to comprise a circular reinforced concrete base set below ground level to a depth of the order of 3m, supported on a ring of large diameter (>450mm) piles. Alternatively a smaller number of higher capacity piles may be adopted. Piled foundations are also likely to be required for the sub-station and control building.

Driven cast-in-place concrete piles are likely to be most suitable for the ground conditions, but bored cast-in-place piles or driven tubular steel piles may also be feasible construction options.

Site plans are presented in Annex C.

7. Ground Conditions

Site specific information supplied by Wardell Armstrong indicates that the site is underlain by several metres of marine/estuarine alluvium (soft silts, clay, running sands and Peat) overlying Glacial Till (stiff clay and gravel). These are underlain by Sherwood Group Sandstones. The superficial drift material is at least 20m deep.

It should be noted that canal dredging cells have been in use post-WWII and therefore large quantities of canal silt cover the site.

8. Site History

8.1. OS Maps

Pre and post WWII historical maps[1] for the site are presented at Annex D and described below.

8.2. Pre-WWII

The 1929 (1:10,000 scale) map indicates that the site was occupied by numerous fields, separated by drainage ditches. The western section of the site is situated within *Ince Marshes* with *Grinsome Farm* located at the very western extent. Aside from a small collection of structures (labelled *Frodsham Marsh Huts*) and a stretch of *Moorditch Lane*, the study area is entirely undeveloped. Note however that the eastern extents of the site are not covered by this map.

[1] *Latest pre-war and earliest post-war.*

8.3. Post-WWII

The 1949 (1:10,000 scale) map records one significant change on site. A large section of marsh along the northern site boundary has been amalgamated into a single area, labelled *Canal Deposit Dump* and bounded by a *Tramway*.

Neither of these OS maps exhibit significant developments/industrial installations that may have been considered viable bombing targets. Furthermore, no military type structures or areas of censorship (protecting military establishments) are apparent. Note that additional OS mapping (not included) confirms that the not covered north-eastern extent was also undeveloped during WWII.

9. The Threat from Aerial Bombing

9.1. General Bombing History of Cheshire

9.1.1. First World War

The UK suffered aerial bombardment during WWI, beginning with indiscriminate night raids by Zeppelin airships. However as British defensive measures became more effective and aircraft development progressed, the German military began a campaign of daylight raids by fixed wing aircraft in June 1917, although night raids by Zeppelin continued.

A WWI bomb census map for the north-west of England records a single Zeppelin raid approximately 5km to the north of the site in proximity to the WWI-era chemical works at Widnes. Two further Zeppelin strikes are apparent to the north and north-east at Wigan and

WWI bombs were generally smaller than those used in WWII and were dropped from a lower altitude, resulting in limited UXB penetration depths. When combined with the relative infrequency of attacks, the threat from WWI UXBs is considered low and will not be further addressed in this report.

9.1.2. Second World War

At the start of WWII, the Luftwaffe planned to destroy key military installations, including RAF airfields and Royal Navy bases, during a series of daylight bombing raids in south, south-east and eastern England. After the Battle of Britain these tactics were modified to include both economic and industrial sites across the country. Targets included dock facilities, railway infrastructure, power stations, weapon manufacturing plants and gas works. As a result of aircraft losses, daylight raids were reduced in favour of attacking targets under the cover of darkness.

As the war progressed the strategy changed to one of attempting to destroy the morale of the civilian population by the “carpet bombing” of major UK cities including Liverpool and Manchester. By May 1941, concentrated attacks ceased as the Luftwaffe was diverted east to prepare for ‘Operation Barbarossa’, the invasion of the Soviet Union.

Some smaller scale ‘nuisance’ air raids continued into late 1941, with the last concerted attacks on Cheshire occurring in early 1942.

9.2. Aerial Delivered Ordnance in the Second World War

9.2.1. Generic Types of WWII German Air-delivered Ordnance

The nature and characteristics of the ordnance used by the Luftwaffe allows an informed assessment of the hazards posed by any unexploded items that may remain today. Detailed illustrations of German air delivered ordnance are presented at Annex E.

- HE Bombs: In terms of weight of ordnance dropped, HE bombs were the most frequent weapon deployed. Most bombs were 50kg, 250kg or 500kg (overall weight, about half of which was the high explosive) though large bombs of up to 2000kg were also used. HE bombs had the weight, velocity and shape to easily penetrate the ground intact if they failed to explode. Post-raid surveys would not always have spotted the entry hole or other indications that a bomb penetrated the ground and failed to explode and contemporary

ARP documents describe the danger of assuming that damage, actually caused by a large UXB, was due to an exploded 50kg bomb. Unexploded HE bombs therefore present the greatest risk to present–day intrusive works.

- Blast Bombs/ Parachute Mines: Blast bombs generally had a slow rate of descent and were extremely unlikely to have penetrated the ground. Non-retarded mines would have shattered on most ground types, if they had failed to explode. There have been extreme cases when these items have been found unexploded, but this was where the ground was either very soft or where standing water had reduced the impact. BACTEC does not consider there to be a significant threat from this type of munition on land.
- Large incendiary bombs: This type of bomb ranged in size from 36kg to 255kg and had a number of inflammable fill materials (including oil and white phosphorus), and a small explosive charge. They were designed to explode and burn close to the surface but their shape and weight meant that they did have penetration capability. If they penetrated the ground complete combustion did not always occur and in such cases they remain a risk to intrusive works.
- 1 kg Incendiary Bombs (IB): These bombs, which were jettisoned from air-dropped containers, were unlikely to penetrate the ground and in urban areas would usually have been located in post-raid surveys. However, if bombs did not initiate and fell in water or dense vegetation, or became mixed with rubble in bomb damaged areas they could have been overlooked. Some variants had explosive heads and these present a risk of detonation during intrusive works.
- Anti-personnel (AP) Bomblets: AP bombs had little ground penetration ability and should have been located by the post-raid survey unless they fell into water, dense vegetation or bomb rubble.
- Specialist Bombs (smoke, flare, etc): These types do not contain high explosive and therefore a detonation consequence is unlikely. They were not designed to penetrate the ground.

9.2.2. German Air-delivered Ordnance Failure Rate

It has been estimated that 10% of the German HE bombs dropped during WWII failed to explode as designed. This estimate is probably based on the statistics of wartime recovered UXBs and therefore will not have taken account of the unknown numbers of UXBs that were not recorded at the time, and is probably an underestimate.

The reasons for failures include:

- Fuze or gaine malfunction due to manufacturing fault, sabotage (by forced labour) or faulty installation.
- Clockwork mechanism failure in delayed action bombs.
- Failure of the bomber aircraft to arm the bombs (charge the electrical condensers which supplied the energy to initiate the detonation sequence) due to human error or equipment defect.
- Jettison of the bomb before it was armed or from a very low altitude. Most likely if the bomber was under attack or crashing.

War Office Statistics document that a daily average of 84 bombs which failed to function were dropped on civilian targets in Great Britain between 21st September 1940 and 5th July 1941. 1 in 12 of these (probably mostly fitted with time delay fuzes) exploded sometime after they fell - the remainder were unintentional failures.

From 1940 to 1945 bomb disposal teams dealt with a total of 50,000 explosive items of 50 kg and over (i.e. German bombs), 7000 AAA shells and 300,000 beach mines. These operations resulted in the deaths of 394 officers and men. However, unexploded ordnance is still regularly encountered across the UK (see recent press articles, Annex F-1)

9.2.3. UXB Ground Penetration

9.2.3.1. General Considerations

The actual penetration depth of aerial delivered bombs into the ground will have been determined by the mass and shape of the bomb, the velocity and angle of the bomb on impact (dependent on the height of release) and the nature of the ground and ground cover; the softer the ground, the greater the potential penetration. Peat, alluvium and soft clays are easier to penetrate than gravel and sand. Bombs are brought to rest or are commonly deflected by bedrock or large boulders.

9.2.3.2. The “j” Curve Effect

An air-dropped bomb falling from normal bombing altitude (say 5000m) into homogeneous ground will continue its line of flight but turn in an upwards curve towards the surface as it comes to rest. This offset from vertical is generally thought to be about one third of the penetration depth, but can be up to 15m depending on ground conditions or the bomb’s angle of impact.

9.2.3.3. Second World War Bomb Penetration Studies

During WWII the Ministry of Home Security undertook a major study on actual bomb penetration depths, carrying out statistical analysis on the measured depths of 1328 bombs as reported by Bomb Disposal, mostly in the London area. They then came to conclusions as to the likely average and maximum depths of penetration of different sized bombs in different geological strata.

The median penetration of 430 x 50kg German bombs in London Clay was 4.6m and the maximum penetration observed for the SC50 bomb was 9m.

They concluded that the largest common German bomb, 500kg, had a likely penetration depth of 6m in sand or gravel but 8.7m in clay. The maximum observed depth for a 500kg bomb was 10.2m and for a 1000kg bomb 12.7m. Theoretical calculations suggested that significantly greater penetration depths were probable.

9.2.4. Initiation of Unexploded Bombs

Unexploded bombs do not spontaneously explode. All high explosive requires significant energy to create the conditions for detonation to occur. In the case of unexploded German bombs discovered within the construction site environment, there are a number of potential initiation mechanisms:

- Direct impact onto the main body of the bomb: Unless the fuze or fuze pocket is struck, there needs to be a significant impact (e.g. from piling or large and violent mechanical excavation) to initiate a buried iron bomb. Such violent action can cause the bomb to detonate.
- Re-starting the clock timer in the fuze: Only a small proportion of German WWII bombs employed clockwork fuzes. It is probable that significant corrosion has taken place within the fuze mechanism over the last 60 years that would prevent clockwork mechanisms from functioning, nevertheless it was reported that the fuze in a UXB dealt with by 33 EOD Regiment in Surrey in 2002 did re-commence.
- Induction of a static charge, causing a current in an electric fuze: The majority of German WWII bombs employed electric fuzes. It is probable that significant corrosion has taken place within the fuze mechanism over the last 60 years such that the fuze circuit could not be activated.
- Friction impact initiating the (shock-sensitive) fuze explosive: This is the most likely scenario resulting in the bomb detonating.

Annex F-2 details UXB incidents where intrusive works have caused UXBs to detonate, resulting in death or injury and damage to plant.

9.3. Bombing of Frodsham and The Surrounding Area

9.3.1. Second World War Overview

The Luftwaffe's main objective for the attacks on the north-west of England involved heavy bombing of the extensive dock facilities at Liverpool. Following the destruction of London's docks in 1940, the port of Liverpool became the most important port in the country. Consequently the city and surrounding districts were subjected to over 300 air raids.

The site is situated on the southern bank of the River Mersey, as well as the Manchester Ship Canal, both of which are likely to have been used for bulk haulage of goods throughout the war. Coastal shipping was a common target for Luftwaffe bombers and therefore the possibility that merchant vessels were attacked near the site, as opportunistic targets, cannot be discounted.

Approximately 3.8km to the west was Lobitos Oil Refinery and approximately 5.4km to the west was the Ellesmere Port ICI Chemical factory; likely to have been turned over to war production. Both of these will have constituted viable bombing targets and will have been easily identifiable from the air. RAF Speke and the Rootes & Co Aircraft factory were also situated approximately 5.5km and 7km to the north-west of the site respectively and are known to have been attacked during WWII.

The undeveloped, isolated nature of the study area suggests that had any bombs been dropped in the vicinity, these will likely have been the result of 'tip and run' tactics. These bombing incidents occurred when German aircraft, harassed by concentrated anti-aircraft fire and/or fighter interception, dropped their bombs prematurely/indiscriminately in order to escape the combat zone.

Records of bombing incidents in the civilian areas of Frodsham were collected by the Air Raid Precautions wardens and collated by the Civil Defence Office. Some other organisations, such as hospitals, military installations and railways, maintained separate records.

9.3.2. Second World War Bombing Statistics

The following table summarises the quantity of German bombs (excluding 1kg incendiaries and anti-personnel bombs) falling on the Rural District of Runcorn (in which the site was historically located) between 1940 and 1945:

Record of German Ordnance Dropped on the Rural District of Runcorn	
Area Acreage	45,765
High Explosive Bombs (all types)	197
Parachute Mines	9
Oil Bombs	1
Phosphorus Bombs	0
Pilotless Aircraft (V1)	0
Fire Pot	0
Total	207
Items Per 1,000 Acres	**4.5**

Detailed records of the quantity and locations of the 1kg incendiary and anti-personnel bombs were not routinely maintained by the authorities as they were frequently too numerous to record. Although the incendiaries are not particularly significant in the threat they pose, they nevertheless are items of ordnance that were designed to cause damage and inflict injury and should not be overlooked in assessing the general risk to personnel and equipment. The anti-personnel bombs were used in much smaller quantities and are rarely found today but are potentially more dangerous.

This table does not include UXO found during or after WWII.

9.4. Site Specific WWII Bombing Records

9.4.1. Written ARP Bombing Incident Records

Cheshire and Chester Archives and Local Studies Centre was contacted, however this archive holds no comprehensive record of bombing incidents within the rural District of Runcorn. A collection of assorted original ARP reports for Cheshire was reviewed and the closest recorded bombing incident to the site was identified as a stick of five 250kg HE bombs. These fell on the 10th January 1942, with the closest strike to the site recorded on Lobitos Oilfields Ltd land, near the River Gowy in Stanlow, approximately 3.7km west of the study area.

9.4.2. Bombing Decoy Sites

A national decoy authority headed by Colonel John Fisher Turner was set up in July 1940, and following earlier experiments in Glasgow and Sheffield, a system of urban lighting decoys was set up. These were known as "Civil" sites; Civil 'QL' for urban lighting simulation, and Civil 'QF' for dummy fires. "Q" – sites were equipped with assorted electrical and pyrotechnical apparatus to simulate the flare given from furnace doors, steel-making, railway marshalling yards, and light given off by inefficient blackout precautions.

Other sites simulated small fires started by incendiary bombs, with oil-storage area fire simulation being developed near large oil installations. A further variation on fire decoy sites was the "SF", or "Special Fires" sites. A larger, longer-burning type of fire was provided at these sites - known as "Starfish" sites - to draw incendiary bombs, and hopefully as a consequence the full enemy payload, from falling on the larger conurbations and defence installations during heavy air raids. Decoy sites were effective in drawing the Luftwaffe's attacks away from legitimate airfields – in 1940 alone 'Q' and 'Starfish' sites received nearly 200 attacks.

A bombing decoy site map, presented in Annex G, indicates that 'Q' and 'Starfish' sites were construed in the vicinity of the site. The latter is likely to have been a decoy fire in the shape of a burning oil terminal to protect the oil refinery further west.

9.4.3. Written Bombing Incident Records of Military Decoy Sites

An assessment was made of the records held at the National Archives and records pertaining to the bombing of the decoy sites situated on or in immediate proximity to the site were consulted. The sources viewed are listed below.

Subseries within HO 198 - Attacks on Decoys:

- HO 198/122 1 Sept 1941 to 29/30 Dec 1941
- HO 198/123 10/11 Jan 1942 to 17/18 Dec 1942
- HO 198/124 3/4 Jan to 26/27 July 1943
- HO 198/125 12/13 Aug 1943 to 22/23 May 1944

These records did not include any references to Luftwaffe attacks on either of the decoys at Ince, however it should be noted that the records viewed were found to be sporadic and not consistent between sites. Consequently it is conceivable that accurate records were not regularly maintained, if at all. Furthermore, records only appear to have been compiled from 1941 onwards, by which time 'Q' and 'Starfish' sites alone across the UK had already sustained almost 200 attacks. For such reasons, the possibility that either decoy site was bombed during WWII cannot be discounted.

9.4.4. Abandoned Bombs

A post-air raid survey of buildings, facilities and installations would have included a search for evidence of bomb entry holes. If evidence were encountered, Bomb Disposal Officer teams would normally have been requested to attempt to locate, render safe and dispose of the bomb. Occasionally evidence of UXBs was discovered but due to a relatively benign position, access problems or a shortage of resources the UXB could not be exposed and rendered safe. Such an incident may have been recorded and noted as an Abandoned Bomb.

Given the inaccuracy of WWII records and the fact that these bombs were 'abandoned', their locations cannot be considered definitive, nor the lists exhaustive. The MoD states that 'action to make the devices safe would be taken only if it was thought they were unstable'. It should be noted that other than the 'officially' abandoned bombs, there will inevitably be UXBs that were never recorded.

BACTEC holds records of one *officially* registered abandoned bomb that could potentially be on site and two additional abandoned bombs in the local surrounding area. The two closest incidents are plotted on an aerial photograph of the area, presented in Annex H. A buffer area to account for error in the unspecific location of AB 202 has been laid over the aerial photograph.

Note that this source also plots the precise positions of the bombing decoy sites, located immediately adjacent to the site, either side of Lordship Lane.

Ref No.	Ordnance	Location	Approximate Distance From Site
AB 202	1 x 3.7" AA Shell	Frodsham Marshes, 1.9km north-west of Frodsham. Exact location unknown.	Potentially on site
AB 204	1 x 3.7" AA Shell	Clifton Hall Farm, Clifton side of the London-Liverpool Railway. Exact location unknown.	2km north-east of the site
AB 178	1 x 50kg HE Bomb	Stanlow. Fell between railway lines owned by Shellmex.	2.8km west of the site.

9.4.5. Second World War Era Aerial Photographs

WWII-era aerial photography of part of the site was obtained from the National Monuments Record Office, Swindon. An image dated August 1945 is presented at Annex I-1. Additional circa 1945 images were obtained from Google Earth and are presented in Annex I-2 and I-3 .

The first photograph, taken in the early post-war period, shows the western section of the site only. It confirms that this area was exclusively agricultural during WWII, however no evidence of the decoy sites is visible. Due to the lack of any bombing in Cheshire after 1942, such installations in the county are likely to have been removed by the end of WWII leaving little/no evidence of their former locations.

The two Google Earth images are of low resolution however they are consistent with the OS mapping for the site. They show that dredging deposits occupy much of the study area as well as agricultural fields, to the south-east. No evidence of HE bombing (bomb craters) is visible on site, however given that the main period of bombing was some four years previous, such features are unlikely to remain visible, especially since the fields will have been regularly re-worked by local farmers and the dredging dump will have been in operation. Annex I-2 however does exhibit a possible bomb crater on the un-used, northern bank of the ship canal.

9.4.6. Site Specific Bomb Penetration Considerations

When considering an assessment of the bomb penetration at the Frodsham Wind Farm site the following parameters would be used:

- Geology – 20m of drift - marine/estuarine alluvium (soft silts, clay, running sands and Peat) overlying Glacial Till (stiff clay and gravel).
- Impact Angle and Velocity – 80-90^{O} from horizontal and 267 metres per second.
- Bomb Mass and Configuration – The 500kg SC (General Purpose) HE bomb, without retarder units or armour piercing nose. This was the largest of the common bombs used against Britain.

Taking into account the above-mentioned factors it has been assessed that a 500kg bomb would have had a maximum bomb penetration depth of **12m** below WWII ground level, or shortly after impact with the Sandstone layer, whichever is sooner. The depth at which the Sandstone formation lies is not known. Penetration depth could potentially have been greater if the UXB was larger (though only 4% of German bombs used in WWII over Britain were of that size). Note that UXBs may be found at any depth between just below the WWII ground

level and the maximum penetration depth. This assessment has been made using generic geological information.

9.5. Likelihood of Post-raid UXO Detection

Utilising the available historical bombing records as reviewed in sections 9.1 to 9.4, it is possible to make an assessment of the likelihood that evidence of unexploded ordnance would have been noted on a site during the war and the incident dealt with or recorded at the time. Factors such as bombing density, frequency of access, ground cover, damage and failure rate have been taken into consideration.

9.5.1. Density of Bombing

Bombing density is an important consideration for assessing the possibility that UXBs remain in an area. A very high density of bombs can for example result in increased levels of damage sustained to structures, greater likelihood of errors in record keeping and a higher risk that UXBs fell over the area.

The Rural District of Runcorn, in which the site was historically located, experienced a low density of bombing during WWII, as confirmed by official statistics. However, two neighbouring bombing decoy sites lay immediately adjacent to the site boundary on Ince Marshes and therefore the bombing density may have been locally higher in the vicinity of the study area.

9.5.2. Ground Cover

The degree and type of groundcover present during WWII would have a significant effect on the visual evidence at ground level which may have indicated the presence of buried UXO.

During WWII the site was almost entirely undeveloped. The western portion of the site was occupied by farmed fields with the rest of the study area covered by marshes or used as a canal dredging dump. Therefore a UXB strike to any part of the site may not have resulted in an easily identifiable or persistent impact. Note that the entry hole of an SC50 UXB (the most commonly deployed German HE bomb) may have been as little as 20cm in diameter and therefore easily obscured in crops, ploughed soil, peat marsh or silt heaps.

Furthermore, it should be noted that 1kg incendiary bomblets were also capable of significant penetration into soft soil; see Annex J and therefore the possibility that such an incident occurred on site cannot be discounted.

9.5.3. Frequency of Access

Unexploded ordnance at sites where human access was infrequent would have a higher chance of being overlooked than at those sites which were subject to greater occupancy. The importance of a site or facility to the war effort is also an important consideration as such sites are likely to have been both frequently accessed and are also likely to have been subject to post-raid checks for evidence of UXO.

Due to the isolated/relatively unused nature of the site, it is unlikely to have been subject to regular or frequent access. The lack of any residential concentrations suggests ARP wardens would not have been very active on site. Note however the two decoy sites will have been manned by local starfish detachments during their operational period and therefore inspections of these facilities are likely to have taken place, particularly in the wake of any air raids.

9.5.4. Damage

If structures on a site have been subject to significant bomb or fire damage, rubble and debris are likely to have been present; similarly an HE bomb strike on open ground is likely to have resulted in a degree of soil disturbance. Under such conditions there is a greater risk of the entry holes of unexploded bombs dropped during subsequent raids being obscured and going unnoticed.

No evidence of damage was identified on site, however very few structures were present on site to which damaged could be attributed. A possible bomb crater was identified approximately 310m north of the site, on the north west bank of the Manchester Ship Canal.

9.5.5. Bomb Failure Rate

There is no evidence to suggest that the bomb failure rate in the vicinity of the site would have been different from the "approximately 10%" figure normally used, however this cannot be confirmed due to the unavailability of written ARP bombing records for WWII.

10. The Threat from Allied Military Ordnance

10.1. General

BACTEC has found no evidence to suggest that the area of the site had any other former military use which could have led to ordnance contamination.

The following potential military uses have been considered:

- Anti-Aircraft Defences
- Home Guard
- Training or firing ranges or the storage of ammunition
- Military bases
- Defensive minefields (including pipemines)
- Defensive Positions
- Manufacture of explosives or ordnance

The most likely source of Allied ordnance is from anti-aircraft fire and the Home Guard, as discussed in the following section.

10.2. Defending Cheshire from Aerial Attack

Both passive and active defences were deployed against enemy bombers attacking targets in the Cheshire region.

Passive defences included measures to hinder the identification of targets (such as a lighting blackout at night and the camouflaging of strategic installations); to mislead bomber pilots into attacking decoy sites located away from the city and to force attacking aircraft to higher altitudes with the use of barrage balloons.

Active air defence relied on a coordinated combination of fighter aircraft to act as interceptors, anti-aircraft gun batteries and later the use of rockets and missiles, in order to actively engage and oppose attacking aircraft.

10.2.1. Anti-Aircraft Artillery and Projectiles

At the start of the war two types of AAA guns were deployed: Heavy Anti-Aircraft Artillery (HAA), using large calibre weapons such as the 3.7" QF (Quick Firing) gun and Light Anti-Aircraft Artillery (LAA) using smaller calibre weapons such as 40mm Bofors gun.

During the early war period there was a severe shortage of AAA available and older WWI 3" and modified naval 4.5" guns were deployed alongside those available 3.7" weapons. The maximum ceiling height of fire at that time was around 11,000m (for the 3.7" gun and less for other weapons). As the war progressed improved variants of the 3.7" gun were introduced and, from 1942, large 5.25 inch weapons began to be brought into service. These had significantly improved ceiling heights of fire reaching over 18,000m.

The LAA batteries were intended to engage fast low flying aircraft and were typically deployed around airfields or strategic installations. These batteries were mobile and could be moved to

new positions with relative ease when required. The most numerous of these was the 40mm Bofors gun which could fire up to 120 x 40mm HE shells per minute to over 1800m.

The HAA projectiles were high explosive shells, usually fitted with a time delay or barometric pressure fuze to make them explode at a pre-determined height. If they failed to explode or strike an aircraft, they would eventually fall back to earth. Details of the most commonly deployed WWII AAA projectiles are shown below:

Gun type	Calibre	Shell Weight	Shell Dimensions
3.0 Inch	76mm	7.3kg	76mm x 356mm
3.7 Inch	94mm	12.7kg	94mm x 438mm
4.5 Inch	114mm	24.7kg	114mm x 578mm
40mm	40mm	0.9kg	40mm x 311mm

Although the larger unexploded projectiles could enter the ground they did not have great penetration ability and are therefore likely to be found close to WWII ground level. These shells are frequently mistakenly identified as small German air-delivered bombs, but are differentiated by the copper driving band found in front of the base. With a high explosive fill and fragmentation hazard these items of UXO present a significant risk if encountered. The smaller 40mm projectiles are similar in appearance and effect to small arms ammunition and, although still dangerous, present a lower risk.

Numerous unexploded AAA shells were recovered during and following WWII and are still occasionally encountered on sites today. 12 HAA batteries were constructed within 10km of the site. These batteries would have engaged Luftwaffe formations in the region. With four guns per battery firing several rounds per minute, AA batteries could expel numerous shells in even the shortest engagements. Unexploded AA projectiles could land several kilometres from their batteries and therefore, due to the undeveloped nature of the site, there is considered to be an elevated risk of unexploded AA shell contamination. This is evidenced by the presence of an abandoned unexploded AA shell on site.

Illustrations of Anti-Aircraft artillery, projectiles and rockets are presented at Annex K.

10.3. Home Guard Activity

The Home Guard (HG) was a defence organisation of the British Army, operational between 1940 and 1944. It comprised 1.5 million local volunteers, otherwise ineligible for military service, and acted as a secondary defence force, in case of enemy invasion. The HG guarded the coastal areas of Britain and other important facilities such as airfields, factories and explosives stores.

Information taken from the Council for British Archaeology's study of the WWII anti-invasion landscape of England, (mapping the locations and types of existing defences around the country) indicates that a pillbox was constructed on the northern site boundary (see Annex H). Thousands of these concrete fortifications were strategically positioned around the UK during the period of anticipated invasion in 1940.

This position would likely have been manned by HG personnel during 19540/41, who would have been issued with land service and small arms ammunition. Records of HG activity were not rigorously kept during WWII and therefore, although no evidence could be located, it is possible that HG units were active in the vicinity and the possibility of live fire training cannot be discounted, especially due to the isolated/unused nature of the study area.

Today, items of ordnance related to the HG are occasionally encountered by members of the public and the construction industry in the British countryside. It seems that activities and training exercises of the HG often resulted in localised UXO contamination and items of surplus or faulty UXO were simply buried, discarded or burnt.

Information/illustrations of land service ammunition and small arms ammunition are presented at Annexes L and M respectively. Note that the vast majority of post-war HG UXO finds are small items, such as grenades or mortars which have a significantly lower explosive content than German HE bombs.

11. Ordnance Clearance and Post-WWII Ground Works

11.1. General

The extent to which any ordnance clearance activities have taken place on site or extensive ground works have occurred is relevant since on the one hand they may indicate previous ordnance contamination but also may have reduced the risk that ordnance remains undiscovered.

11.2. EOD Bomb Disposal and Clearance Tasks

BACTEC holds a number of official records of explosive ordnance disposal operations during and following WWII, obtained from the Explosive Ordnance Disposal (EOD) Archive Information Office at 33 Engineer Regiment (EOD). However no records could be found to indicate that any EOD tasks have taken place on or within close proximity to the site.

11.3. Post war Redevelopment

The site has not been subject to any significant post-WWII redevelopment, however, the Ince Chemical Plant (now Kemira Growhow) has been constructed in the intervening years to the south of Lordship Lane. BACTEC has found no evidence regarding UXO finds resulting from this construction. Also significant earth works associated with dredging operations are known to have taken place. No details regarding these works are known and such activities are likely to have been fairly complex within the large study area.

12. The Overall Explosive Ordnance Threat Assessment

12.1. General Considerations

Taking into account the quality of the historical evidence, the assessment of the overall threat to the proposed works from unexploded ordnance must evaluate the following risks:

- That the site was contaminated with unexploded ordnance
- That unexploded ordnance remains on site
- That such items will be encountered during the proposed works
- That ordnance may be activated by the works operations
- The consequences of encountering or initiating ordnance

12.2. The Risk that the Site was Contaminated with Unexploded Ordnance

For the reasons discussed in Sections 9.5 and 10 BACTEC believes that there is a risk that the site was contaminated with UXO.

- The site was situated approximately 16km from the heavily bombed Liverpool area (which sustained over 300 air raids) and therefore escaped much of the bombing. Consequently it experienced a low density of bombing, as confirmed by official statistics.
- Records indicate that two neighbouring bombing decoy sites were located either side of Lordship Lane, adjacent to the site boundary, in the western portion of the study area. One of these was an SF decoy fire site in the shape of a burning oil facility to lure bombers away from Lobitos Oil Refinery, approximately 3.8km to the west of the site. Original WWII records pertaining to decoy sites were reviewed, however bombing was not recorded and no records associated with individual bombing incidents are known to exist. Therefore the possibility of bombing on site cannot be ruled out, especially given its vast size and indescript nature, making accurate referencing of any such incidents difficult.
- Furthermore, Cheshire and Chester Archives and Local Studies Centre do not hold a comprehensive record of bombing incidents within the Rural District of Runcorn, in which the site was historically located. The nearest recorded incident was a 250kg HE bomb strike approximately 3.7km west of the study area. Note however that 1945 aerial photography of the site exhibits what could be a bomb crater approximately 310m north of the study area, on the north west bank of the Manchester Ship Canal.

- BACTEC holds records of one officially registered abandoned bomb on site. This British 3.7" AA Shell is located on Frodsham Marshes, 1.9km north-west of Frodsham. Note however it is not known whether this UXB has since been removed. The site was in range of several WWII anti-aircraft batteries and therefore the possibility of additional AA shell contamination on site cannot be discounted.
- During WWII the site was isolated, almost entirely undeveloped and is unlikely to have been subject to regular or frequent access. Therefore there is an elevated chance of a UXB falling unobserved. Furthermore, had such an incident occurred the resulting impact may not have been easily identifiable or persistent. Note that the entry hole of an SC50 UXB (the most commonly deployed German HE bomb) may have been as little as 20cm in diameter and therefore easily obscured in crops, ploughed soil, peat marsh or dredged silt heaps.
- Council for British Archaeology records plot a WWII pillbox close to the northern site boundary. Although records of Home Guard activities were not routinely kept, this fortification is indicative of a Home Guard presence in the area.
- Experience has shown that the 'housekeeping' of less disciplined/voluntary Home Guard personnel during WWII was often poor with items of faulty/surplus UXO often burnt, buried, misplaced or otherwise discarded in civilian areas. Training exercises often took place in isolated, rural areas and therefore the possibility of land service/small arms ammunition contamination on site cannot be entirely ruled out.

12.3. The Risk that Unexploded Ordnance Remains on Site

The site has not been subject to any significant post-WWWII redevelopment works that may have encountered and removed UXO, however large scale earth works and silt deposition associated with dredging activities are known to have occurred. Therefore any WWII-era UXO on site may have been buried to a deeper depth. Also noteworthy is that any additional UXO from the neighbouring canal bed may have been re-deposited on site, which involves a dredging and pumping operation.

12.4. The Risk that Ordnance may be Encountered during the Works

The most likely scenarios under which a UXO could be encountered during construction works is during piling, drilling operations or bulk excavations for basement levels. The overall risk will depend on the extent of the works, such as the extent, depth, frequency and volume of any excavations and ground penetrations, including boreholes and pile foundations.

Since an air-dropped bomb may come to rest at any depth between just below ground level and its maximum penetration depth there is also a chance that such an item could be encountered during shallow excavations (for services or site investigations) into the original WWII ground level. Note that any WWII-era UXO may now be located at greater depth due to post-WWII deposition of dredging material.

12.5. The Risk that Ordnance may be Initiated

The risk that UXO could be initiated if encountered will depend on its condition, how it is found and the energy with which it is struck. The most violent activity on most construction sites is percussive piling.

As a result items that are shallow buried present a lower risk than those that are deep buried, since the force of impact is usually lower and they are more likely to be observed – when immediate mitigating actions can be taken.

12.6. The Consequences of Encountering or Initiating Ordnance

Clearly the consequences of an inadvertent detonation of UXO during construction operations would be catastrophic with a serious risk to life, damage to plant and a total site shutdown during follow-up investigations.

Since the risk of initiating ordnance is comparatively low if appropriate mitigation measures are undertaken, the most important consequence of the discovery of ordnance will be economic. This would be particularly so in the case of high profile locations and could involve the evacuation of the public. The unexpected discovery of ordnance may require the closing of

the site for any time between a few hours and a week with a potentially significant cost in lost time. Note also that the suspected find of ordnance, if handled solely through the authorities, may also involve loss of production since the first action of the Police in most cases will be to isolate the locale whilst awaiting military assistance, even if this turns out to have been unnecessary.

12.7. BACTEC's Assessment

Taking into consideration the findings of this study, BACTEC considers the risk on site to be heterogeneous and can therefore be divided into **Medium-High** and **High Risk**. These are illustrated on a Risk Map presented in Annex N.

Although the study area is large, there does not appear to be much variation in its use and type of ground cover during WWII. This, coupled with a fairly even distribution of UXO indicators across the site, means that identification of any Low Risk Zones has not been possible.

High Risk Zone – The danger area containing the suspected abandoned British AA shell.

	Level of Risk			
Type of Ordnance	**Negligible**	**Low**	**Medium**	**High**
German HE UXBs			*	
British AA Shells				*
German 1kg incendiaries			*	
Other Allied Military Ordnance			*	

Medium-High Risk Zone – The remainder of the study area.

	Level of Risk			
Type of Ordnance	**Negligible**	**Low**	**Medium**	**High**
German HE UXBs			*	
British AAA Shells			*	
German 1kg incendiaries			*	
Other Allied Military Ordnance			*	

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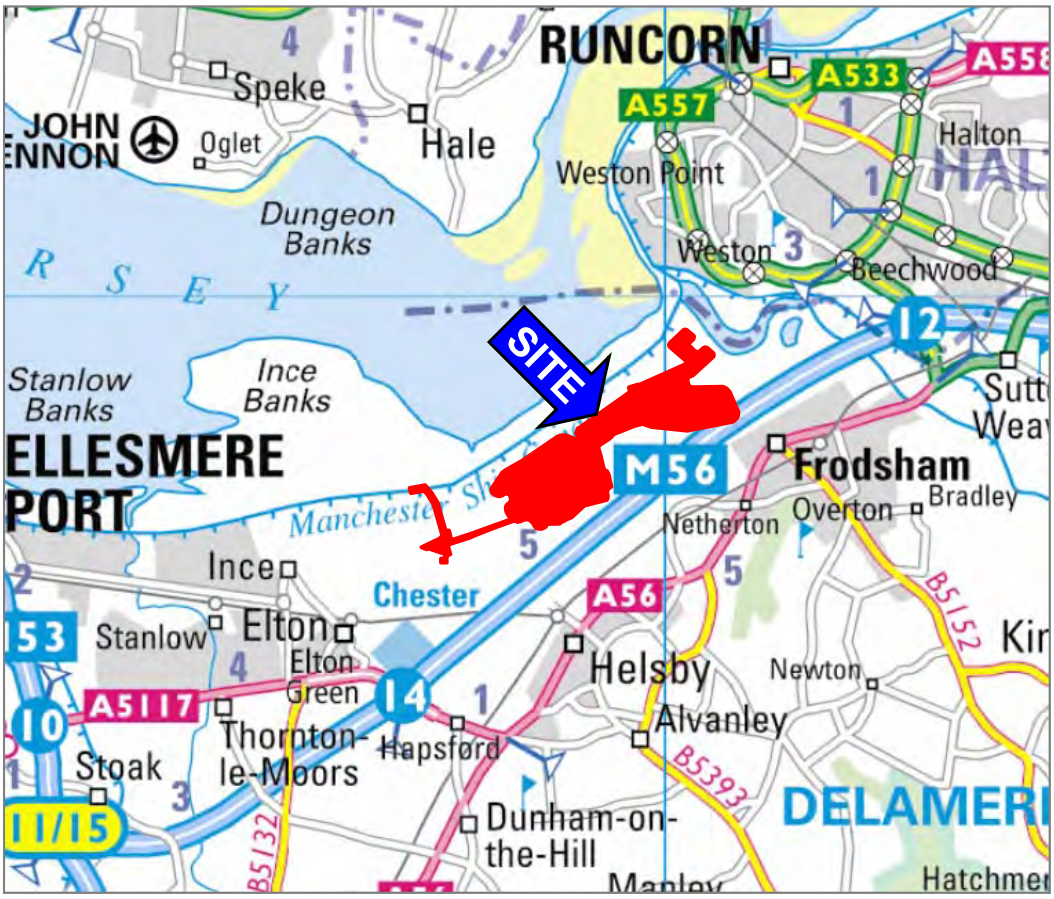
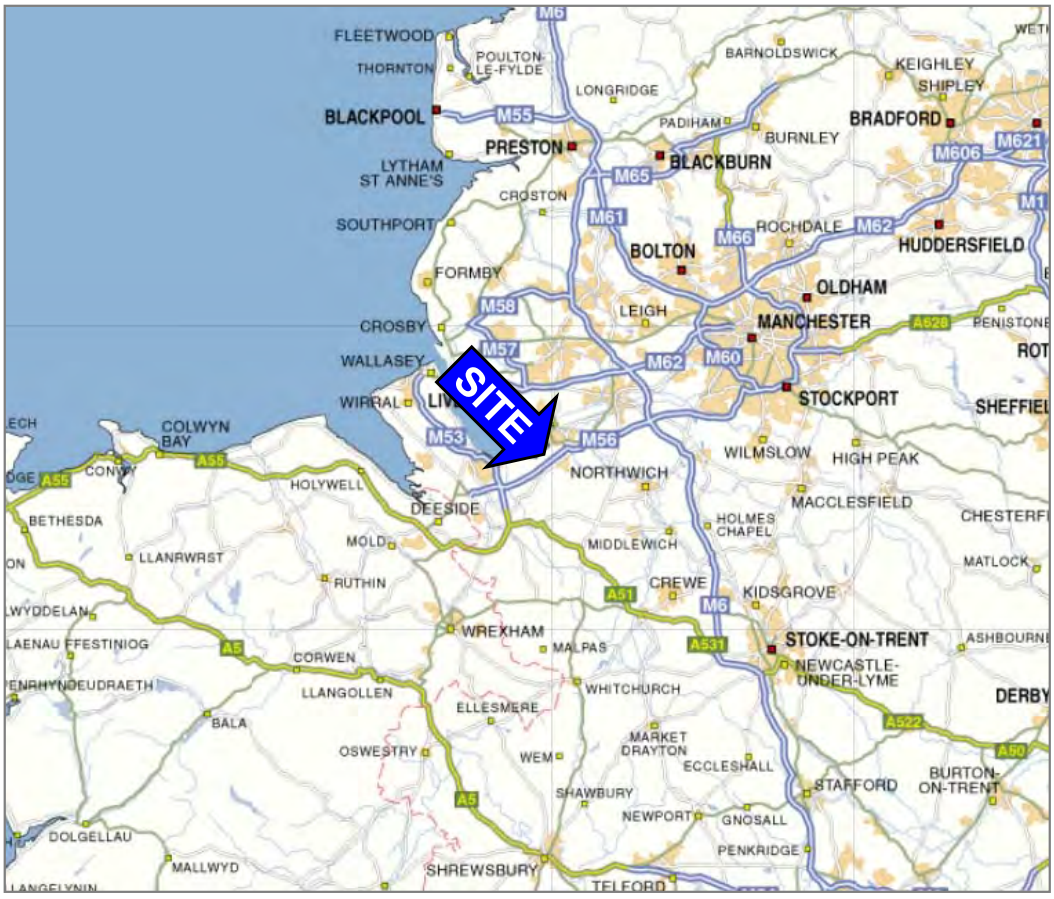
North





Report Reference:	Client:	
5057TA	Wardell Armstrong	BACTEC
	Project: Frodsham Wind Farm	

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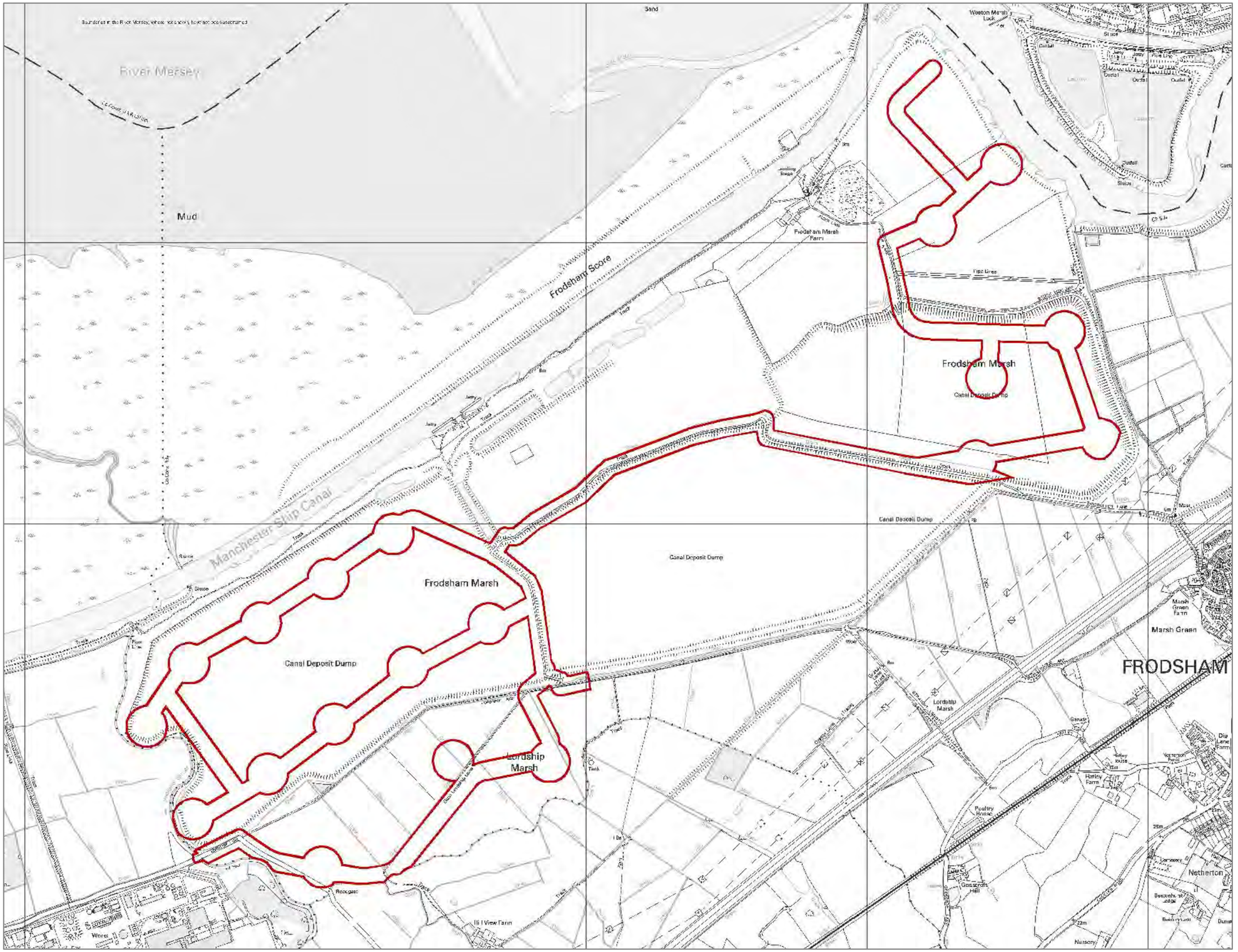
Study area boundary

North

Report Reference: 5057TA	Client: Wardell Armstrong	BAC TEC
	Project: Frodsham Wind Farm, Cheshire	
Source: Google Earth		



Turbine Layout

North

Report Reference:	Client:	
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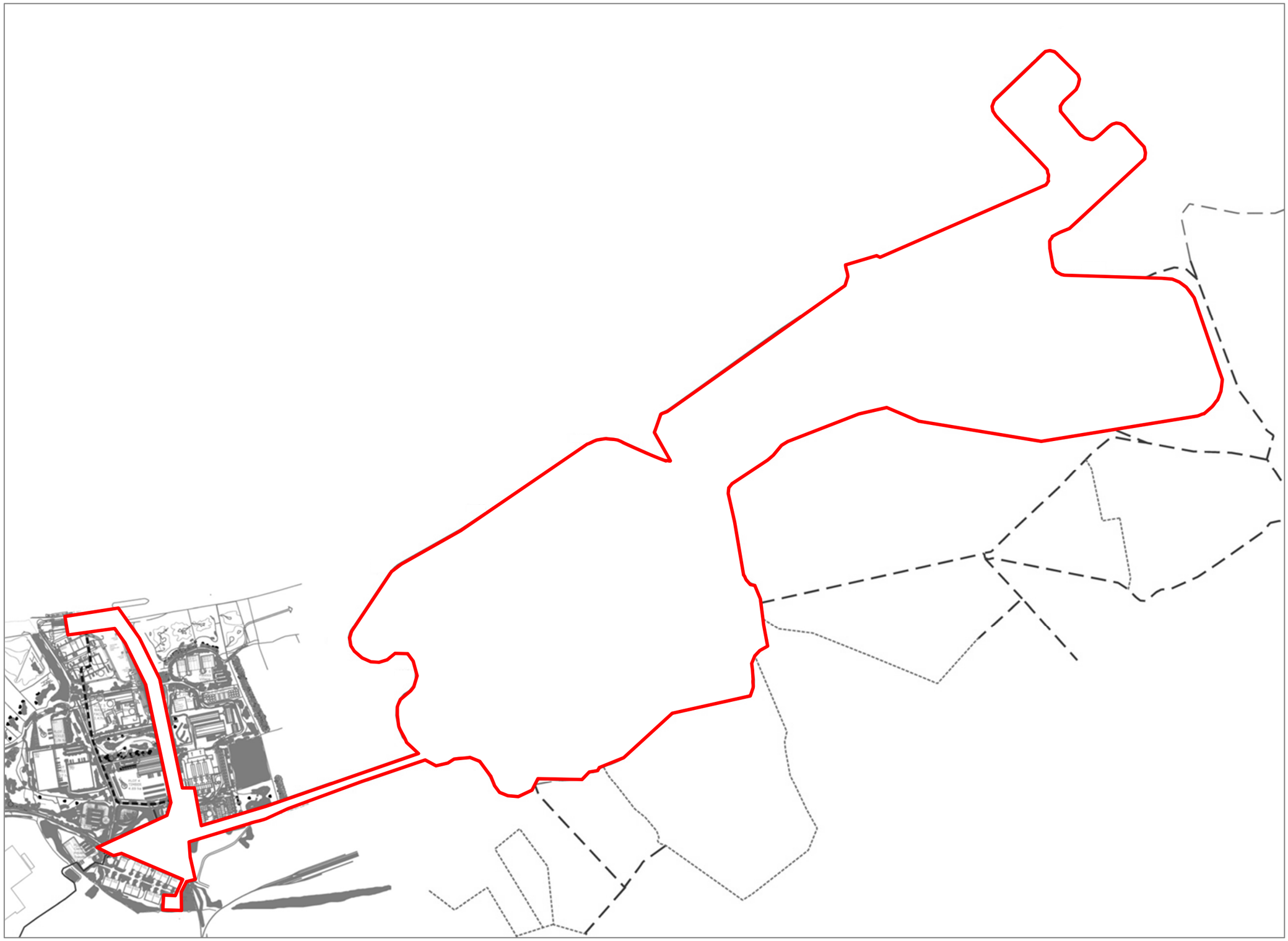

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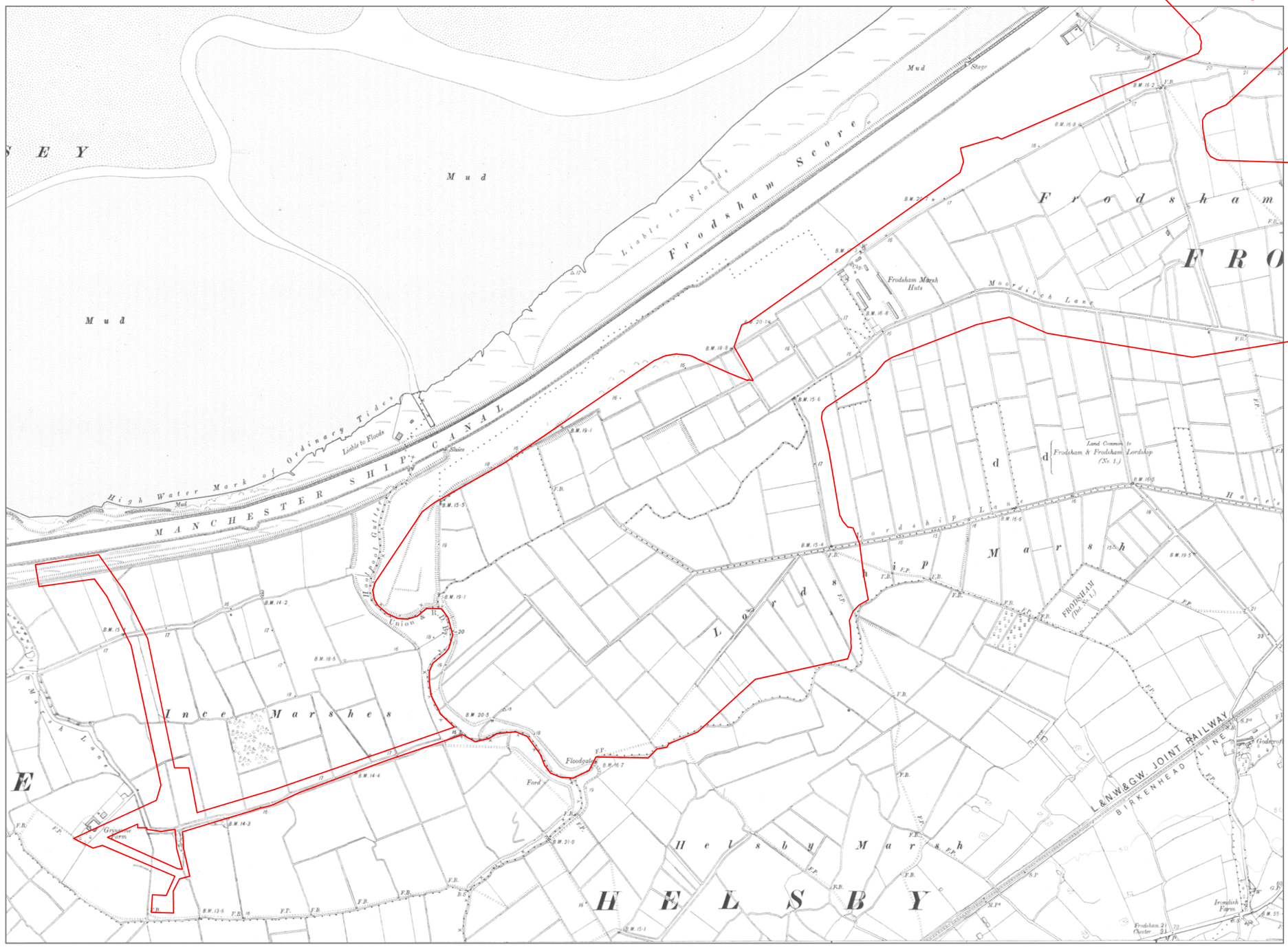

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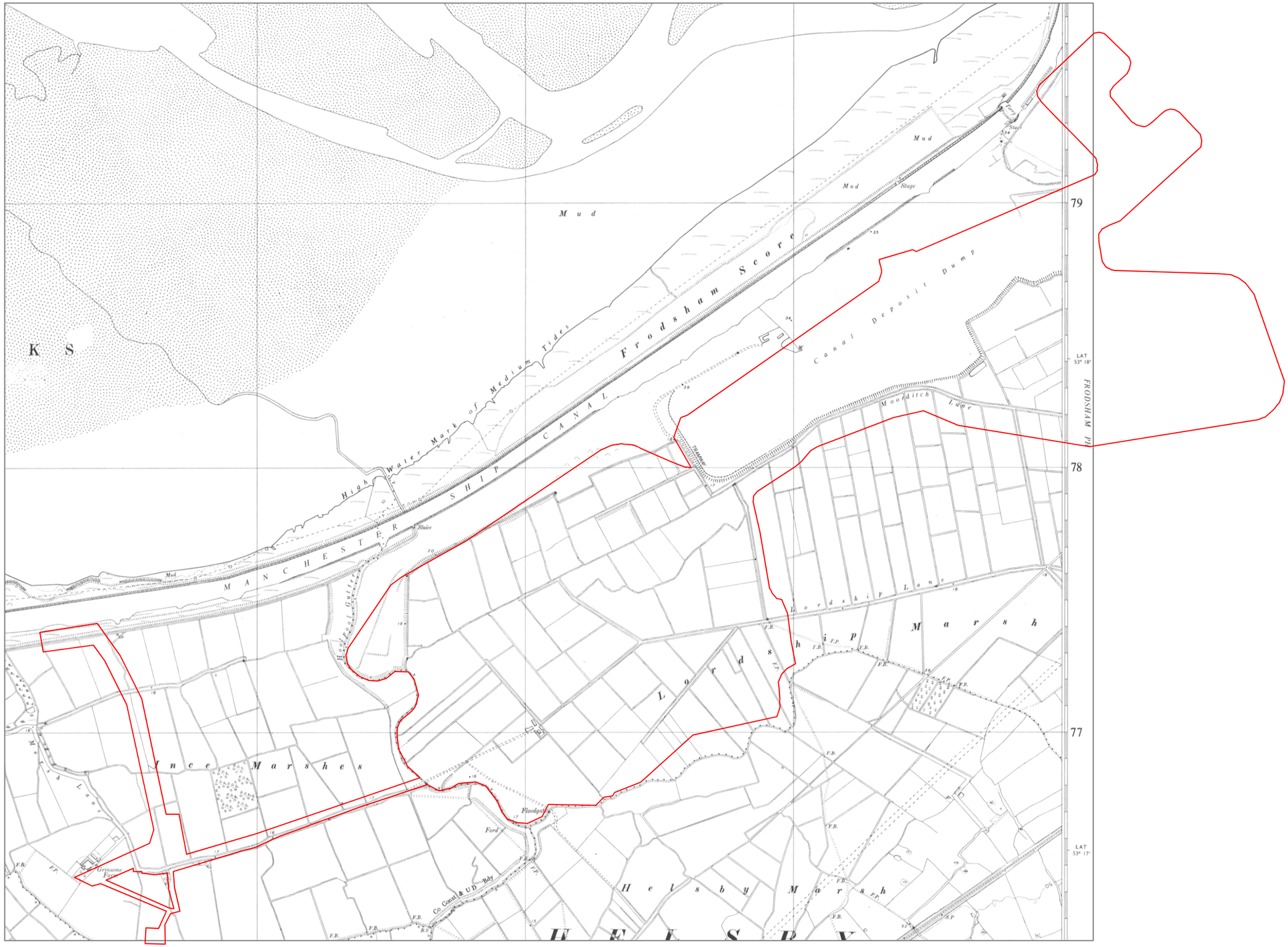


Study area boundary

North

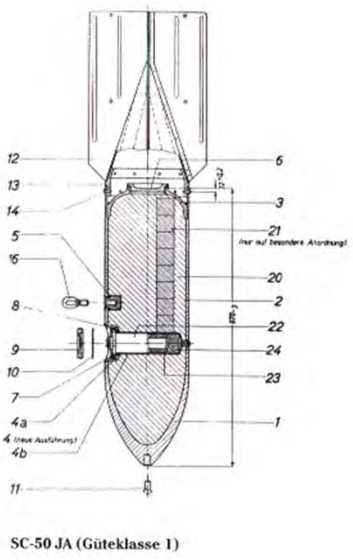
Report Reference:	Client:	
5057TA	Wardell Armstrong	BACTEC
	Project: Frodsham Wind Farm, Cheshire	
Source: F!ND Maps		

SC 50

Bomb Weight:	40-54kg (110-119lb)
Explosive Weight:	c25kg (55lb)
Fuze Type:	Impact fuze/electro-mechanical time delay fuze
Bomb Dimensions:	1,090 x 280mm (42.9 x 11.0in)
Body Diameter:	200mm (7.87in)
Use:	Against lightly damageable materials, hangars, railway rolling stock, ammunition depots, light bridges and buildings up to three stories.
Remarks:	The smallest and most common conventional German bomb. Nearly 70% of bombs dropped on the UK were 50kg.

50kg bomb, London Docklands

Minus tail section

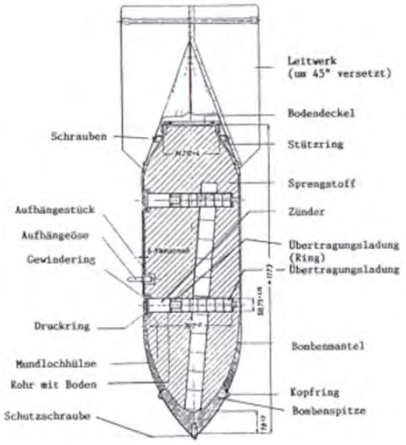


SC-50 JA (Güteklasse 1)

SC 250

Bomb weight:	245-256kg (540-564lb)
Explosive weight:	125-130kg (276-287lb)
Fuze type:	Electrical impact/mechanical time delay fuze.
Bomb dimensions:	1640 x 512mm (64.57 x 20.16in)
Body diameter:	368mm (14.5in)
Use:	Against railway installations, embankments, flyovers, underpasses, large buildings and below-ground installations.

250kg bomb, Hawkinge

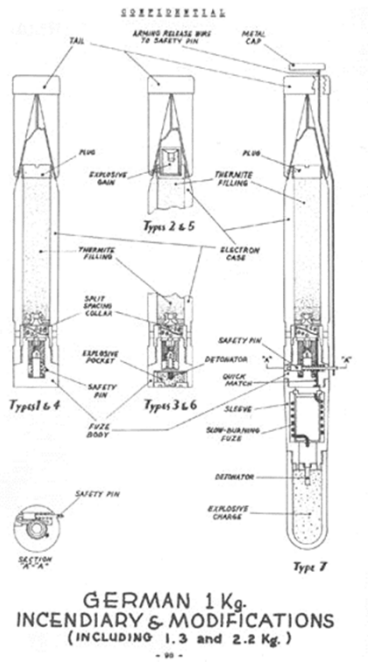


SC-250 JA (Güteklasse I)

1kg Incendiary Bomb

Bomb weight:	1.0 and 1.3kg (2.2 and 2.87lb)
Filling:	680gm (1.3lb) Thermite
Fuze type:	Impact fuze
Bomb dimensions:	350 x 50mm (13.8 x 1.97in)
Body diameter:	50mm (1.97in)
Use:	As incendiary – dropped in clusters against towns and industrial complexes
Remarks:	Jettisoned from air-dropped containers. Magnesium alloy case. Sometimes fitted with high explosive charge

1. Scaffold pipe
2. Incendiary 1kg bomb
3. Incendiary bomb recently found on site in UK



Report Reference:	Client:	
5057TA	Wardell Armstrong	BACTEC
	Project: Frodsham Wind Farm	

Source: BACTEC International Limited and various historical sources

1st September 2012 News – **Unexploded World War II Device** detonated on Bournemouth beach
An unexploded World War II device has been detonated on Bournemouth beach, according to Dorset Police. The discovery was made on Friday at 19:11 BST near the junction of East Overcliff Drive and Manor Road.
http://www.bbc.co.uk/news/uk-england-dorset-19445172

31st August 2012 News – **Suspected Unexploded Weapon** found on Cornwall's Porthmeor beach
Lifeguards have found what is believed to be a section of an unexploded weapon on a Cornish beach.The object, which witnesses have said looks like a corroded depth charge - an anti-submarine warfare weapon - has been found at Porthmeor Beach, in St Ives, Falmouth Coastguard has said.
http://www.bbc.co.uk/news/uk-england-cornwall-19440291

11th August 2012 News – **Unexploded Bomb** uncovered by workmen in Carlisle
Army bomb disposal experts have been called to Carlisle after what is thought to be an unexploded bomb was dug up. Workmen on a building site at Trinity School uncovered the device earlier. Cumbria Police said a cordon had been put in place and the sports centre on Strand Road had been evacuated as a precaution. A bomb disposal unit from Catterick Garrison, in North Yorkshire, attended the scene.
http://www.bbc.co.uk/news/uk-england-cumbria-19224152

28th July 2012 News – Alert over **'unexploded shells'** in Sheerness Harbour
Thirty-nine people were evacuated from two vessels in Kent after suspected unexploded shells were found. A 100m exclusion zone was also put around Sheerness Harbour on Saturday afternoon after two separate calls. The first call came from a catamaran which had an 18in by 5in shell on its deck at about 14:00 BST. At 15:30 BST, a 90m cable layer reported having a 12in by 4in shell on board. The shells were later declared safe by Royal Navy experts.
http://www.bbc.co.uk/news/uk-england-kent-19034493

10th July 2012 News – **Unexploded WWII Bomb** safely detonated off Kent coast
An unexploded wartime German bomb found off the coast of Kent has been safely detonated, coastguards have said. The 500lb (226kg) device was discovered by a dredger in Dover harbour on Monday but it could not be made safe as the tidal conditions were not right. Dover Coastguard worked with a four-man Royal Navy bomb disposal team from Portsmouth to move it to a remote area. A spokeswoman said it was detonated at 08:45 BST, three-and-a-half miles (5.6km) east of Deal Pier. The World War II explosive was 3.3ft (1m) in length and was said to have had fins which had rusted off.
http://www.bbc.co.uk/news/uk-england-kent-18765547

8th April 2012 News – Huge explosion as experts detonate **large WWII Mine**
Water and ash were propelled more than 120m (390ft) into the air when Royal Navy experts detonated a German mine in the Thames estuary. The 750kg (1,650lb) unexploded World War II (WWII) weapon was placed on the sea bed after it was caught in the nets of a fishing boat earlier in the week. Divers brought it to the surface and then took it to a spot off Kent, during a "delicate" seven-hour operation.
http://www.bbc.co.uk/news/uk-england-kent-17652116

5th March 2012 News – Beach open after **WWII shell found**
A beach in County Londonderry has reopened after an unexploded World War II shell was found on Sunday. The device was discovered lying near the water on Benone beach by a member of the public. The beach was evacuated just before 16:00 GMT, and a controlled explosion was carried out by army bomb experts
http://www.bbc.co.uk/news/uk-northern-ireland-foyle-west-17255505

21st February 2012 News – **Two WWII bombs** detonated near Lincolnshire village
Bomb disposal experts have carried out a controlled explosion on two devices found near Manby in Lincolnshire. Anglian Water found the unexploded World War II shells near the former RAF Manby airfield, opposite the Motorplex building, on Monday. The area was cordoned off and police remained at the scene until experts from the Ministry of Defence explosive ordnance disposal team arrived.
http://www.bbc.co.uk/news/uk-england-lincolnshire-17111021

9th January 2012 News – County Durham road reopens after **WWII shell uncovered**
A road in County Durham was closed after an unexploded WWII shell was found. The shell was found on land at Slaidburn Road, Stanley, near the A693 Chester Road. Durham Police advised people to avoid the area, closing Chester Road and evacuating a local bus depot and nearby garage as a precaution. Catterick's bomb squad carried out a controlled explosion and all cordons have now been lifted.
http://www.bbc.co.uk/news/uk-england-tyne-16473968

13th October 2011 News – **WWII grenades** found near Gatwick Airport
Unexploded World War II hand grenades have been discovered close to Gatwick Airport. Network Rail staff found the explosives while working near Gatwick Airport railway station in West Sussex. A bomb disposal team was called in to carry out a controlled explosion at about 10:50 BST, Sussex Police said. The bomb disposal team found three hand grenades, one four-inch mortar and a smoke grenade in a metal container and identified them as World War II explosives, he added. Outgoing flights from the airport and rail services were halted as a precaution for about 15 minutes but have since resumed. The alert affected train services run by Gatwick Express, Southern, First Capital Connect and First Great Western.
http://www.bbc.co.uk/news/uk-england-sussex-15292719

SKY NEWS Website of the Year — FIRST FOR BREAKING NEWS

M62 Motorway Closed For Detonation Of World War Two Bomb

5:04pm UK, Friday January 04, 2008

A busy motorway has been closed to allow for a wartime bomb to be detonated nearby.

The controlled explosion

Army expertsdestroyed the huge Second World War device in a controlled explosion near the M62.

The motorway was shut in both directions between junctions 37 and 38 as a safety precaution.

The "deeply buried" bomb had lain dormant in an East Yorkshire field for almost 64 years.

The device was discovered by a metal detecting enthusiast on New Year's Eve in a field near the B1230 at Balkholme, near Howden, which was also closed.

An Army bomb disposal team travelled up from Essex to join police, ambulance and fire services and utility companies at the scene.

Captain Tim Ives, of 33 Engineer Regiment, earlier said 10 soldiers would be employed to "reduce the effects of the controlled explosion by packing sand around the device".

Page last updated at 14:45 GMT, Friday, 22 May 2009 15:45 UK

E-mail this to a friend Printable version

Building site WWII bomb exploded

Building site WWII bomb exploded

A controlled explosion has been carried out on a World War II bomb found on a building site in East Sussex.

The 110lb (50kg) SC50 bomb, thought to have been dropped from a German aircraft in 1940 or 1941, was found at the Hollenden House site in Bexhill.

Children at St Peter and St Paul Primary School next door in Buckhurst Road were sent home early after the discovery on Thursday.

Police said a 160ft (50m) cordon was put round the site during the blast.

BBC

14:23 GMT, Thursday, 5 June 2008 15:23 UK

E-mail this to a friend Printable version

Unexploded bomb 'started to tick'

An unexploded World War II bomb started to tick and ooze liquid as experts tried to defuse it, police have said.

The large bomb was found in a river at Sugar House Lane, near Bromley-by-Bow Tube station in east London, on Monday.

Rush-hour travel was disrupted as overnight work to make the bomb safe continued into Thursday morning.

Police commander Simon O'Brien said: "It started to tick and ooze some pretty horrible substances." It stopped ticking when doused with liquid.

'Hero colleague'

"It measures approximately the size and length of a man, and weighs around 1,000kg (2,200lb).

International

FRIDAY, 16 SEPTEMBER, 1994 23

Blown up by history

RESCUE workers search for survivors after a Second World War bomb exploded at a building site in Berlin, killing three people and injuring at least eight others.

A fire brigade spokesman said he feared the final death toll could be higher. One worker was still missing, believed to be trapped under a machine. "We've found human remains 100 metres away but we can't tell if they belong to the dead already found," the spokesman said.

The blast, set off by drilling work on Frankfurter Allee, one of east Berlin's busiest avenues, trapped workers under building machinery and sent huge chunks of concrete tumbling through the air.

A large office block was being built on the site of the explosion which sent shoppers scrambling for shelter and paralysed dense afternoon traffic. One eyewitness said: "There was a bang, then silence, and then it started raining stones and dirt."

Dozens of cars within a 250-metre radius were wrecked and the top two floors of a nearby apartment block caved in.

Radio reports claimed that the total number of injured stood at 14.

BBC Home News Sport Weather iPlayer TV Radio More...

NEWS LIVE BBC NEWS CHANNEL

Page last updated at 14:37 GMT, Wednesday, 2 June 2010 15:37 UK

World War II bomb kills three in Germany

Three people have been killed and six injured trying to defuse a World War II bomb in central Germany.

Workers building a sports stadium had earlier unearthed the bomb in the town of Goettingen.

It was not immediately clear why the bomb, reportedly weighing 500kg (1,100lb), had detonated.

Unexploded WWII bombs dropped by Allied planes are frequently found in Germany, though it is unusual for them to explode unexpectedly.

A special commission is investigating the causes of the explosion, while prosecutors are considering whether the team leader should face charges of manslaughter through culpable negligence, the BBC's Oana Lungescu reports from Berlin.

More than 7,000 people were immediately evacuated when the 500kg bomb was found. Several schools, a kindergarten and local companies remain closed.

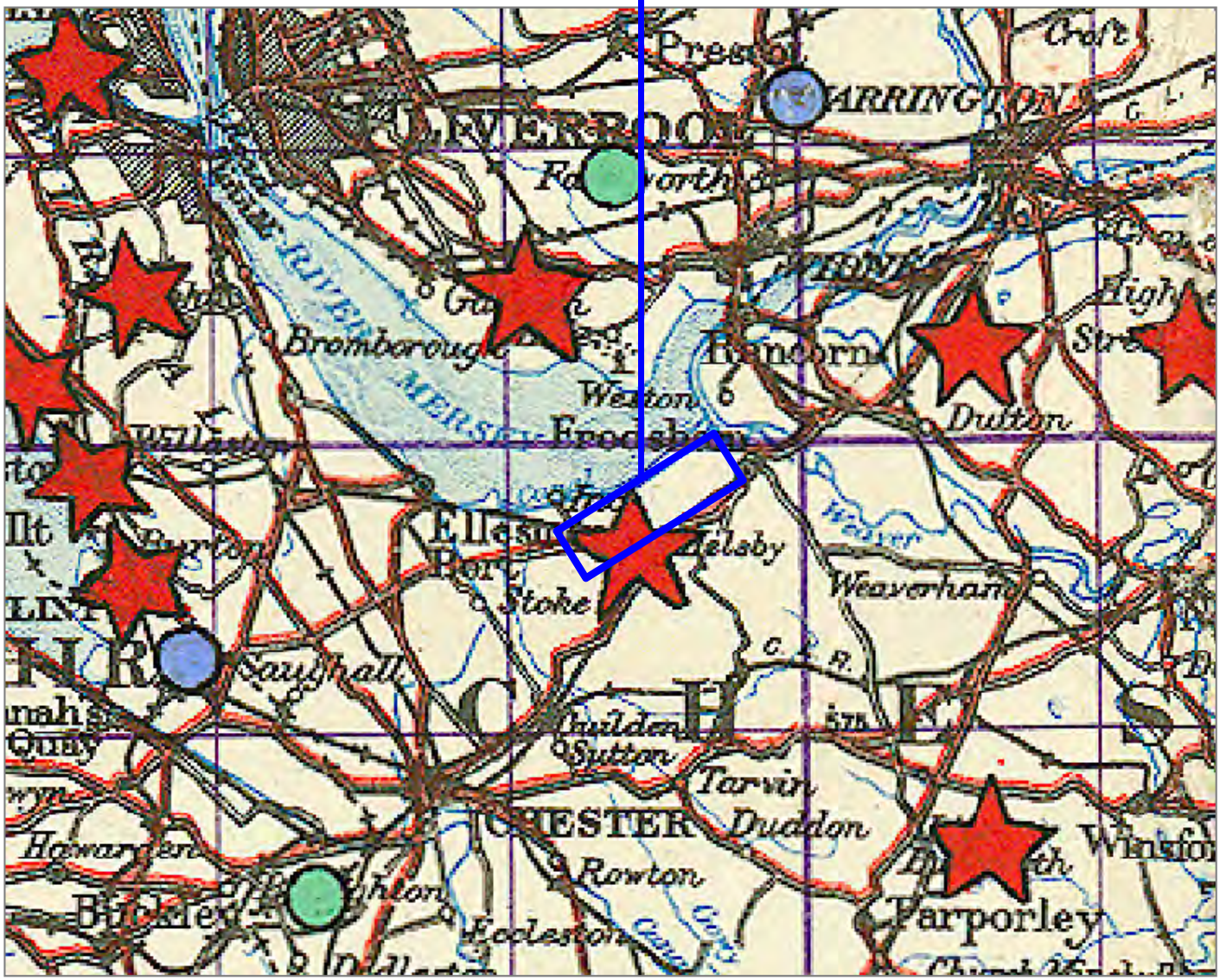
Last week, another device was successfully defused close to the site.

In Berlin, four bombs have been found in the past two months, including one near the capital's main airport.

Top Left: Three people killed and eight injured in Berlin, 1994
Bottom Left: Three people killed in Germany, 2010
Top Right: WWII bomb injures seventeen at construction site in Hattingen, Germany, in September 2008.
Middle Right: WWII Bomb Explodes on German Motorway. A highway construction worker in Germany accidentally struck an unexploded WWII bomb, causing an explosion which killed him and wrecked several passing cars in October 2006.
Bottom Right: Piling rig and dump truck after detonation of Allied UXB, Austria 2006. Emergency teams aiding injured operator

North

General site location



KEY

- Q Site
- SF (with or without QL)
- QF (with or without QL)
- Cover Plan Site
- K Site (with or without Q)
- Dummy Buildings

Report Reference:	Client:	
5057TA	Wardell Armstrong	BACTEC
	Project: Frodsham Wind Farm	

Source: National Archives

Buffer area to account for abandoned bomb location error

North

Report Reference:	Client:	
5057TA	Wardell Armstrong	BACTEC
	Project: Frodsham Wind Farm, Cheshire	
Source:	The Defence of Britain Project - Council for British Archaeology/BACTEC International Ltd	

Study area boundary

Report Reference:	Client:	
5057TA	Wardell Armstrong	BACTEC
	Project: Frodsham Wind Farm	

Source: English Heritage

Study area boundary

North

Report Reference: 5057TA	Client: Wardell Armstrong	BAC TEC
	Project: Frodsham Wind Farm, Cheshire	
Source: Google Earth		

Study area boundary

North

Report Reference: 5057TA	Client: Wardell Armstrong	BAC TEC
	Project: Frodsham Wind Farm, Cheshire	
Source: Google Earth		

1942

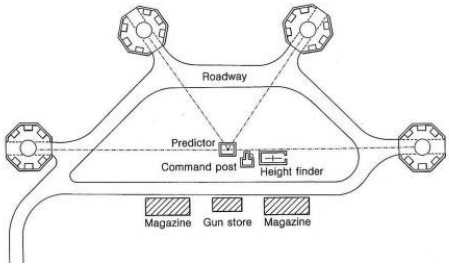
1kg German Incendiary Bomb next to a 30cm ruler

BACTEC 1kg Incendiary finds at a greenfield site in Kent

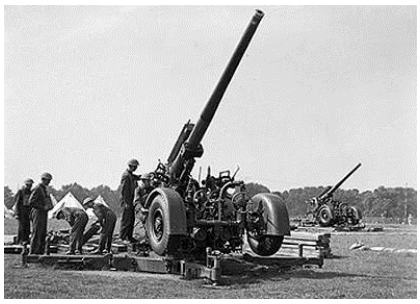
3.7 inch Anti-Aircraft Projectile

Weight:	12.7kg (28lb)
Dimensions:	94 x 360mm (3.7 x 14.7in)
Carriage:	Mobile and Static Versions
Rate of Fire:	10-20 rounds per minute
Ceiling:	9-18,000m (29-59,000ft)
Muzzle Velocity:	792m/s (2,598ft/s)
Remarks:	4.5 inch projectiles were also commonly utilised

This AA shell was uncovered on a construction site in North London in February 2009.



Layout plan for a typical HAA battery site.

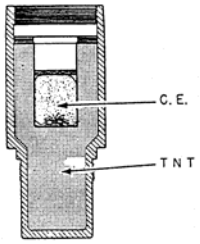


Hyde Park 1939 3.7 Inch QF gun on mobile mounting

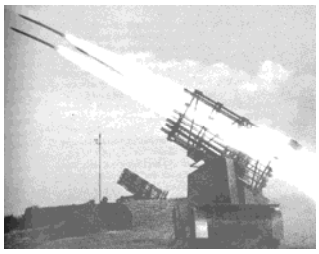
3.7 inch AA Projectile Minus Fuze

Rockets / Unrotated Projectiles

Weight:	Overall: 24.5kg (54lb) Warhead: 1.94kg (4.28lb)
Dimensions:	1930mm x 82.6mm (76 x 3.25in)
Carriage:	Mobile – transported on trailers
Ceiling:	6770m (22,200ft)
Maximum Velocity:	457mps (1,500 fps)

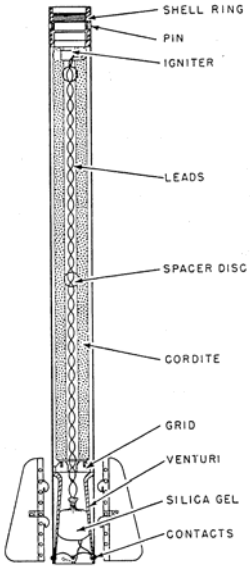


MK II HE Shell (3.5kg)



Rocket Battery in action

Home Guard soldiers load an anti-aircraft rocket at a 'Z' Battery



2" U.P AA Rocket

40mm Bofors Gun Projectile

Weight:	0.86kg (1.96lb)
Dimensions:	40mm x 310mm (1.6in x 12.2in)
Rate of Fire:	120 rounds per minute
Ceiling:	23,000ft (7000m)
Muzzle Velocity:	2,890 ft/s (881m/s)
Remarks:	Mobile batteries – normally few records of where these guns were located

Unexploded 40mm Bofors projectile recovered from a marine environment

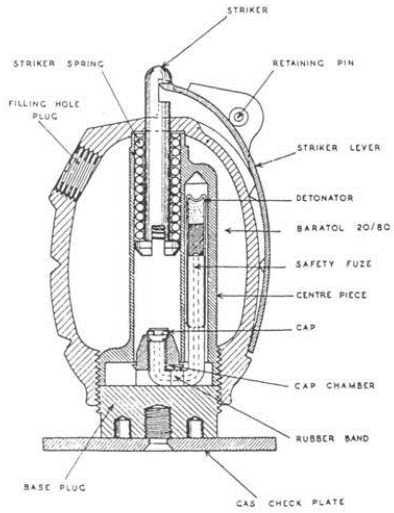
40mm Bofors gun and crew at Stanmore in Middlesex, 28 June 1940.

Report Reference: 5057TA	Client: Wardell Armstrong	BACTEC
	Project: Frodsham Wind Farm	

Source: BACTEC International Limited and various historical sources

No. 36 'Mills' Grenade

Weight:	0.7kg filled (1lb 6oz)
Type:	Hand or discharger, fragmentation
Dimensions:	95 x 61mm (3.7 x 2.4in)
Filling:	Alumatol, Amatol 2 or TNT
Remarks:	4 second hand-throwing fuse with approximate 30m range. First introduced May 1918.



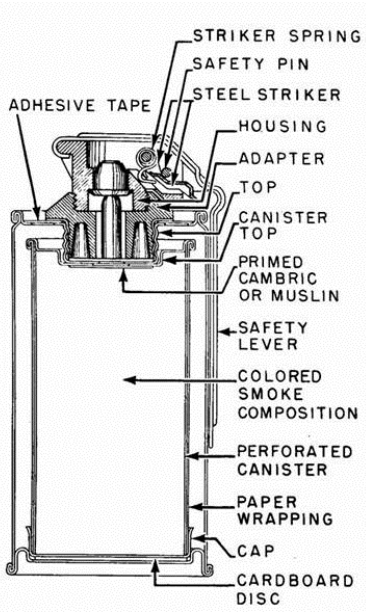
Grenade, .303 inch rifle, No. 36M, Mark I.

No. 69 Grenade

Weight:	0.38kg filled (0.8lb)
Type:	Percussion/Blast
Date Introduced:	December 1940
Remarks:	Black Bakelite body. Blast rather than fragmentation type. After unscrewing the safety cap, a tape is held when throwing the grenade releasing the safety bolt in the throwing motion. Detection is problematic due to its very low metal content.

Typical Smoke Grenade

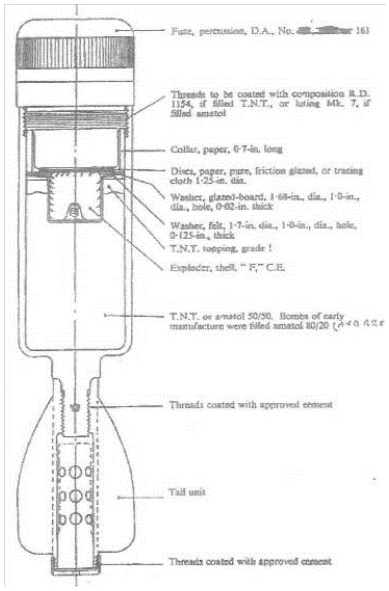
Dimensions:	Approx. 65 x 115mm (2.5 x 4.5in)
Type:	Smoke
Date Introduced:	Current MoD issue
Remarks:	Smoke grenades are used as ground-to-ground or ground-to-air signalling devices, target or landing zone marking devices, and screening devices for unit movement.



Source: BACTEC International Limited and various historical sources

Typical 2 inch High Explosive Mortar

Bomb Weight: 1.02kg (2.25lb)
Type: High Explosive
Dimensions: 51 x 290mm (2in x 11.4in)
Filling: 200g RDX/TNT
Maximum Range: 457m (500yds)
Remarks: Fitted with an impact fuze which detonates the fuze booster charge (exploder) and, in turn, the high explosive charge. The main charge shatters the mortar bomb body, producing near optimum fragmentation and blast effect at the target.

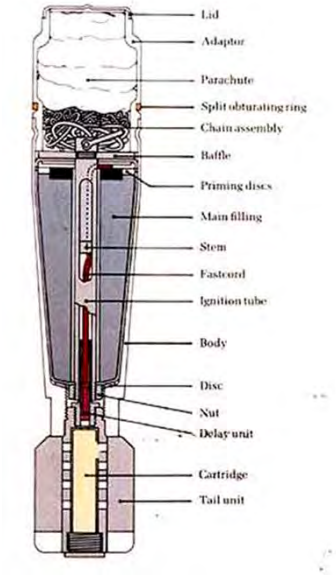


Typical 3 inch Smoke Mortar

Type: Smoke
Dimensions: c490 x 76mm (19.3in x 3in)
Filling: Typically white phosphorous
Maximum Range: 2515m (2,750yds)
Remarks: On impact, the fuze functions and initiates the bursting charge. The bursting charge ruptures the mortar bomb body and disperses the white phosphorous filler. The white phosphorous produces smoke upon exposure to the air.

Typical 2 inch Illuminating Mortar

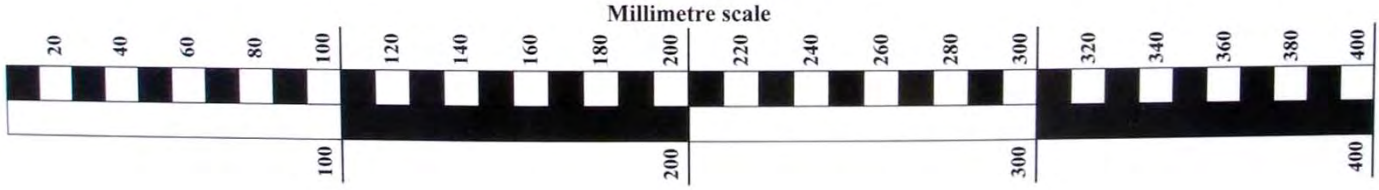
Type: Illum.
Dimensions: 51 x 290mm
Filling: Various
Remarks: The expulsion charge ignites and ejects the candle assembly. A spring ejects the parachute from the tail cone. The parachute opens, slowing the descent of the burning candle which illuminates the target.



Report Reference:	Client:	
5057TA	Wardell Armstrong	BACTEC
	Project: Frodsham Wind Farm	

Source: BACTEC International Limited and various historical sources

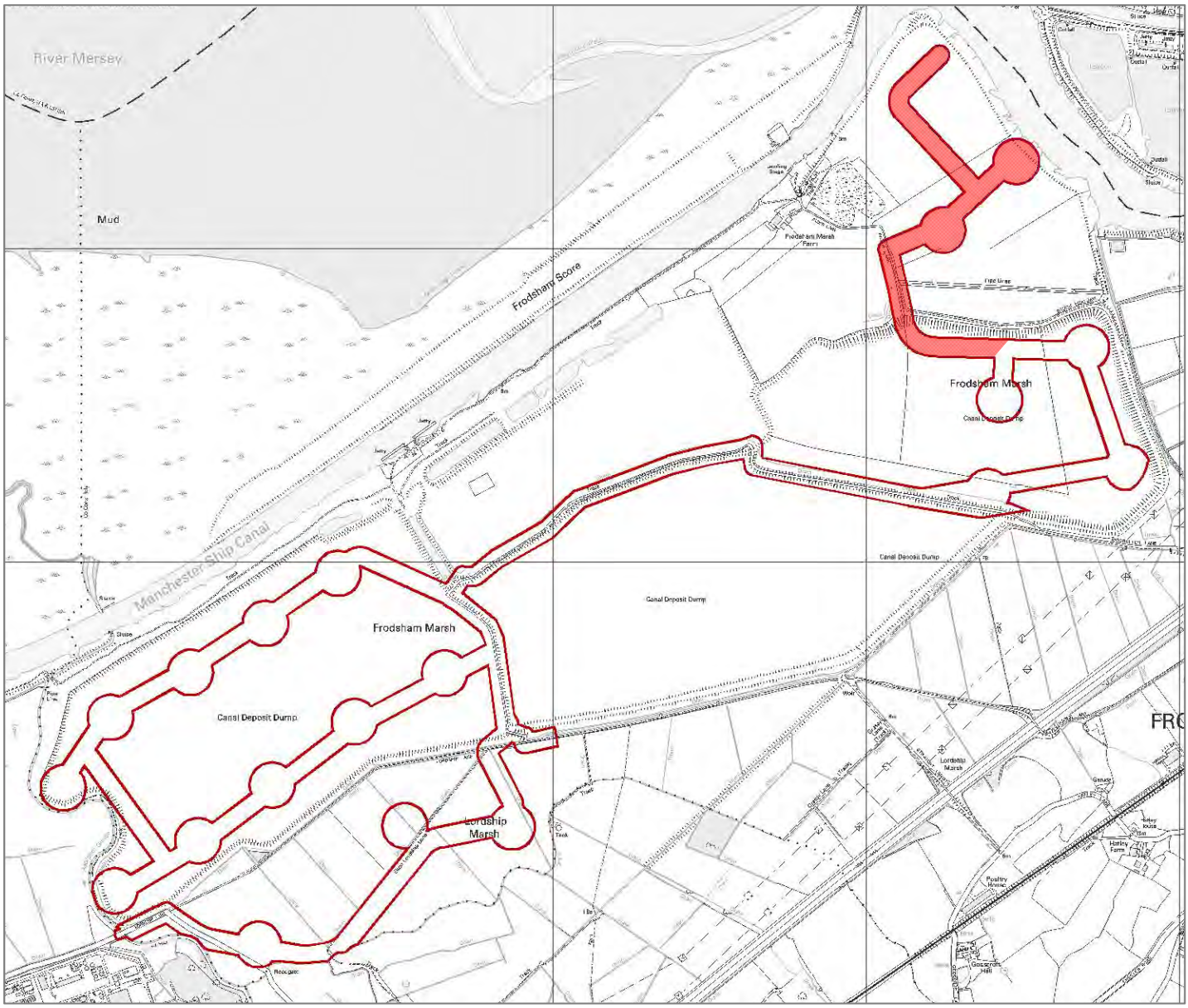
Small arms ammunition and cannon rounds up to 30mm



Recovered British WWII-era SAA

North

Map for information purposes only



High Risk Zone

Danger area containing the suspected abandoned British AA shell

Medium-High Risk Zone

Remainder of the study area

Report Reference:	Client:	
5057TA	Wardell Armstrong	BACTEC
	Project: Frodsham Wind Farm	

Source: Wardell Armstrong / BACTEC

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Website: www.bactec.com

THE QUEEN'S AWARDS FOR ENTERPRISE 2008

Appendix 2

“Factual Ground Investigation Report”, Van Elle, January 2014 including Static CPT (Cone Penetration Tests) Report

Factual Ground Investigation Report

Frodsham Windfarm, Brook Furlong, Off Marsh Lane, Frodsham, Cheshire

Client: Peel Wind Farms (Frodsham) Ltd

Job Number: G131520

Date of Issue: 27/01/14

Document Control

Project Title	Frodsham Windfarm, Brook Furlong, Off Marsh Lane, Frodsham, Cheshire		Project Ref	G131520
Report Prepared By	[redacted], Graduate Geotechnical Engineer			
Report Approved By	Andrew Johnston (BSc)			
Issue No	Status	Date	Approved For Issue	
3	Current	18.02.2014	AJ	

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Part 1: Investigation Report

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6.0 APPENDIX

Appendix 1:

(i) Windowless Sampling
(ii) Dynamic Probing
(iii) Cable Percussive
(iv) CPT results
(v) Location Plans

Appendix 2: Geotechnical Testing Results

1.0 TERMS OF REFERENCE

1.1 The Ground Investigation was carried out between the 12th October and 22nd November 2013 employing windowless sampling, dynamic probing and cable percussive drilling techniques to advance twenty-five boreholes within the footprint of the proposed development in order to obtain samples for descriptive and testing purposes. A further twenty-one cone penetration tests were also undertaken throughout the site. This investigation adhered to the guidelines outlined in both BS5930:1999, Code of practice for Site Investigations and BS1377:1990, Soils for Civil Engineering Purposes.

1.2 The site of the proposed development is situated in the rural area in the north west environs of the town of Frodsham. The site is located approximately 2.8 km due east north east of Ince & Elton railway station, 3.9 km due west of the town of Frodsham and 7.2 km to the south west of the town of Runcorn.

1.3 In light of the proposed development, this investigation has been tasked with identifying and sampling the underlying strata as well as subsequent laboratory testing and presentation of all data relating to the investigation within a factual report.

1.4 The investigation comprised of a geotechnical ground investigation that can be subdivided into two principal components:

First Phase
Intrusive investigation comprising five cable percussive boreholes, twenty windowless sample boreholes and twenty-one cone penetration tests.

Second Phase
Geotechnical Laboratory Testing.
Factual Reporting.

1.5 The conclusions and recommendations made in this report are limited to those that can be made based on the findings of the investigation. Where comments are made based on information obtained from third parties, Van Elle assumes that all third party information is true and correct. No independent action has been undertaken to validate the findings of third party information, unless specifically stated.

This report has been prepared in accordance with our understanding of current best practice. However, new information or legislation, or changes to best practice may necessitate revision of the report after the date of its issue.
Van Elle has prepared this report for the sole use and reliance of the Client; Peel Wind Farms (Frodsham) Ltd and their appointees/project teams, in accordance with our standard Conditions and Limitations. This report may not be used or relied upon by any third party without the explicit written agreement of Van Elle.

The ground is a product of continuing natural and artificial process. As a result, the ground will exhibit a variety of characteristics that vary from place to place across a site, and also with time.

The Borehole Logs given in this report were prepared for the sole benefit of the client in accordance with their brief. As such these do not necessarily address all aspects of the ground behaviour on site.

This report relates to the proposed development at Frodsham Windfarm, Brook Furlong, Off Marsh Lane, Frodsham, Cheshire. Attention is drawn to the fact that the findings are based on data obtained from the trial holes and associated laboratory and in-situ testing. The possibility of variation in ground conditions around the trial holes should not be overlooked. Any opinion or diagram of a possible configuration of strata beyond the trial holes or extrapolated to greater depth is conjectural and given for guidance only. No liability can be accepted for such variations.

Ownership of land brings with it onerous legal liabilities in respect of harm to the environment. "Contaminated Land" is defined in Section 57 of the Environment Act 1995 as "Land which is in such a condition by reason of substances in, or under the land that significant harm is being caused or that pollution of controlled waters is being, or is likely to be caused". This investigation was undertaken in good faith with regards to the request and requirements of the client at the time of quotation, it does not constitute a full interpretative report with regards to the geotechnical or environmental status of the site. There may be other sources of information not included in this report that hold data relevant to the site that could materially affect the conclusions made in this report.

2.0 THE SITE

2.1 The site comprises an area of land (570.0 Hectares) to the north west of the town of Frodsham, Cheshire. The area under analysis is centred around the approximate Ordnance Survey National Grid Reference SJ 489 777. A site plan is included within Appendix 1, shown the location of the site and the exploratory hole locations.

2.2 Beyond the above referenced details, no previous intrusive investigations were made available for review prior to the investigation.

3.0 GROUND INVESTIGATION STRATEGY

The Ground Investigation was carried out between the 12th October and 22nd November 2013 employing windowless sampling, dynamic probing, cable percussive, and cone penetration techniques to advance the exploratory boreholes. This investigation adhered to the guidelines outlined in both BS5930:1999, Code of practice for Site Investigations and BS1377:1990, Soils for Civil Engineering Purposes.

3.1 Boreholes

3.1.1 During the investigation five boreholes were intruded using cable percussive drilling techniques to depths of between 20.45 m and 43.45 m bgl. There were also twenty windowless sample boreholes intruded to depths of between 1.4 m and 5.45 m bgl, continued to a depth of 10.1 m bgl. In addition to the exploratory boreholes, a further twenty one cone penetration tests were advanced from depths of between 6.87 m and 24.48 m bgl.

3.1.2 Within the boreholes, insitu Standard Penetration Test (SPT) were conducted to ascertain 'N' values of the various lithologies encountered. This test acts as a proxy to ascertain the strength of the material encountered. During the investigation, disturbed, undisturbed and bulk samples were recovered at pre-determined intervals and at every strata change for descriptive purposes and subsequent laboratory testing. Refer to Chapter 6: Appendices that contains all the produced Borehole Logs.

3.2 Laboratory Testing

3.2.1 Samples were transported to the laboratory in order to obtain more accurate classification of the underlying strata. These samples will be tested to the following parameters:

Moisture Content
Plasticity Index/Atterberg Limits
Quick Undrained Triaxial Analysis
Particle Size Distribution

3.2.2 Any samples retained on the premises of Van Elle Limited will be kept until week commencing 20th January 2013, after which they will be disposed of. Despite the fact testing has been requested, if you do require any further laboratory test scheduling, please contact Van Elle prior to the despatch date.

4.0 RESULTS OF THE INVESTIGATION

This chapter discusses the geological and geotechnical ground conditions encountered during the ground investigation. Please refer to Chapter 6: Appendices for a more detailed account of the conditions encountered during the investigation.

4.1 Made Ground & Topsoil

Made ground was recorded within all cable percussive boreholes, with the exception of SA3, to depths of between 6.8 m and 8.5 m bgl, and in all of the windowless sample explorations from ground level to depths of up to 5.45 m bgl. Made ground mainly comprised of clayey silt and sand deposits with iron slag toward ground level then ash and coal observed in deeper regions of the made ground, accompanied by a slight hydrocarbon odour in many of the exploratory holes. Due to the former use of much of the site, variation in terms of occurrence, depth and composition may occur.

4.2 Superficial Strata

Superficial strata was not observed any of the windowless sample boreholes, from ground level to 5.45m bgl, the full depth of the windowless sample boreholes. In the cable percussive boreholes superficial strata was observed from ground level to 31.9 m bgl in SA3 and to a maximum depth of 43.45 m bgl in SA5.

Within SA1, superficial deposits were generally observed to mostly comprise cohesive deposits of sandy or silty clay from ground level to 29.2 m bgl subdivided into four separate units. From ground level to 12.6 m bgl a unit of very soft clay was encountered the appearance and description of which appears to be consistent with that of dredged material. After this a band of peat was observed from 12.6 m to 13.1 m bgl, followed by a band of silt to 13.7 m bgl, then a unit of medium to very dense sand to 19.2 m bgl, and finally a unit of stiff to very stiff clay to 29.2m bgl, whereupon the weathered upper horizons of the underlying solid strata was encountered.

Other cable percussive boreholes revealed a similar pattern of strata: dredging material towards the surface (although not in SA3), with a greater amount peat found in SA4. This difference in SA3 might be due to the borehole being installed outside the ‘lagoon’. SA2 refused at 20.45 m bgl, 3 m into a band of very dense sand. Based upon the descriptions, it is likely that the succession of superficial strata is indicative of alluvial deposits, formed by various deposition processes acting above the underlying solid lithology below over prolonged period of time.

4.3 Solid Geology

Samples of solid strata were recovered from boreholes SA1 and SA3 from depths of 29.2 m and 31.8 m bgl respectively, each to the base of the borehole. The solid strata sampled from SA1 and SA3 was a red brown sandstone in which rig refusal was achieved. In boreholes SA2, SA4 and SA5, no solid geology was encountered, with only superficial strata being recorded.

Based upon the engineer's descriptions in conjunction with the published data available for the region, it is likely that the sandstone and sand revealed towards the base of the boreholes is likely to be indicative of the Wilmslow Sandstone Formation of Early Triassic age.

4.4 Groundwater

Groundwater strikes are recorded as per the table below. Changes in groundwater level do occur for a number of reasons, including seasonal effects and variations in drainage. The long term groundwater elevation could increase at some time in the future.

Borehole No	Groundwater Strike 1 (m bgl)		Groundwater Strike 2 (m bgl)		Groundwater Strike 3 (m bgl)	
	Strike Depth:	Rising to:	Strike Depth:	Rising to:	Strike Depth:	Rising to:
SA1	10.2	10.2	11.0	11.0	-	-
SA2	5.4	5.4	9.4	9.4	9.7	9.7
SA3	8.7	5.6	10.0	8.2	11.4	11.4
SA4	13.1	11.2	26.7	9.5	-	-
SA5	2.9	2.9	9.95	8.4	26.9	14.1
WS1	5	5	-	-	-	-
WS2	2.7	2.7	-	-	-	-
WS3	2.9	2.9	-	-	-	-
WS4	2.0	2.0	-	-	-	-
WS5	3.0	3.0	-	-	-	-
WS6	4.0	4.0	-	-	-	-
WS7	2.9	2.9	-	-	-	-
WS8	3.0	3.0	-	-	-	-
WS9	3.2	3.2	-	-	-	-
WS10	3.6	3.6	-	-	-	-
WS11	2.8	2.8	-	-	-	-
WS12	2.5	2.5	-	-	-	-
WS13	3.25	3.25	-	-	-	-
WS14	2.0	2.0	-	-	-	-
WS15	2.0	2.0	-	-	-	-
WS16	-	-	-	-	-	-
WS16A	-	-	-	-	-	-
WS17	3.0	3.0	-	-	-	-
WS18	-	-	-	-	-	-
WS19	-	-	-	-	-	-
WS20	4.0	4.0	-	-	-	-

5.0 REFERENCES

British Geological Survey (BGS – formerly the Institute of Geological Sciences (IGS)) 1:50,000 Series Sheet E097, 'Runcorn' (1977), Bedrock & Superficial Drift Edition.

6.0 APPENDIX

Appendix 1: (i) Windowless Sampling

(ii) Dynamic Probing

(iii) Cable Percussive

(iv) CPT results

(v) Site Location Plans

Appendix 2: Geotechnical Testing Results

Appendix 1: (i) Windowless Sampling

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BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				WS1
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	16-09-13 16-09-13	5.40	E 347,776.1 N 376,884.7	
Contractor				Sheet
				1 of 1

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
0.00	D1				0.20	Dark brown sandy gravelly SILT. Sand is fine to medium. Gravel is fine to medium sub angular iron slag. MADE GROUND.		
0.20	D2				0.50	Dark grey mottled light brown sandy SILT. Sand is fine. MADE GROUND.		
0.50	D3				(0.80)	Very soft light brown sandy silty CLAY. MADE GROUND.		
1.00-1.45	SPT	N=0			1.30			
1.30	D4					Very soft light grey locally light brown silty CLAY. Fine sand bands. MADE GROUND. From 2.3 m bgl; sand bands becoming absent.		
2.00-2.45	SPT	N=1			(1.45)			
2.30	D5				2.75			
2.75	D6					Very loose dark brown peaty SILT. Frequent organic fragments. MADE GROUND.		
3.00-3.45	SPT	N=1			(0.75)			
3.50	D7				3.50	Very soft light greyish brown silty CLAY. MADE GROUND. From 4.2 m bgl; becoming grey with slight hydrocarbon odour.		
4.00-4.45	SPT	N=1						
4.50	D8				(1.95)			
5.00-5.45	SPT	N=2	▼		5.45			

Boring Progress and Water Observations						Chiselling			Water Added	
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To

GENERAL REMARKS

Groundwater was encountered at 5.0 m bgl. The borehole was cased to 1 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

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BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS10**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	12-09-13 12-09-13	11.41	E 348,694.4 N 377,937.7	
Contractor				Sheet
				1 of 1

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
0.00	D1				(1.10)	Dark brown sandy SILT. Sand is fine. MADE GROUND.		
1.00-1.45	SPT	N=13			1.10			
1.10	D2				(0.50)	Firm dark grey very silty CLAY. MADE GROUND.		
1.60	D3				1.60	Stiff grey mottled orange brown CLAY. MADE GROUND.		
2.00-2.45	SPT	N=17			(1.20)			
2.60	D4				2.80			
2.80	D5					Dense, becoming medium dense with depth, light brown SAND. Sand is fine. MADE GROUND. From 4.0 m bgl; becoming medium dense.		
3.00-3.45	SPT	N=31	1		(1.45)			
3.80	D6							
4.00-4.45	SPT	N=23			4.25			
4.25	D7				(1.20)	Stiff dark brown slightly sandy silty CLAY. Sand is fine. Very rare fine sub rounded to sub angular coal fragments. MADE GROUND.		
5.00-5.45	SPT	N=21			5.45			

Boring Progress and Water Observations						Chiselling			Water Added	
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To

GENERAL REMARKS

Groundwater was encountered at 3.6 m bgl. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

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BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS11**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	12-09-13 12-09-13	9.72	E 349,008.6 N 378,139.6	
Contractor				Sheet
				1 of 1

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
0.00	D1				0.25	Dark brown sandy SILT. Sand is fine. MADE GROUND.		
0.25	D2				(0.50) 0.75	Light brown SAND. Sand is fine. MADE GROUND.		
0.75	D3					Soft dark grey silty CLAY. Slight hydrocarbon odour. MADE GROUND.		
1.00-1.45	SPT	N=4						
					(1.65)			
1.75	D4							
2.00-2.45	SPT	N=7						
					2.40			
2.40	D5				2.60	Dark brown sandy gravelly CLAY. Sand is fine to medium. Gravel is fine to medium subrounded ash. MADE GROUND.		
2.60	D6		▼1			Very soft dark grey silty CLAY. MADE GROUND.		
3.00-3.45	SPT	N=0						
3.60	D7							
4.00-4.45	SPT	N=4			(2.85)			
4.60	D8							
5.00-5.45	SPT	N=2						
					5.45			

Boring Progress and Water Observations						Chiselling			Water Added	
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To

GENERAL REMARKS

Groundwater was encountered at 2.8 m bgl. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

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BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS12**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	13-09-13 13-09-13	9.56	E 349,356.9 N 378,304.7	
Contractor				Sheet
				1 of 1

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
0.00	D1				(0.80)	Dark brown sandy SILT. Sand is fine. MADE GROUND.		
					0.80			
0.80	D2				(0.50)	Very soft dark brown stained black silty CLAY. MADE GROUND.		
1.00-1.45	SPT	N=0			1.30			
1.30	D3				(0.60)	Dark grey CLAY. Slight hydrocarbon odour. MADE GROUND.		
					1.90			
1.90	D4				(0.45)	Very loose dark greyish brown SAND. Sand is fine to medium with a little coarse. MADE GROUND.		
2.00-2.45	SPT	N=0			2.35			
2.35	D5		▼1		(0.45)	Dark brown slightly sandy silty CLAY. Sand is fine to medium. Frequent organic fragments. MADE GROUND.		
					2.80			
2.80	D6					Very soft dark grey slightly silty CLAY. MADE GROUND. From 3.5 m bgl; becoming dark grey mottled brown.		
3.00-3.45	SPT	N=1						
3.80	D7				(2.65)			
4.00-4.45	SPT	N=2						
4.80	D8							
5.00-5.45	SPT	N=2						
					5.45			

Boring Progress and Water Observations						Chiselling			Water Added	
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To

GENERAL REMARKS

Groundwater was encountered at 2.5 m bgl. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

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BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS13**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	13-09-13 13-09-13	13.51	E 349,757.3 N 378,276.2	
Contractor				Sheet
				1 of 1

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
0.00	D1				0.25	Light brown sandy gravelly SILT. Sand is fine. Gravel is fine to medium sub rounded to sub angular iron slag. Occasional rootlets. MADE GROUND.		
0.25	D2				0.50			
0.50	D3					Light brown gravelly SAND. Sand is fine to medium Gravel is fine to medium sub rounded to sub angular. MADE GROUND.		
					(0.75)	Very soft dark brown silty very sandy CLAY. Sand is fine to medium. Occasional organic fragments. MADE GROUND.		
1.00-1.45	SPT	N=2			1.25			
1.25	D4					Very soft dark grey silty CLAY. Slight hydrocarbon odour. MADE GROUND.		
2.00-2.45	SPT	N=0						
2.25	D5				(2.35)			
3.00-3.45	SPT	N=2	▼					
3.25	D6				3.60			
3.60	D7					Firm, becoming stiff with depth, light brown mottled grey silty sandy CLAY. Sand is fine. MADE GROUND. From 5.0 m bgl; becoming stiff.		
4.00-4.45	SPT	N=11			(1.80)			
4.60	D8							
5.00-5.45	SPT	N=25			5.40			
					5.45	Dense red brown SAND. MADE GROUND.		

Boring Progress and Water Observations						Chiselling			Water Added	
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To

GENERAL REMARKS

Groundwater was encountered at 3.25 m bgl. The borehole was cased to 1 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

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BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS14**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	16-09-13 16-09-13	12.83	E 350,044.0 N 378,230.5	
Contractor				Sheet
				1 of 1

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
0.00	D1				0.30	Dark brown sandy gravelly SILT. Sand is fine Gravel is fine to medium sub rounded iron slag. MADE GROUND.		
0.30	D2				0.50	Light brown SAND. Sand is fine to medium. MADE GROUND.		
0.50	D3				0.60	Dark brown sandy SILT. Sand is fine. MADE GROUND.		
0.60	D4				0.90	Light brown SAND. Sand is fine to coarse. MADE GROUND.		
0.90	D5					Very loose dark brown sandy SILT. Sand is fine. MADE GROUND.		
1.00-1.45	SPT	N=1			(0.60)			
					1.50			
1.50	D6					Soft dark grey silty CLAY. Slight hydrocarbon odour. MADE GROUND.		
2.00-2.45	SPT	N=4			(1.00)			
					2.50			
2.50	D7					Frim light greyish brown sandy CLAY. Sand is fine. Occasional fine gravels. From 3.4 m bgl; becoming silty. MADE GROUND.		
3.00-3.45	SPT	N=10			(1.00)			
					3.50			
3.50	D8					Medium dense dark grey slightly gravelly SILT. Gravel is fine to medium sub rounded to sub angular ash and coal. MADE GROUND.		
4.00-4.45	SPT	N=10			(0.90)			
					4.40			
4.40	D9					Stiff dark brown silty CLAY. MADE GROUND.		
5.00-5.45	SPT	N=26			(1.05)			
					5.45			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Groundwater was not encountered. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

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BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS15**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	16-09-13 16-09-13	12.44	E 350,462.2 N 378,157.1	
Contractor				Sheet
				1 of 1

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
0.00	D1				(0.40) 0.40	Light brown sandy gravelly SILT. Sand is fine. Gravels are fine to medium sub rounded to sub angular flint. MADE GROUND.		
0.40	D2					Very soft light brown sandy silty CLAY. Sand is fine. MADE GROUND.		
1.00-1.45	SPT	N=0			(1.40)			
1.40	D3				1.80			
1.80	D4					Very soft dark grey silty CLAY. Fine sand bands. Slight hydrocarbon odour. MADE GROUND.		
2.00-2.45	SPT	N=2			(0.70) 2.50			
2.50	D5					Frim, becoming stiff with depth, dark grey stained black silty CLAY. MADE GROUND. From 3.2 m bgl; becoming light brown and less silty. From 4.4 m bgl; becoming stained orange. From 5.0 m bgl; becoming stiff.		
3.00-3.45	SPT	N=11						
3.50	D6							
4.00-4.45	SPT	N=14			(2.95)			
4.50	D7							
5.00-5.45	SPT	N=23						
					5.45			

Boring Progress and Water Observations						Chiselling			Water Added	
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To

GENERAL REMARKS

Groundwater was not encountered. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

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BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS16**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	19-09-13 19-09-13	5.67	E 350,962.7 N 378,326.5	
Contractor				Sheet
				1 of 1

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
0.00	D1				0.20	Dark brown sandy SILT. Sand is fine. Occasional rootlets. MADE GROUND.		
0.20	D2				(0.50)	Dark brown gravelly SAND. Sand is fine to medium with a little coarse. Gravel is fine to medium sub rounded to sub angular flint. MADE GROUND.		
0.70	D3				0.70			
1.00-1.40	SPT	N=50/200mm			(0.70)	Light brown sandy silty CLAY. Sand is fine. MADE GROUND.		
					1.40			

Boring Progress and Water Observations						Chiselling			Water Added	
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To

GENERAL REMARKS

Drilling terminated at 1.4 m bgl due to pushing obstruction. Groundwater was not encountered. The borehole was backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 UK BH G131520.GPJ AGS3_ALL.GDT 17/2/14

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BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS16A**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	19-09-13 19-09-13	5.75	E 350,964.2 N 378,323.5	
Contractor				Sheet
				1 of 1

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
0.00	D1				0.20	Dark brown sandy SILT. Sand is fine. Occasional rootlets. MADE GROUND.		
0.20	D2				0.50	Light brown sandy GRAVEL. Sand is fine to medium. Gravel is fine to medium sub rounded to sub angular flint. MADE GROUND.		
0.50	D3				0.80	Dark brown gravelly SAND. Sand is fine to medium with a little coarse. Gravel is fine to medium sub rounded to sub angular flint. MADE GROUND.		
0.80	D4				(0.65)			
1.00-1.45	SPT	N=50/295mm			1.45	Light brown sandy silty CLAY. Sand is fine. MADE GROUND.		
1.45	D5							

Boring Progress and Water Observations						Chiselling			Water Added	
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To

GENERAL REMARKS

Drilling terminated at 1.45 m bgl due to pushing obstruction. Groundwater was not encountered. The borehole was backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 UK BH G131520.GPJ AGS3_ALL.GDT 17/2/14

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BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS17**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	19-09-13 19-09-13	11.08	E 350,408.1 N 378,759.5	
Contractor				Sheet
				1 of 1

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
0.00	D1				0.25	Dark brown sandy gravelly SILT. Sand is fine. Gravel is fine to medium sub rounded to sub angular iron slag and flint. MADE GROUND.		
0.25	D2				0.50			
0.50	D3				0.80	Light grey locally dark grey GRAVEL. Gravel is fine to coarse sub rounded to sub angular flint. Occasional cobbles. MADE GROUND.		
0.80	D4					Orange brown gravelly silty SAND. Sand is fine to medium. Gravel is fine to medium sub rounded to sub angular flint. MADE GROUND.		
1.00-1.45	SPT	N=4			(0.80)	Soft light greyish brown silty CLAY. Occasional organic fragments. MADE GROUND.		
					1.60			
1.60	D5					Very soft dark grey silty CLAY. MADE GROUND. From 2.2m to 3.4m bgl; becoming light greyish brown with occasional fine sand bands.		
2.00-2.45	SPT	N=0						
2.60	D6		1					
3.00-3.45	SPT	N=2						
					(3.85)			
3.60	D7							
4.00-4.45	SPT	N=2						
4.60	D8							
5.00-5.45	SPT	N=1						
					5.45			

Boring Progress and Water Observations						Chiselling			Water Added	
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To

GENERAL REMARKS

Groundwater was encountered at 3.0 m bgl. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 UK BH G131520.GPJ AGS3_ALL.GDT 17/2/14

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BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS18**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	23-09-13 23-09-13	14.05	E 350,108.2 N 378,789.1	
Contractor				Sheet
				1 of 1

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
0.00	D1				0.25	Dark brown sandy SILT. Sand is fine. Frequent rootlets. MADE GROUND.		
0.25	D2				(0.95)	Stiff light brown gravelly silty CLAY. Gravel is fine to medium sub rounded to sub angular flint. MADE GROUND.		
1.00-1.45	SPT	N=17			1.20			
1.20	D3				(1.00)	Firm dark brown silty CLAY. Frequent fine sand bands. MADE GROUND.		
2.00-2.45	SPT	N=10			2.20			
2.20	D4				(0.70)	Dark grey sandy silty CLAY. Sand is fine to medium. MADE GROUND.		
2.90	D5				2.90			
3.00-3.45	SPT	N=9			(0.50)	Firm dark brownish grey silty CLAY. Occasional fine sub rounded gravels. MADE GROUND.		
3.40	D6				3.40	Firm light brown mottled orange silty CLAY. MADE GROUND. From 4.2m bgl; occasional fine sand bands.		
4.00-4.45	SPT	N=8			(1.60)			
4.40	D7							
5.00-5.45	SPT	N=27			5.00			
					(0.45)	Medium dense reddish brown SAND. Sand is fine to medium. MADE GROUND.		
					5.45			

Boring Progress and Water Observations						Chiselling			Water Added	
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To

GENERAL REMARKS

Groundwater was not encountered. The borehole was cased to 1 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 UK BH G131520.GPJ AGS3_ALL.GDT 17/2/14

Van Elle Limited

Telephone:
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BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				WS19
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	20-09-13 20-09-13	14.21	E 349,738.6 N 378,603.5	
Contractor				Sheet
				1 of 1

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
0.00	D1				0.20	Dark brown sandy SILT. Sand is fine. Frequent organic material. MADE GROUND.		
0.20	D2				(0.60)	Light brown gravelly SAND. Sand is fine to medium. Gravel is fine to medium sub rounded to sub angular iron slag. MADE GROUND.		
0.80	D3				0.80	Medium dense light brown sandy GRAVEL. Sand is fine to medium. Gravel is fine to medium sub rounded to sub angular iron slag and flint. MADE GROUND.		
1.00-1.45	SPT	N=16			1.10			
1.10	D4				1.30			
1.30	D5				(0.80)	Medium dense dark brown sandy SILT. Sand is fine. MADE GROUND.		
2.00-2.45	SPT	N=14			2.10	Light brown silty gravelly SAND. Sand is fine to medium. Gravel is fine to medium sub rounded to sub angular flint. Occasional organic material. MADE GROUND.		
2.10	D6				(0.40)	Firm dark brown locally black sandy silty CLAY. Sand is fine. MADE GROUND.		
2.50	D7				2.50	Firm dark greyish brown silty CLAY. Slight hydrocarbon odour. MADE GROUND. From 2.9m to 3.7m bgl; locally black and rare fine sand bands. From 4.1m bgl; becoming mottled orange.		
3.00-3.45	SPT	N=15						
3.50	D8				(2.50)			
4.00-4.45	SPT	N=14						
4.50	D9				5.00			
5.00-5.45	SPT	N=31			(0.45)	Dense reddish brown SAND. Sand is fine to medium. MADE GROUND.		
					5.45			

Boring Progress and Water Observations					
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Chiselling			Water Added	
From	To	Hours	From	To

GENERAL REMARKS

Groundwater was not encountered. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 UK BH G131520.GPJ AGS3_ALL.GDT 17/2/14

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BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				WS2
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	17-09-13 17-09-13	5.47	E 347,602.8 N 377,170.8	
Contractor				Sheet
				1 of 1

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
0.00	D1				0.25	Dark brown silty GRAVEL. Gravel is fine to coarse sub rounded to sub angular iron slag. MADE GROUND.		
0.25	D2				0.50	Dark brown SAND. Sand is fine to medium. Occasional fine iron slag and flint gravels. MADE GROUND.		
0.50	D3				(0.60)	Very soft dark greyish brown sandy silty CLAY. Sand is fine to medium. MADE GROUND.		
1.00-1.45	SPT	N=0			1.10			
1.10	D4					Soft light grey mottled orange brown silty CLAY. Very rare fine gravels. MADE GROUND.		
2.00-2.45	SPT	N=4			(1.70)			
2.10	D5		▼					
2.80	D6				2.80			
3.00-3.45	SPT	N=8			(0.60)	Firm dark grey sandy silty CLAY. Sand is fine. Frequent organic fragments. MADE GROUND.		
3.40	D7				3.40			
4.00-4.45	SPT	N=0			(0.90)	Very loose dark brown peaty SILT. Frequent organic fragments. MADE GROUND.		
4.30	D8				4.30			
5.00-5.45	SPT	N=3			(1.15)	Very soft light grey silty CLAY. Frequent organic fragments. MADE GROUND.		
					5.45			

Boring Progress and Water Observations					
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Chiselling			Water Added	
From	To	Hours	From	To

GENERAL REMARKS

Groundwater was encountered at 2.7 m bgl. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 UK BH G131520.GPJ AGS3_ALL.GDT 17/2/14

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Telephone:
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BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS20**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	23-09-13 23-09-13	12.06	E 350,060.5 N 379,063.2	
Contractor				Sheet
				1 of 1

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
0.00	D1				0.30	Light brown sandy silty GRAVEL. Sand is fine. Gravel is fine to medium sub rounded to sub angular iron slag. MADE GROUND.		
0.30	D2				(0.50) 0.80	Dark brown locally black sandy SILT. Occasional fine flint gravels. MADE GROUND.		
0.80	D3					Soft dark brown silty CLAY. Occasional fine sandy bands. MADE GROUND.		
1.00-1.45	SPT	N=4			(0.80) 1.60			
1.60	D4				(0.50) 2.10	Very loose dark grey silty SAND. Sand is fine to medium with a little coarse. MADE GROUND.		
2.00-2.45	SPT	N=0				Very soft dark grey sandy silty CLAY. Sand is fine to medium. Occasional fine ash gravels. MADE GROUND.		
2.10	D5							
3.00-3.45	SPT	N=1			(1.90)			
3.10	D6		▼1					
4.00	D7				4.00	Very soft dark grey mottled light brown silty CLAY. Rare fine sand bands. MADE GROUND.		
4.00-4.45	SPT	N=3			(1.45)			
5.00-5.45	SPT	N=4			5.45			

Boring Progress and Water Observations						Chiselling			Water Added	
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To

GENERAL REMARKS

Groundwater was encountered at 4.0 m bgl. The borehole was cased to 1 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 UK BH G131520.GPJ AGS3_ALL.GDT 17/2/14

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BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				WS3
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	17-09-13 17-09-13	7.11	E 347,354.9 N 377,269.6	
Contractor				Sheet
				1 of 1

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
0.00	D1				0.20	Dark greyish brown silty sandy GRAVEL. Sand is fine. Gravel is fine to medium with a little coarse iron slag and flint. MADE GROUND.		
0.20	D2				0.55	Dark brown silty very gravelly SAND. Sand is fine to medium. Gravel is fine to medium sub rounded to sub angular iron slag and flint. MADE GROUND.		
0.55	D3					Very soft light brown sandy silty CLAY. Sand is fine to medium. Gravel is fine to medium sub rounded to sub angular flint. MADE GROUND.		
1.00-1.45	SPT	N=3			(1.05)			
					1.60			
1.60	D4				1.90	Light brown SAND. Sand is fine to medium with a little coarse. MADE GROUND.		
1.90	D5					Very loose reddish brown gravelly sandy SILT. Sand is fine. Gravel is fine to coarse sub rounded to sub angular coal and ash. MADE GROUND.		
2.00-2.45	SPT	N=0			2.20			
2.20	D6				2.50	Dark grey silty CLAY. Occasional fine to medium gravels. Fine sand bands. MADE GROUND.		
2.50	D7		▼1		(0.60)	Very soft light brown sandy silty CLAY. Sand is fine to medium. Occasional fine ash and coal fragments. MADE GROUND.		
3.00-3.45	SPT	N=2			3.10			
3.10	D8					Soft light greyish brown silty CLAY. MADE GROUND.		
4.00-4.45	SPT	N=4						
4.10	D9				(2.35)			
5.00-5.45	SPT	N=5						
					5.45			

Boring Progress and Water Observations					
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Chiselling			Water Added	
From	To	Hours	From	To

GENERAL REMARKS

Groundwater was encountered at 2.9 m bgl. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 UK BH G131520.GPJ AGS3_ALL.GDT 17/2/14

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BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS4**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	24-09-13 24-09-13	11.16	E 347,525.3 N 377,610.6	
Contractor				Sheet
				1 of 1

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
0.00	D1				(0.60)	Dark brown sandy SILT. Sand is fine. Frequent rootlets. MADE GROUND. From 0.25m bgl; becoming dark greyish brown and rootlets becoming absent.		
0.25	D2				0.60			
0.60	D3				(0.40)	Dark brown silty CLAY. Occasional fine sand bands and organic material. MADE GROUND.		
1.00	D4				1.00			
1.00-1.45	SPT	N=3			1.30	Very loose dark brown silty SAND. Sand is fine to medium. Occasional fine gravels. MADE GROUND.		
1.30	D5		1		(1.40)	Very soft light brown locally dark grey silty CLAY. MADE GROUND. From 1.3m to 2.0m bgl; occasional fine sand bands.		
2.00-2.45	SPT	N=0						
2.30	D6				2.70			
2.70	D7				2.90	Reddish brown silty SAND. Sand is fine to medium. Occasional fine gravels. MADE GROUND.		
2.90	D8				(0.85)	Very loose light grey silty SAND. Sand is fine to medium. MADE GROUND.		
3.00-3.45	SPT	N=3			3.75			
3.75	D9				(0.45)	Soft dark brown locally reddish brown very sandy silty CLAY. Sand is fine to medium. MADE GROUND.		
4.00-4.45	SPT	N=4			4.20			
4.20	D10				(1.25)	Soft light grey very sandy CLAY. Sand is fine to medium. MADE GROUND.		
5.00-5.45	SPT	N=7			5.45			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Groundwater was encountered at 2.0 m bgl. The borehole was cased to 1 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

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BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				WS5
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	05-10-13 05-10-13	12.50	E 347,998.0 N 377,904.9	
Contractor				Sheet
				1 of 1

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
0.00	D1				(0.50) 0.50	Dark brown sandy SILT. Sand is fine. Frequent organic material. MADE GROUND.		
0.50	D2				0.70	Light brown silty SAND. Sand is fine to medium. MADE GROUND.		
0.70	D3				0.90	Dark brown locally black silty CLAY. Rare fine gravels. MADE GROUND.		
0.90 1.00-1.45	D4 SPT	N=11			(1.10) 2.00	Medium dense dark brown sandy SILT. Sand is fine to medium. MADE GROUND. between 1.0 m and 1.5 m bgl; loss of strata		
2.00 2.00-2.45	D5 SPT	N=0			(0.90) 2.90	Very soft dark greyish brown silty CLAY. Rare fine gravels. MADE GROUND.		
2.90 3.00-3.45	D6 SPT	N=2	1		(0.50) 3.40	Very soft light brown locally dark grey sandy silty CLAY. Sand is fine to medium. MADE GROUND.		
3.40 4.00-4.45	D7 SPT	N=2			(1.50) 4.90	Very soft dark grey, locally light brown silty CLAY. Occasional fine sand bands. Slight hydrocarbon odour. MADE GROUND.		
4.40	D8							
4.90 5.00-5.45	D9 SPT	N=6			(0.55) 5.45	Soft light brown sandy silty CLAY. Sand is fine to medium. MADE GROUND.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	Groundwater was encountered at 3.0 m bgl. The borehole was cased to 1 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 UK BH G131520.GPJ AGS3_ALL.GDT 17/2/14

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BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				WS6
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	05-10-13 05-10-13	14.82	E 348,304.0 N 378,069.0	
Contractor				Sheet
				1 of 1

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
0.00	D1				0.25	Dark brown sandy SILT. Frequent rootlets. MADE GROUND.		
0.25	D2				(1.15)	Very loose light brown silty SAND. Sand is fine to medium. MADE GROUND.		
1.00-1.45	SPT	N=3			1.40			
1.25	D3							
1.40	D4				1.60	Light brown locally dark grey sandy silty CLAY. Sand is fine to medium. MADE GROUND.		
1.60	D5				1.80	Light brown silty SAND. Sand is fine to medium. MADE GROUND.		
1.80	D6				(0.40)	Very soft dark grey locally light brown sandy silty CLAY. Sand is fine to medium with a little coarse. MADE GROUND.		
2.00-2.45	SPT	N=0			2.20			
2.20	D7				(1.10)	Very soft light greyish brown silty CLAY. Occasional fine sand bands. MADE GROUND. From 2.6 m to 3.0 m bgl; locally black and slightly sandy.		
3.00-3.45	SPT	N=0			3.30			
3.30	D8					Soft light brown sandy very silty CLAY. Sand is fine. MADE GROUND. From 3.8 m bgl; becoming dark brown locally black and less silty		
3.80	D9		▼1					
4.00-4.45	SPT	N=4			(1.50)			
4.80	D10				4.80			
5.00-5.45	SPT	N=11			(0.65)	Medium dense dark greyish brown silty SAND. Sand is fine to medium with a little coarse. MADE GROUND.		
					5.45			

Boring Progress and Water Observations					
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Chiselling			Water Added	
From	To	Hours	From	To

GENERAL REMARKS

Groundwater was encountered at 4.0 m bgl. The borehole was cased to 1 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 UK BH G131520.GPJ AGS3_ALL.GDT 17/2/14

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BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				WS7
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	18-09-13 18-09-13	5.27	E 348,030.8 N 377,007.9	
Contractor				Sheet
				1 of 1

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
0.00	D1				(0.70)	Dark brown sandy gravelly SILT. Sand is fine. Gravel is fine to coarse sub rounded to sub angular iron slag. Occasional rootlets. MADE GROUND.		
					0.70			
0.70	D2					Very soft light grey locally brown silty CLAY. Fine sand bands. MADE GROUND.		
1.00-1.45	SPT	N=0				From 2.2 m bgl; occasional organic material.		
1.70	D3				(2.20)			
2.00-2.45	SPT	N=1						
2.70	D4		▼1		2.90			
2.90	D5					Very loose dark brown peaty SILT. Frequent organic material. MADE GROUND.		
3.00-3.45	SPT	N=0			3.20			
3.20	D6					Light grey silty CLAY. MADE GROUND.		
					3.50			
3.50	D7					Very loose dark brown peaty SILT. Frequent organic material. MADE GROUND.		
4.00-4.45	SPT	N=2			(0.90)			
					4.40			
4.40	D8					Soft light grey sandy silty CLAY. Sand is fine to medium. MADE GROUND.		
5.00-5.45	SPT	N=6			(1.05)			
					5.45			

Boring Progress and Water Observations						Chiselling			Water Added	
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To

GENERAL REMARKS

Groundwater was encountered at 2.9 m bgl. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 UK BH G131520.GPJ AGS3_ALL.GDT 17/2/14

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BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS8**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	18-09-13 18-09-13	5.31	E 348,454.1 N 377,343.9	
Contractor				Sheet
				1 of 1

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
0.00	D1				(0.70)	Dark brown sandy silty GRAVEL. Sand is fine. Gravel is fine to coarse sub rounded to sub angular iron slag. MADE GROUND.		
0.70	D2				0.70 (0.50)	Loose dark brown sandy gravelly clayey SILT. Sand is fine to medium. Gravel is fine to medium with a little coarse sub rounded to sub angular iron slag and flint. MADE GROUND.		
1.00-1.45	SPT	N=9			1.20			
1.20	D3				1.50	Light greyish brown silty CLAY. Occasional fine sand bands. MADE GROUND.		
1.50	D4				(0.70)	Very soft light brownish grey mottled orange brown sandy silty CLAY. Sand is fine. MADE GROUND.		
2.00-2.45	SPT	N=0			2.20			
2.20	D5				(0.60)	Light brown mottled orange silty CLAY. MADE GROUND.		
2.80	D6		1		2.80	Soft dark greyish brown slightly sandy silty CLAY. Sand is fine. MADE GROUND.		
3.00-3.45	SPT	N=4			(0.80)			
3.60	D7				3.60	Very soft light brown silty CLAY. Occasional fine sand bands. MADE GROUND. From 4.4 m bgl; becoming dark grey and fine sand bands becoming rare.		
4.00-4.45	SPT	N=0						
4.40	D8				(1.85)			
5.00-5.45	SPT	N=1						
					5.45			

Boring Progress and Water Observations					
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Chiselling			Water Added	
From	To	Hours	From	To

GENERAL REMARKS

Groundwater was encountered at 3.0 m bgl. The borehole was cased to 1 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 UK BH G131520.GPJ AGS3_ALL.GDT 17/2/14

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BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS9**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	12-09-13 12-09-13	13.22	E 348,830.4 N 377,629.9	
Contractor				Sheet
				1 of 1

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
0.00	D1				0.25	Dark grey sandy GRAVEL. Sand is fine to coarse. Gravel is fine to medium with a little coarse sub rounded to sub angular iron slag. MADE GROUND.		
0.25	D2				(0.75)	Light brown SAND. Sand is fine to medium. MADE GROUND.		
					1.00			
1.00	D3					Loose dark brown sandy SILT. Sand is fine. MADE GROUND.		
1.00-1.45	SPT	N=4			(0.50)			
					1.50			
1.50	D4					Very soft dark brown mottled light brown sandy very silty CLAY. Sand is fine. From 2.0 m bgl; sand becoming absent. MADE GROUND.		
2.00-2.45	SPT	N=1			(1.10)			
					2.60			
2.50	D5					Very soft dark brownish grey sandy silty CLAY. Sand is fine. Frequent organic fragments. Slight hydrocarbon odour. Very rare coal and ash fragments. MADE GROUND.		
2.60	D6							
3.00-3.45	SPT	N=1			(0.95)			
			▼1		3.55			
3.55	D7					Very soft, becoming soft with depth, dark grey silty CLAY. Occasional fine sand bands. MADE GROUND. From 5.0 m bgl; becoming soft.		
4.00-4.45	SPT	N=0						
					(1.90)			
4.55	D8							
5.00-5.45	SPT	N=4						
					5.45			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Groundwater was encountered at 3.2 m bgl. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 UK BH G131520.GPJ AGS3_ALL.GDT 17/2/14

Appendix 1: (ii) Dynamic Probing

Van Elle Limited

Telephone:
Fax:

DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS1**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	16-09-13 16-09-13	5.40	E 347,776.1 N 376,884.7	
Contractor				Sheet
				1 of 2

Depth (m)	Readings (blows/100mm)	Diagram (N100 Values)	Torque (Nm)	Remarks
1	0 0 0 0 0	5 10 15 20 25 30		
2	0 0 0 0 0			
3	0 0 0 0 0			
4	0 0 0 0 0			
5	0 0 0 0 0			
6	0 0 0 0 0			
7	0 0 0 0 0			
	2 1 1 0			

Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was encountered at 5.0 m bgl. The borehole was cased to 1 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

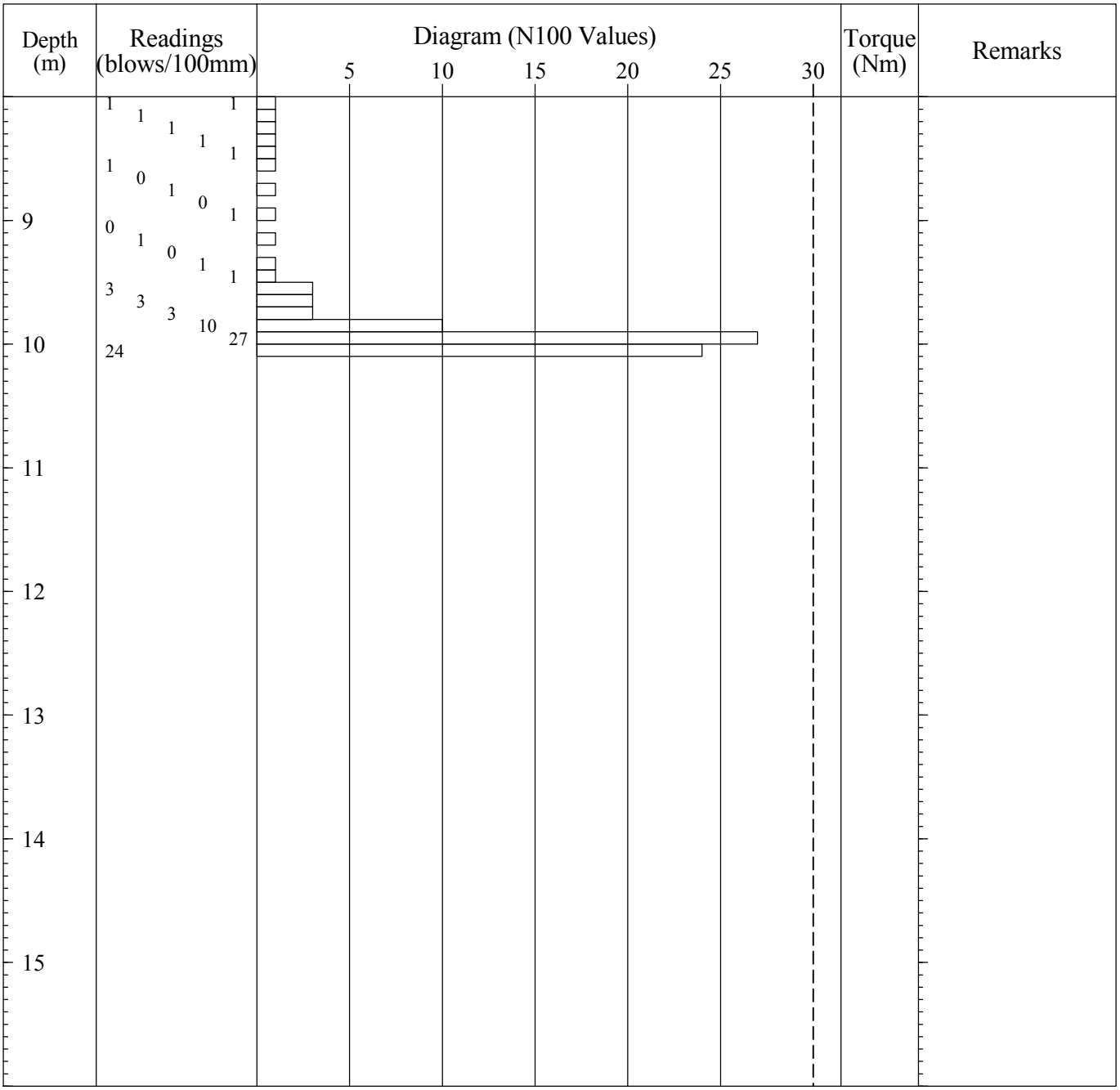
AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

Van Elle Limited

Telephone:
Fax:

DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS1**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	16-09-13 16-09-13	5.40	E 347,776.1 N 376,884.7	
Contractor				Sheet
				2 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was encountered at 5.0 m bgl. The borehole was cased to 1 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

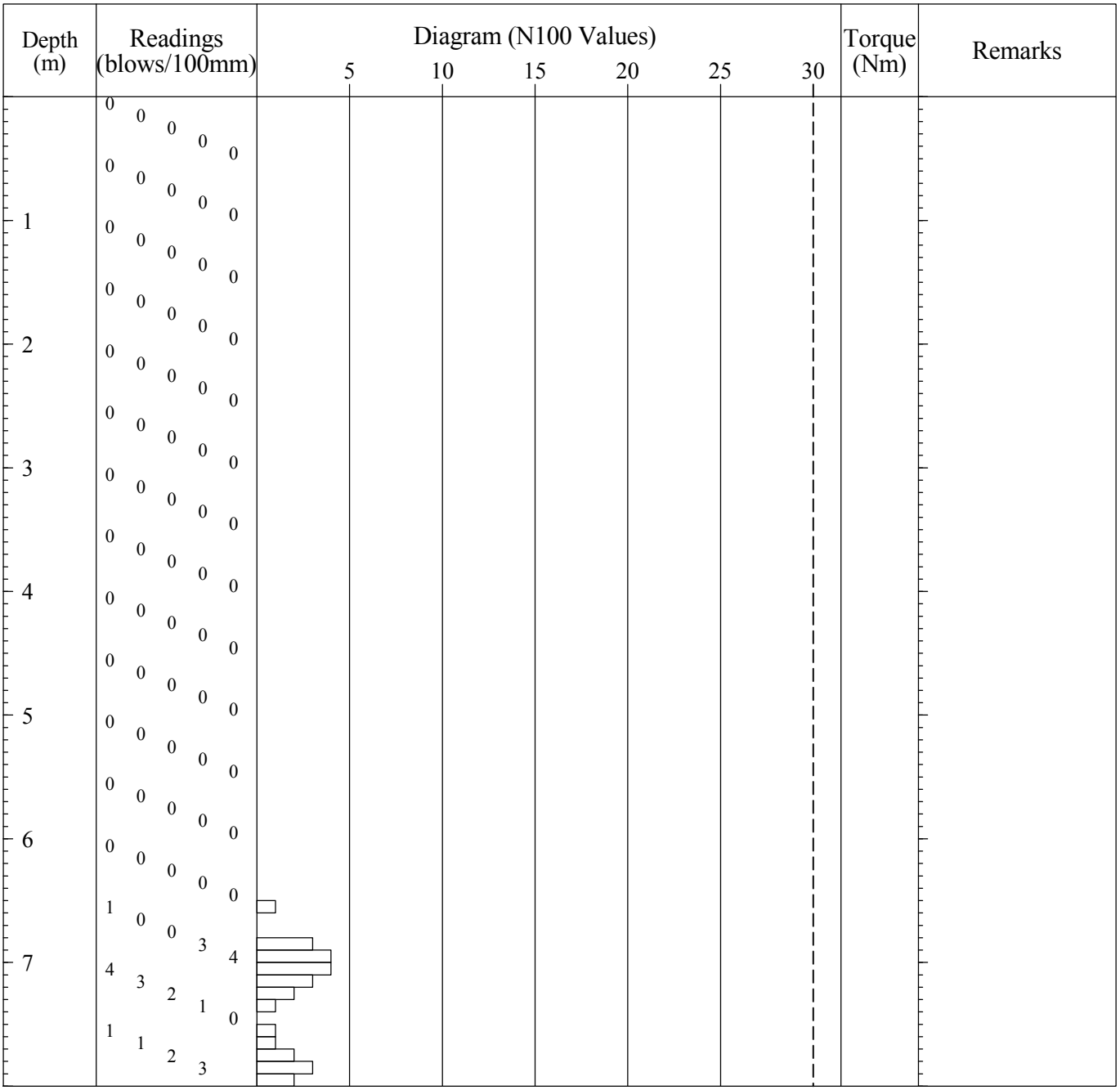
AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

Van Elle Limited

Telephone:
Fax:

DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS10**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	12-09-13 12-09-13	11.41	E 348,694.4 N 377,937.7	
Contractor				Sheet
				1 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was encountered at 3.6 m bgl. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

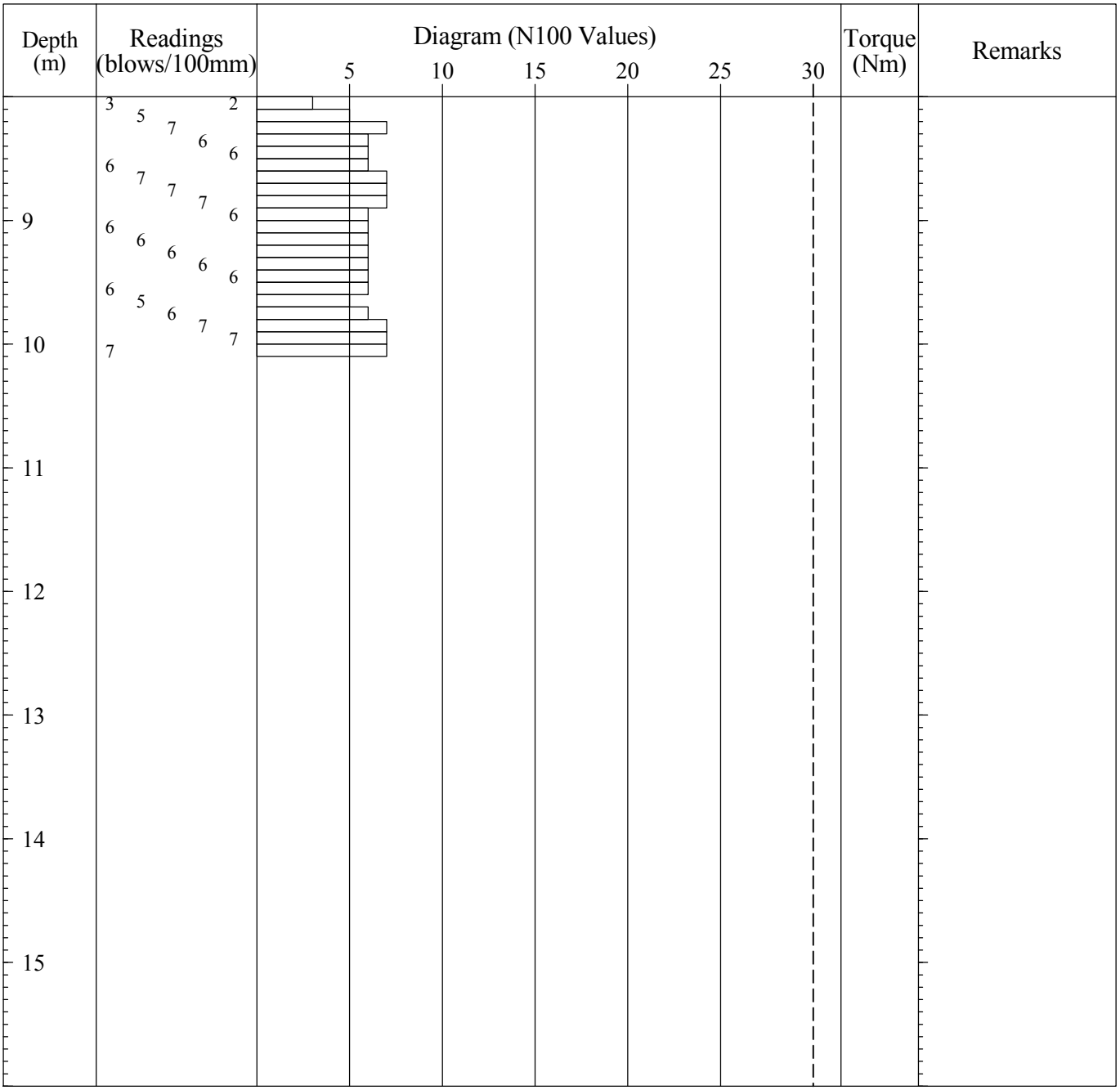
AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

Van Elle Limited

Telephone:
Fax:

DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS10**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	12-09-13 12-09-13	11.41	E 348,694.4 N 377,937.7	
Contractor				Sheet
				2 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was encountered at 3.6 m bgl. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

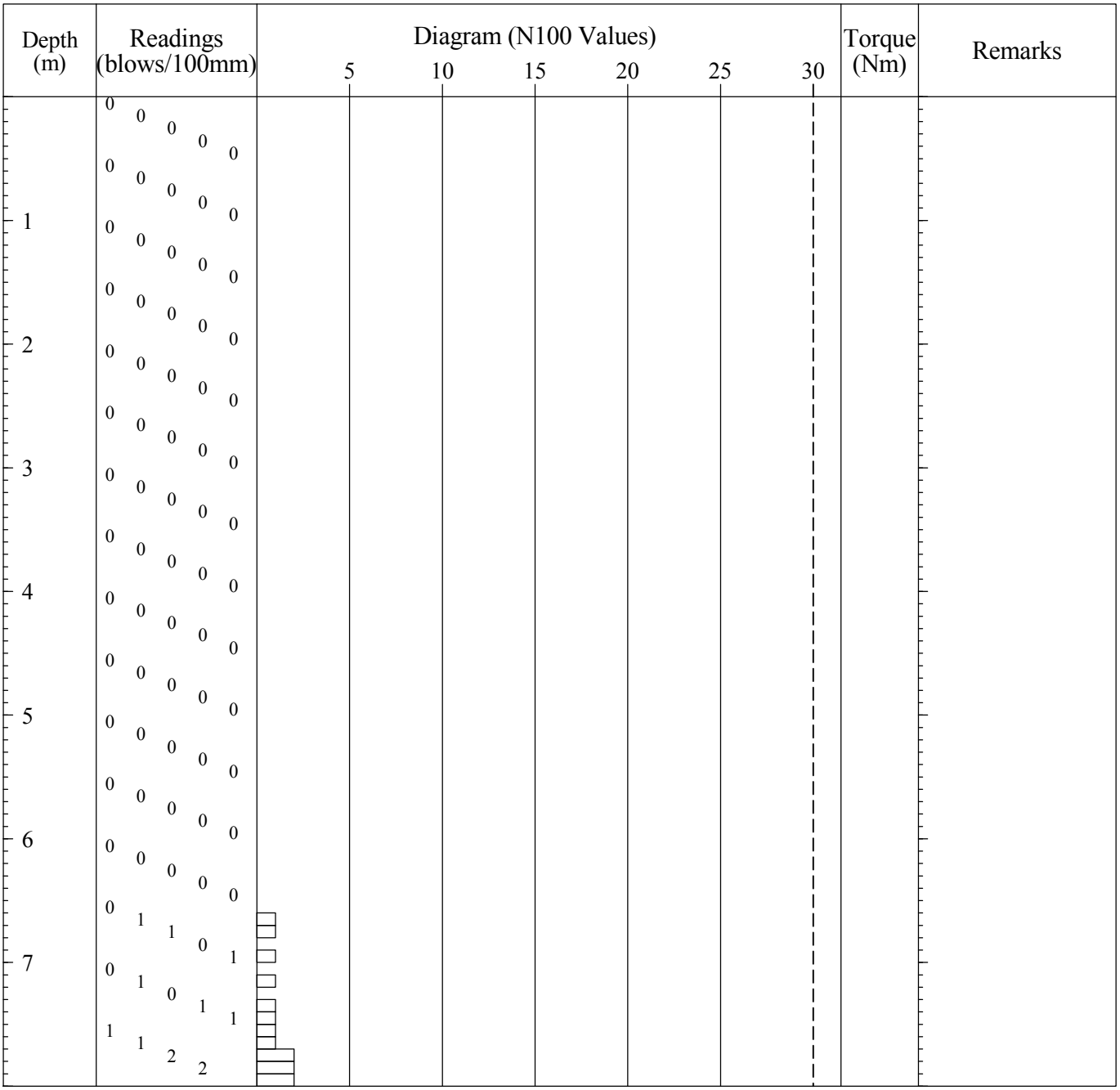
AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

Van Elle Limited

Telephone:
Fax:

DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS11**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	12-09-13 12-09-13	9.72	E 349,008.6 N 378,139.6	
Contractor				Sheet
				1 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was encountered at 2.8 m bgl. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

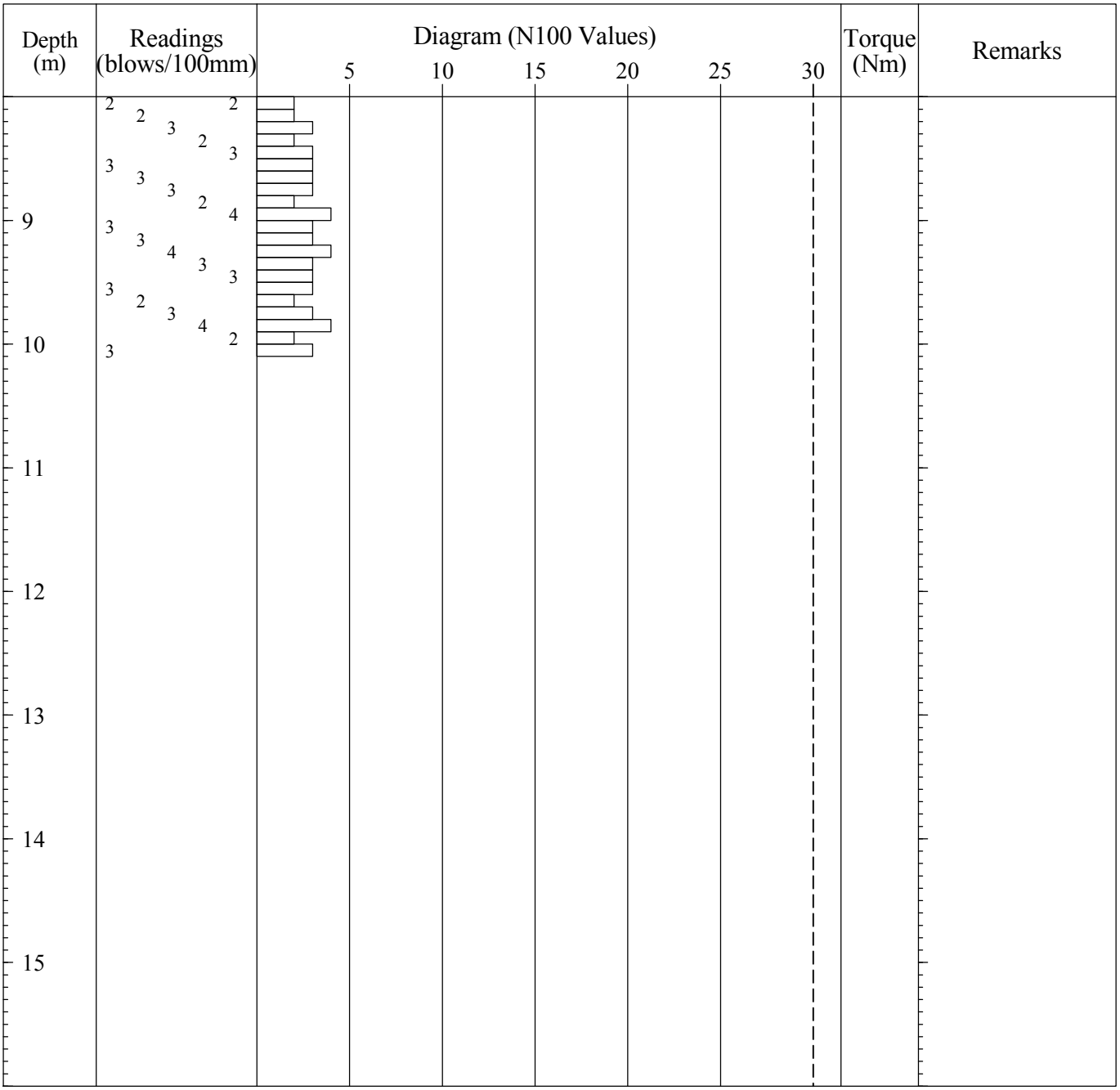
AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

Van Elle Limited

Telephone:
Fax:

DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS11**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	12-09-13 12-09-13	9.72	E 349,008.6 N 378,139.6	
Contractor				Sheet
				2 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was encountered at 2.8 m bgl. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

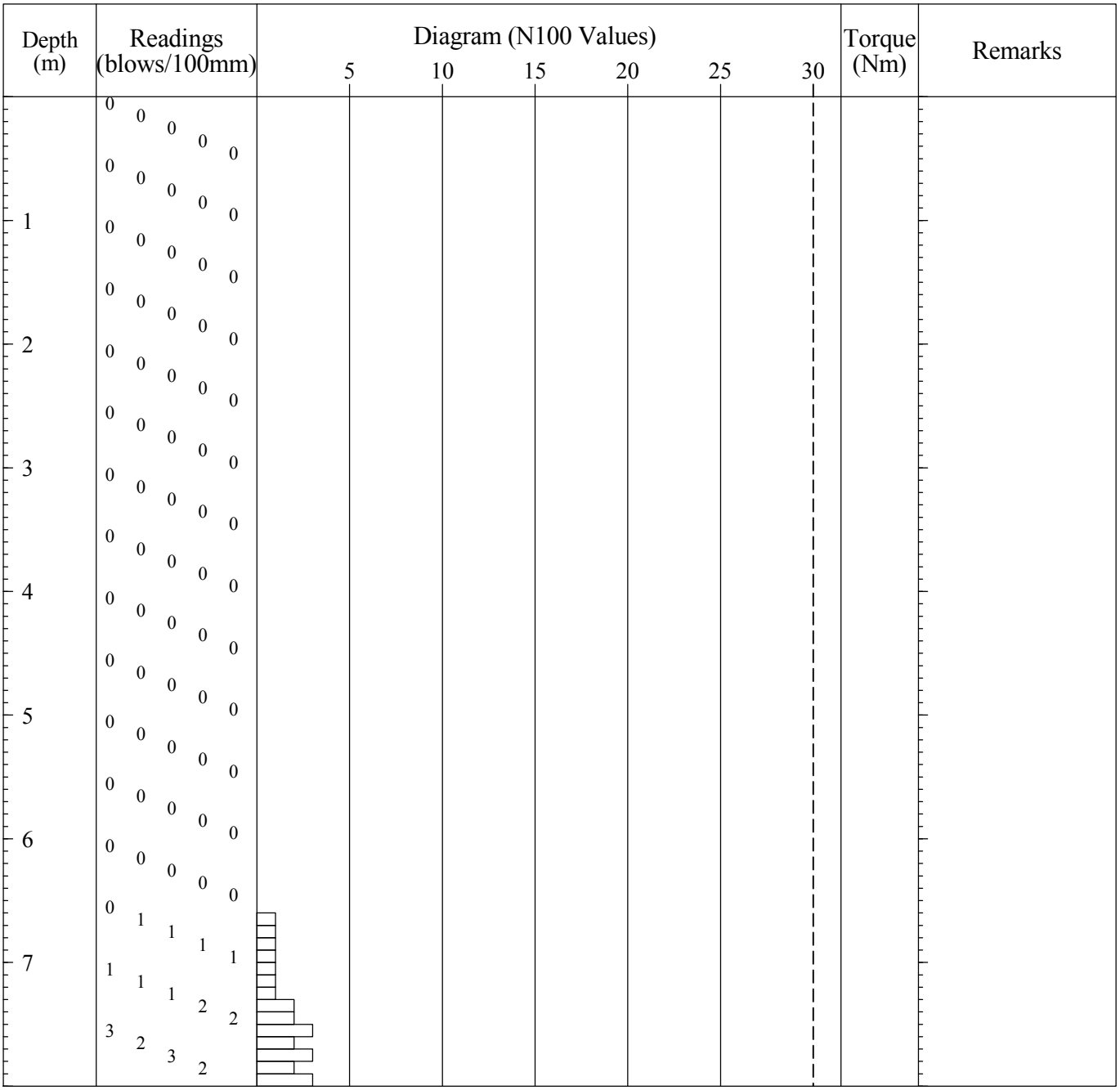
AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

Van Elle Limited

Telephone:
Fax:

DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS12**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	13-09-13 13-09-13	9.56	E 349,356.9 N 378,304.7	
Contractor				Sheet
				1 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was encountered at 2.5 m bgl. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

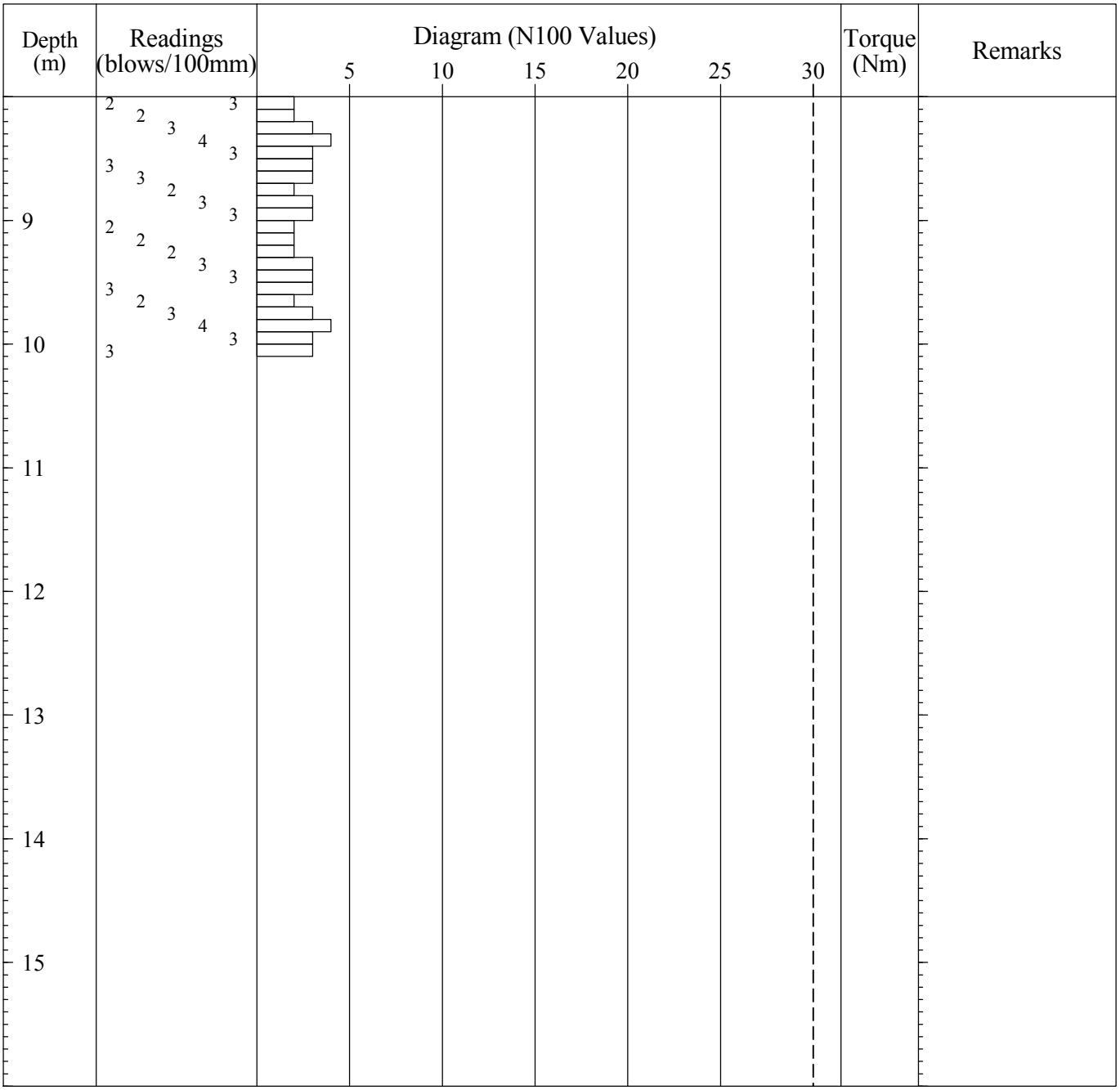
AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

Van Elle Limited

Telephone:
Fax:

DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS12**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	13-09-13 13-09-13	9.56	E 349,356.9 N 378,304.7	
Contractor				Sheet
				2 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was encountered at 2.5 m bgl. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

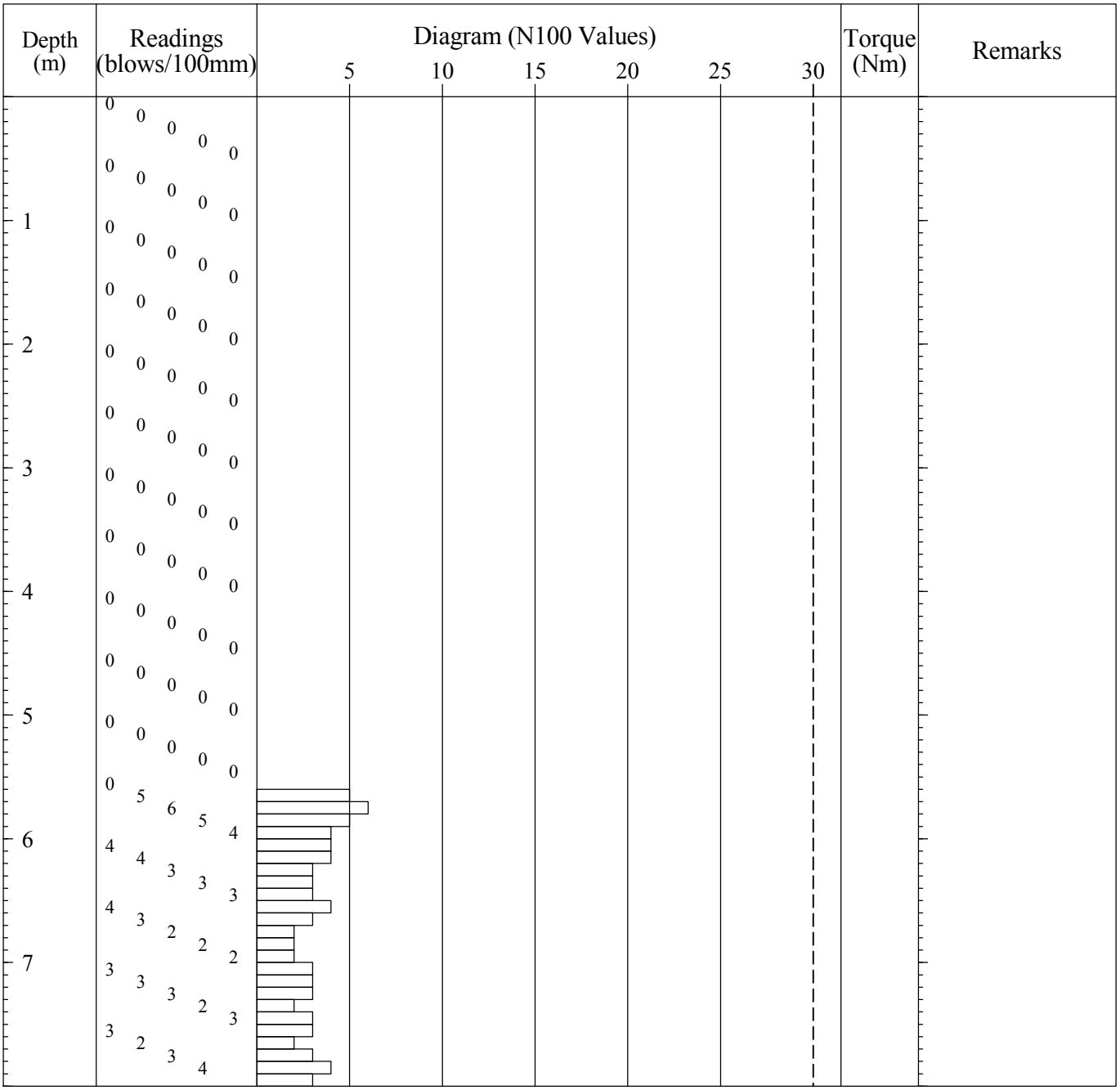
AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

Van Elle Limited

Telephone:
Fax:

DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS13**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	13-09-13 13-09-13	13.51	E 349,757.3 N 378,276.2	
Contractor				Sheet
				1 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was encountered at 3.25 m bgl. The borehole was cased to 1 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

Van Elle Limited

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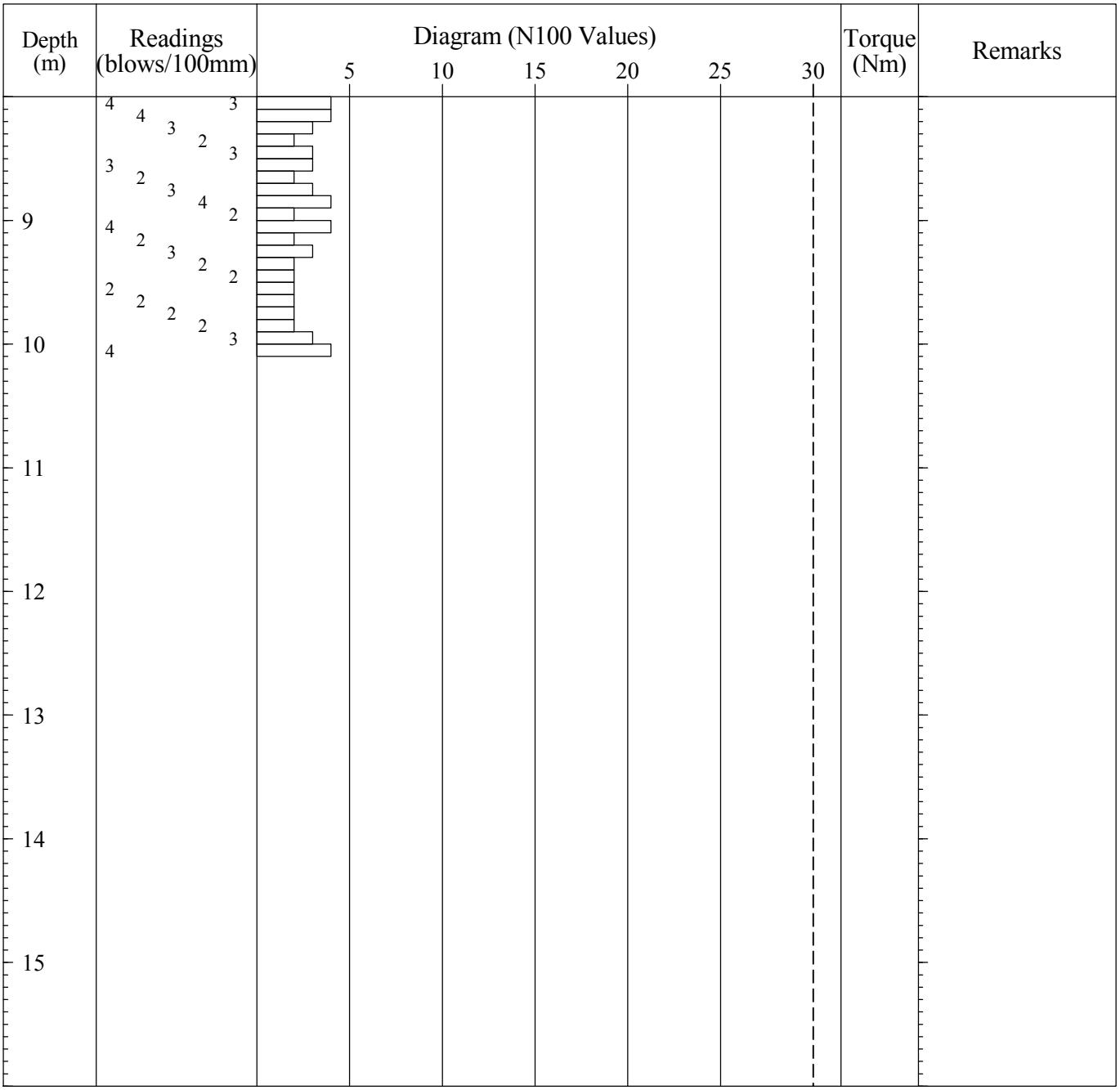
DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS13**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	13-09-13 13-09-13	13.51	E 349,757.3 N 378,276.2	
Contractor				Sheet
				2 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was encountered at 3.25 m bgl. The borehole was cased to 1 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

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Telephone:
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DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS14**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	16-09-13 16-09-13	12.83	E 350,044.0 N 378,230.5	
Contractor				Sheet
				1 of 2

Depth (m)	Readings (blows/100mm)	Diagram (N100 Values)	Torque (Nm)	Remarks
1	0 0 0 0 0 0 0 0 0 0	5 10 15 20 25 30		
2	0 0 0 0 0 0 0 0 0 0			
3	0 0 0 0 0 0 0 0 0 0			
4	0 0 0 0 0 0 0 0 0 0			
5	0 0 0 0 0 0 0 0 0 0			
6	0 1 0 0 0 1 2 4 3 3			
7	4 4 5 6 6 6 8 5 11 9			
	10 9 12 9			

Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was not encountered. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

Van Elle Limited

Telephone:
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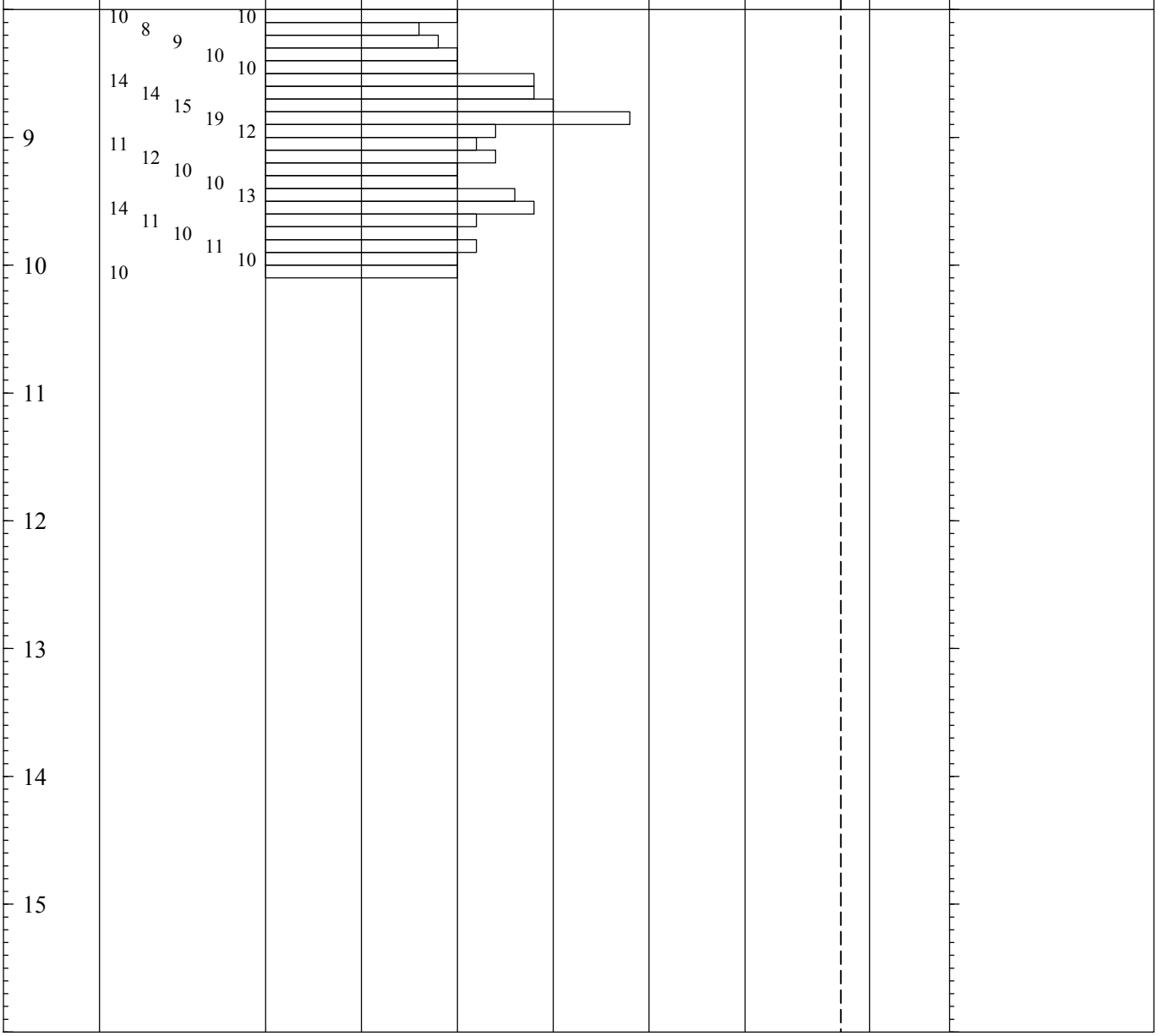
DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS14**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	16-09-13 16-09-13	12.83	E 350,044.0 N 378,230.5	
Contractor				Sheet
				2 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was not encountered. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

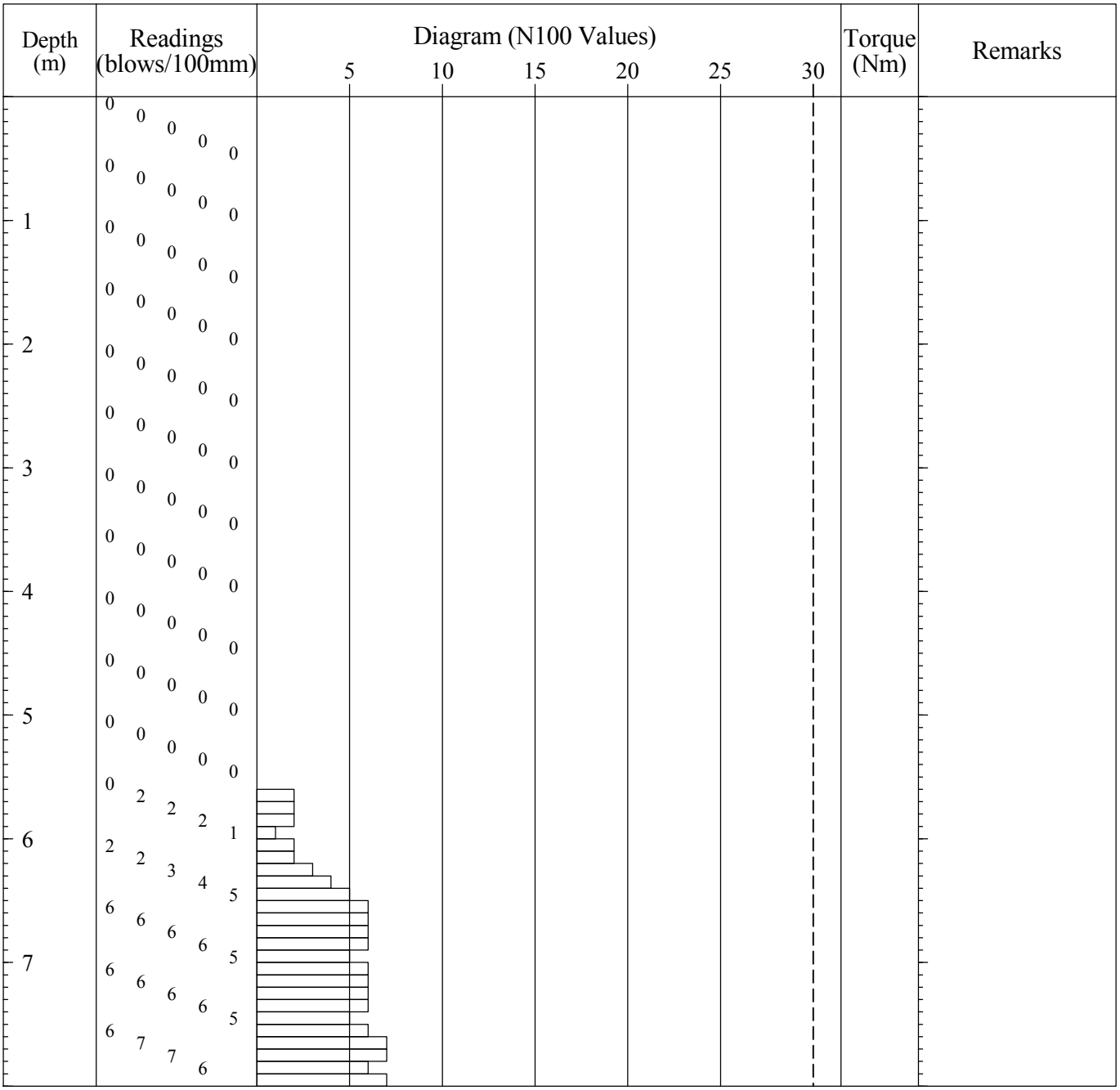
AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

Van Elle Limited

Telephone:
Fax:

DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS15**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	16-09-13 16-09-13	12.44	E 350,462.2 N 378,157.1	
Contractor				Sheet
				1 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was not encountered. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

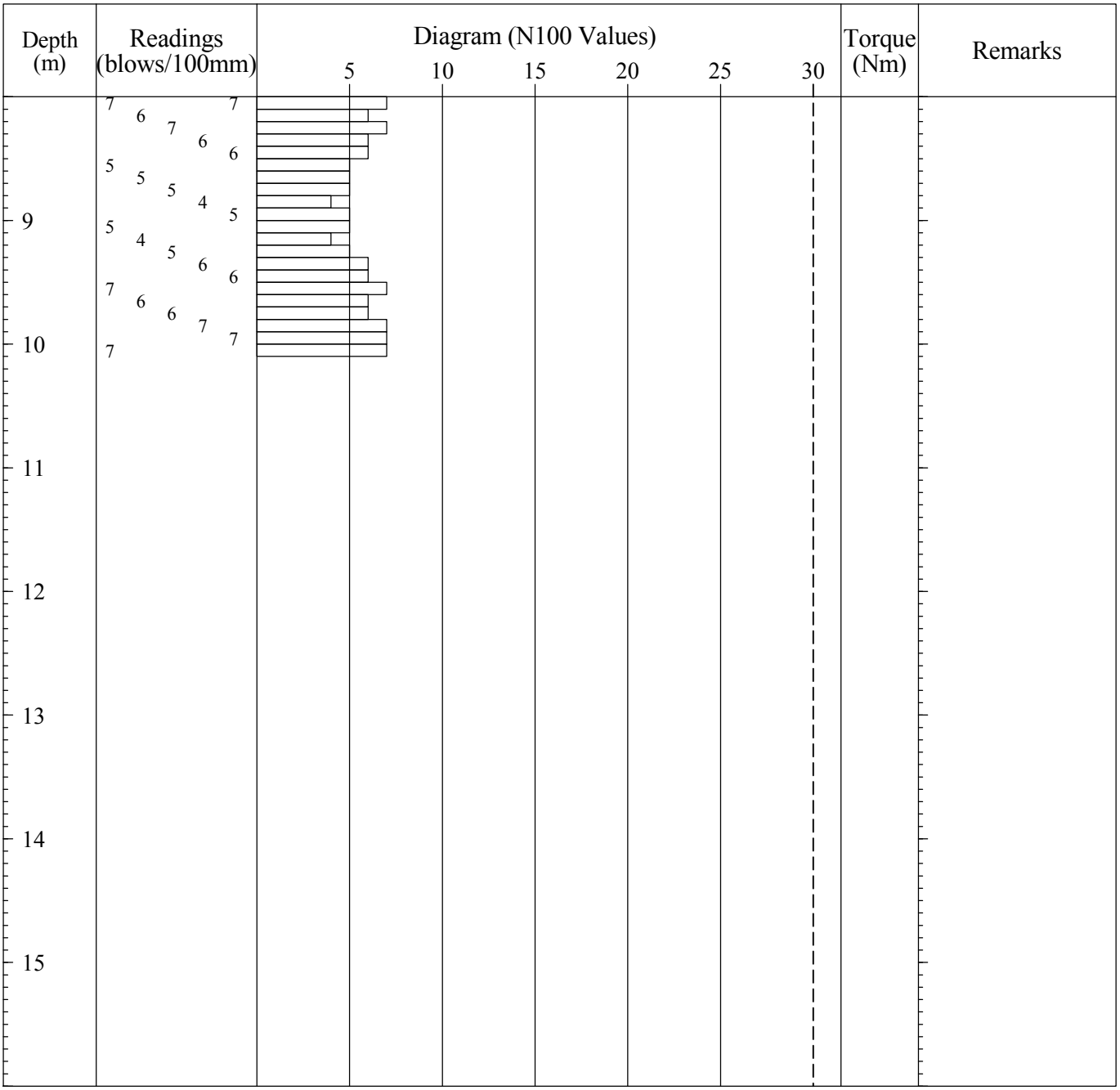
AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

Van Elle Limited

Telephone:
Fax:

DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS15**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	16-09-13 16-09-13	12.44	E 350,462.2 N 378,157.1	
Contractor				Sheet
				2 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was not encountered. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

Van Elle Limited

Telephone:
Fax:

DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS16A**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	19-09-13 19-09-13	5.75	E 350,964.2 N 378,323.5	
Contractor				Sheet
				1 of 2

Depth (m)	Readings (blows/100mm)	Diagram (N100 Values)	Torque (Nm)	Remarks
1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	5 10 15 20 25 30		
2	0 4 9 19 24 27 26 9 9 7 11 10 9 10 11			
3	13 1 0 0 0 0 0 1 0 0			
4	0 1 0 0 1 0 0 1 0 0			
5	1 4 5 5 6 5 5 5 3 3			
6	2 2 3 3 4 5 5 4 3 3			
7	3 4 5 6 6 5 4 3 11			

Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Drilling terminated at 1.45 m bgl due to pushing obstruction. Groundwater was not encountered. The borehole was backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

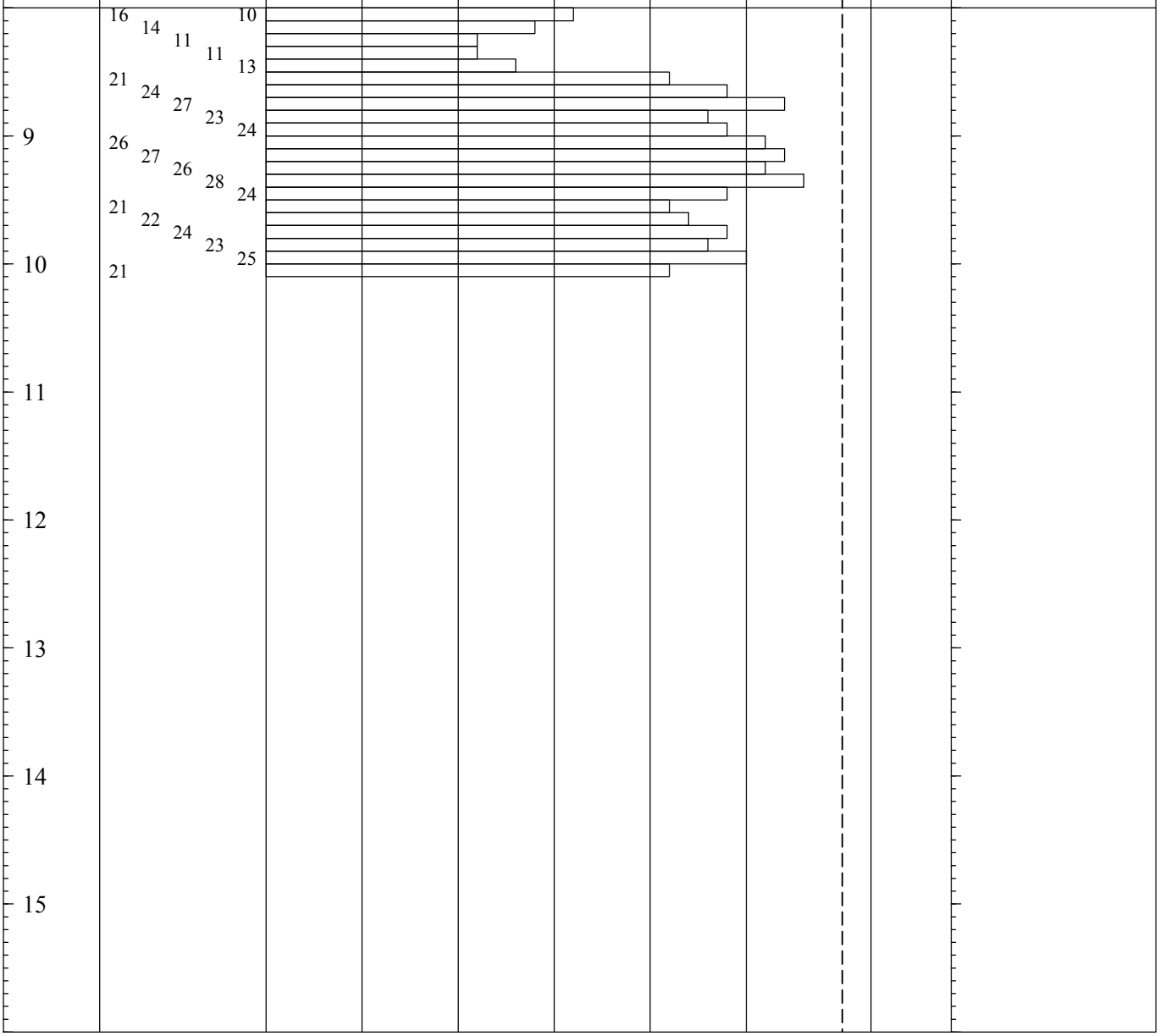
AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

Van Elle Limited

Telephone:
Fax:

DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS16A**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	19-09-13 19-09-13	5.75	E 350,964.2 N 378,323.5	
Contractor				Sheet
				2 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Drilling terminated at 1.45 m bgl due to pushing obstruction. Groundwater was not encountered. The borehole was backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

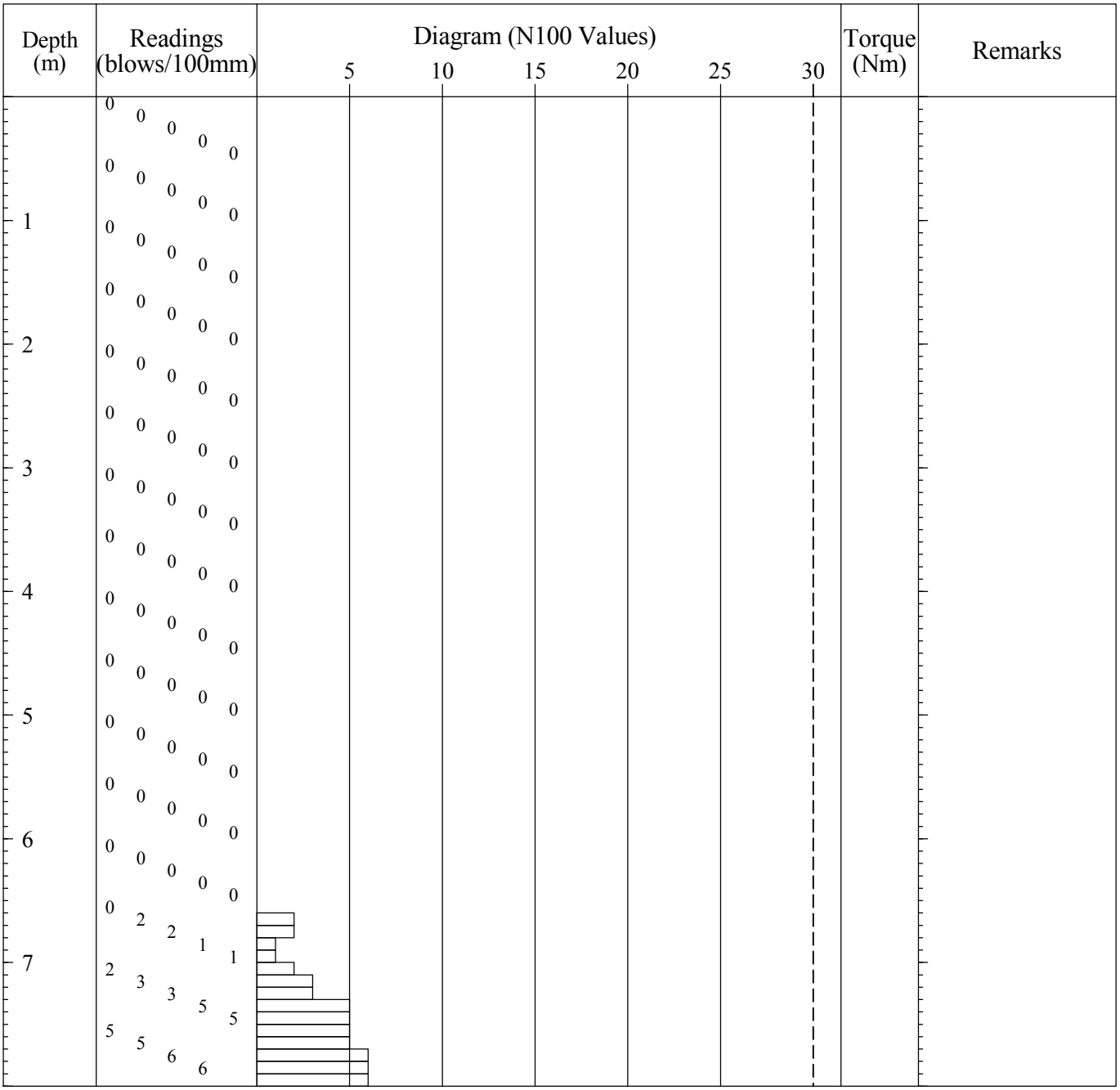
AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

Van Elle Limited

Telephone:
Fax:

DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS17**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	19-09-13 19-09-13	11.08	E 350,408.1 N 378,759.5	
Contractor				Sheet
				1 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was encountered at 3.0 m bgl. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

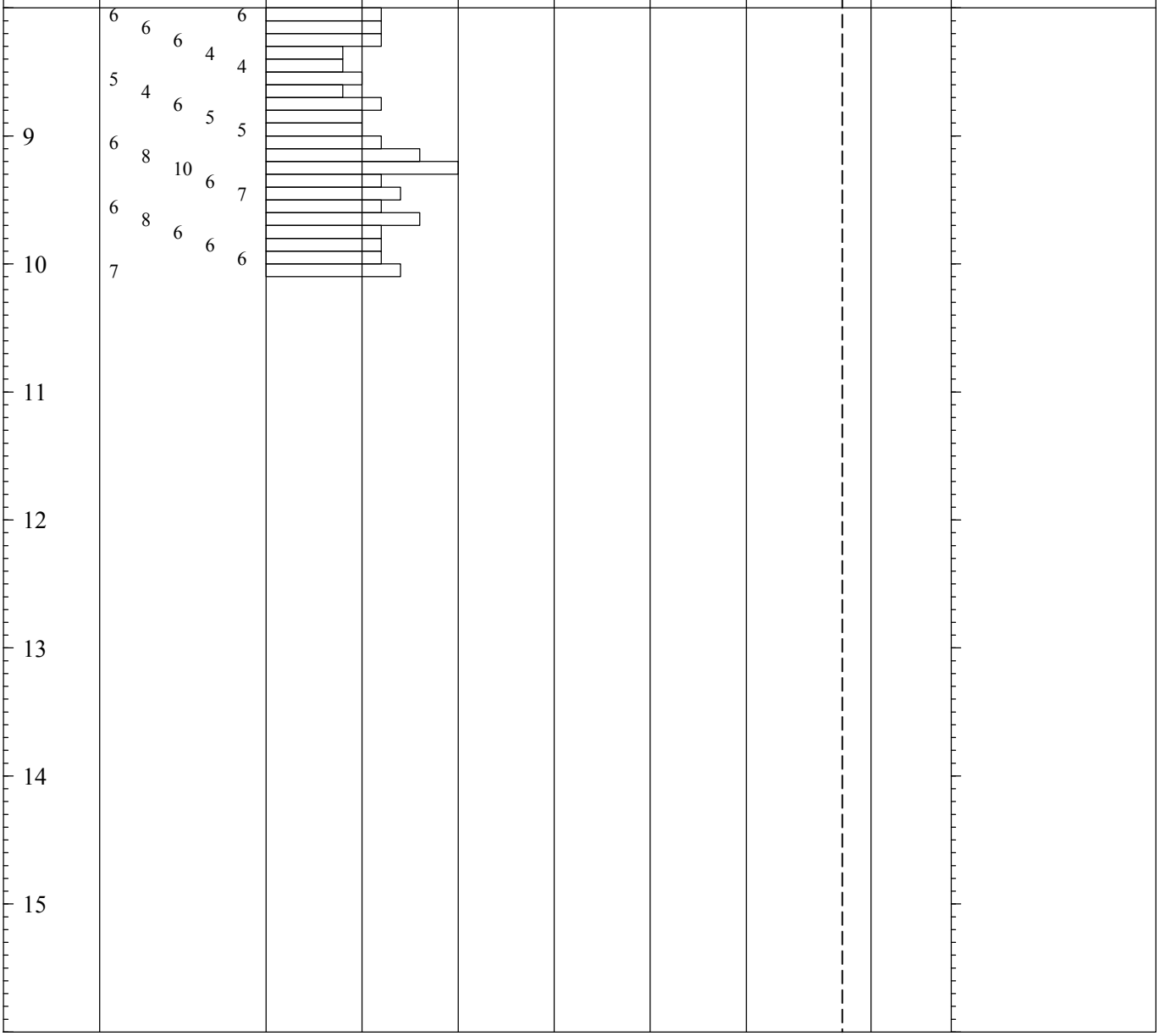
AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

Van Elle Limited

Telephone:
Fax:

DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS17**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	19-09-13 19-09-13	11.08	E 350,408.1 N 378,759.5	
Contractor				Sheet
				2 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was encountered at 3.0 m bgl. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

Van Elle Limited

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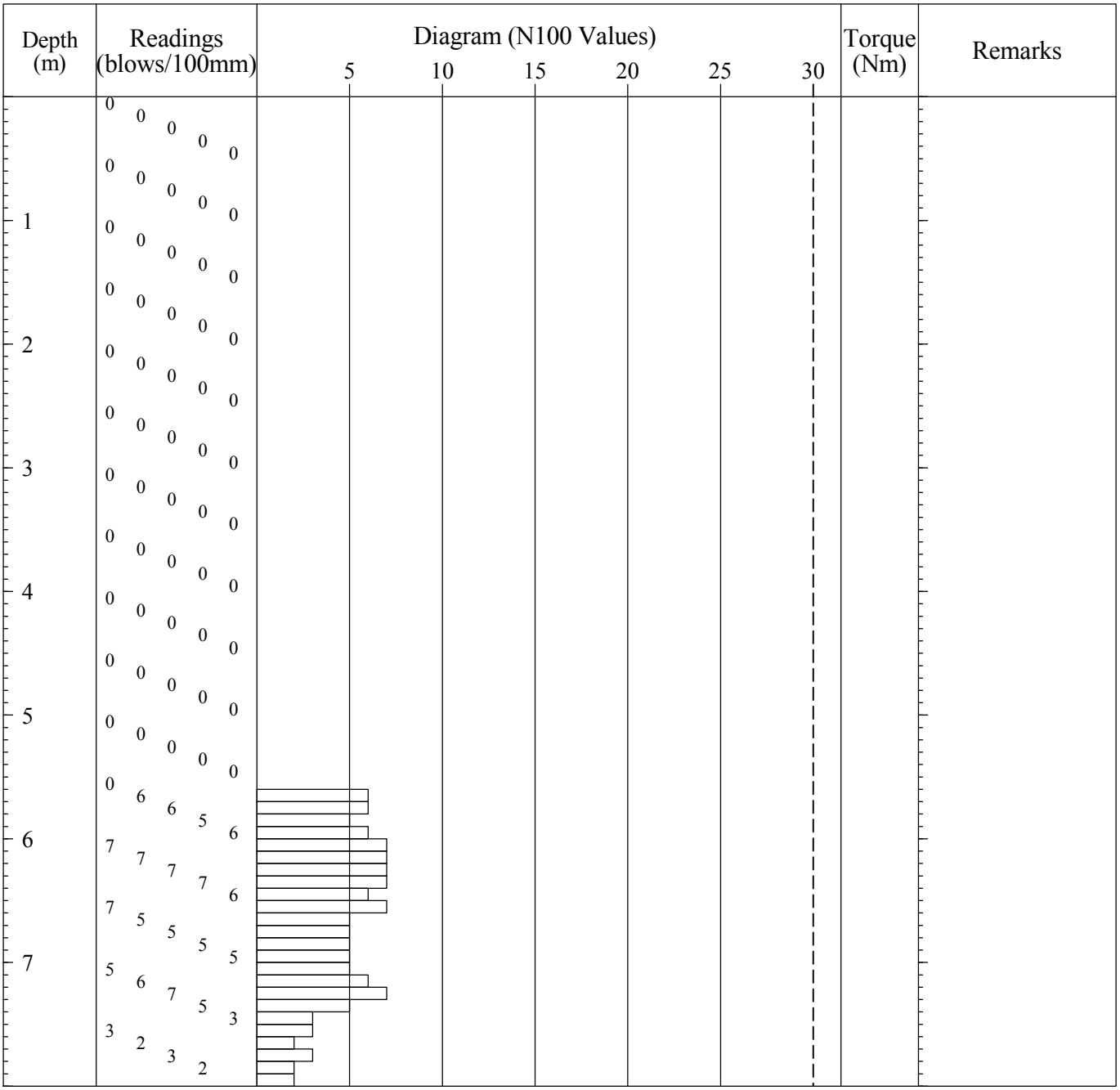
Fax:

DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS18**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	23-09-13 23-09-13	14.05	E 350,108.2 N 378,789.1	
Contractor				Sheet
				1 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was not encountered. The borehole was cased to 1 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

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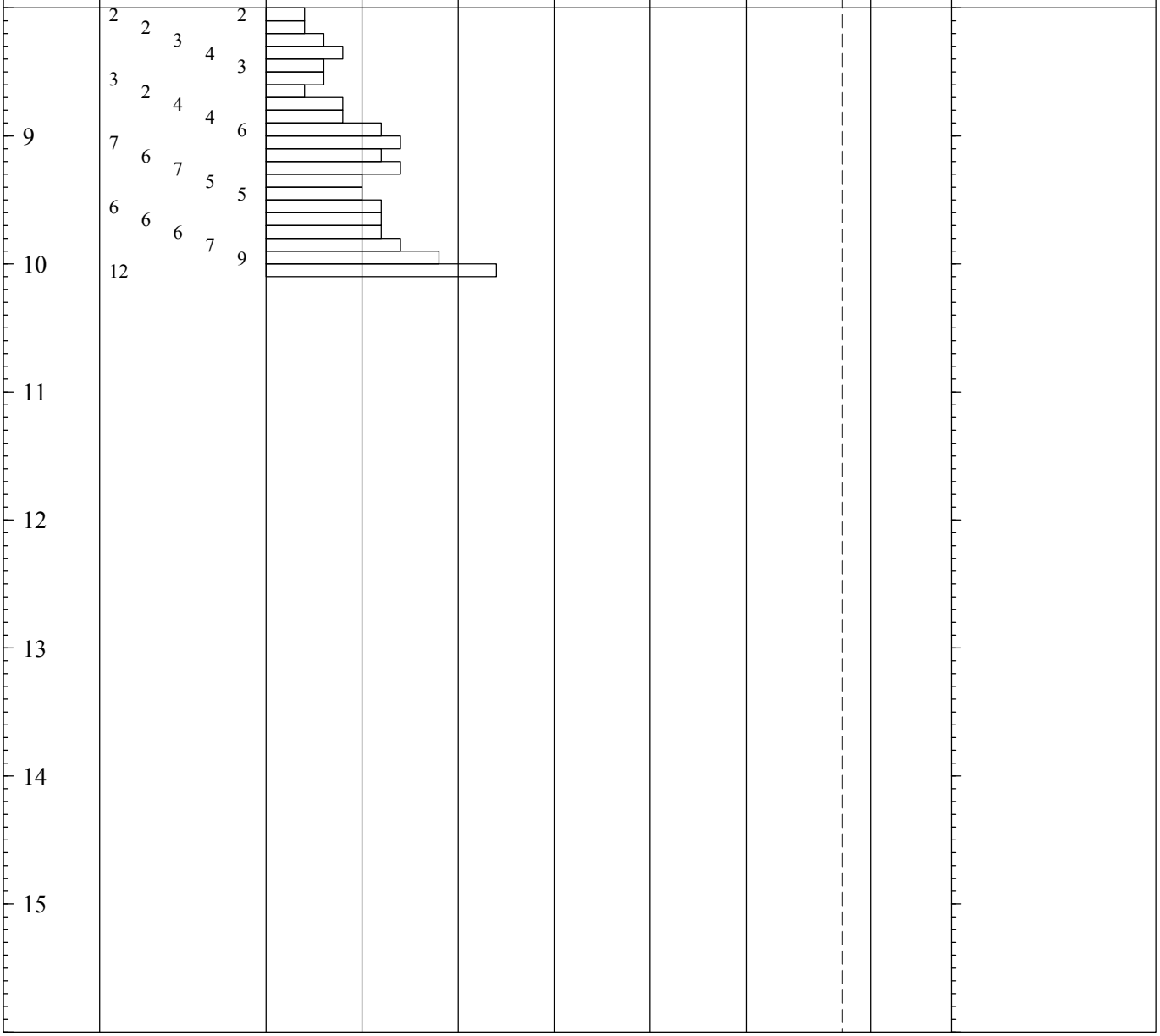
DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS18**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	23-09-13 23-09-13	14.05	E 350,108.2 N 378,789.1	
Contractor				Sheet
				2 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was not encountered. The borehole was cased to 1 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

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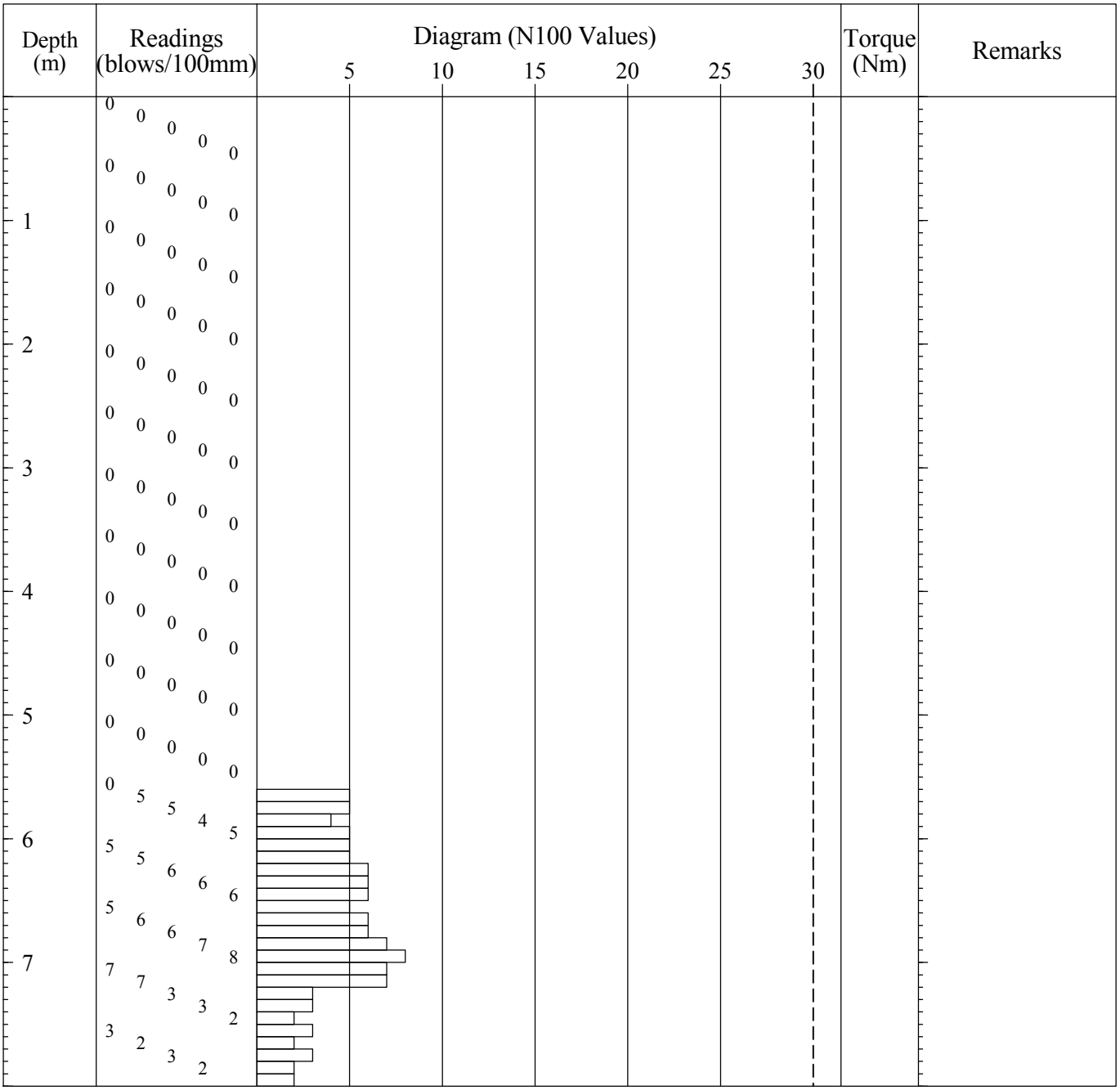
DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS19**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	20-09-13 20-09-13	14.21	E 349,738.6 N 378,603.5	
Contractor				Sheet
				1 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was not encountered. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

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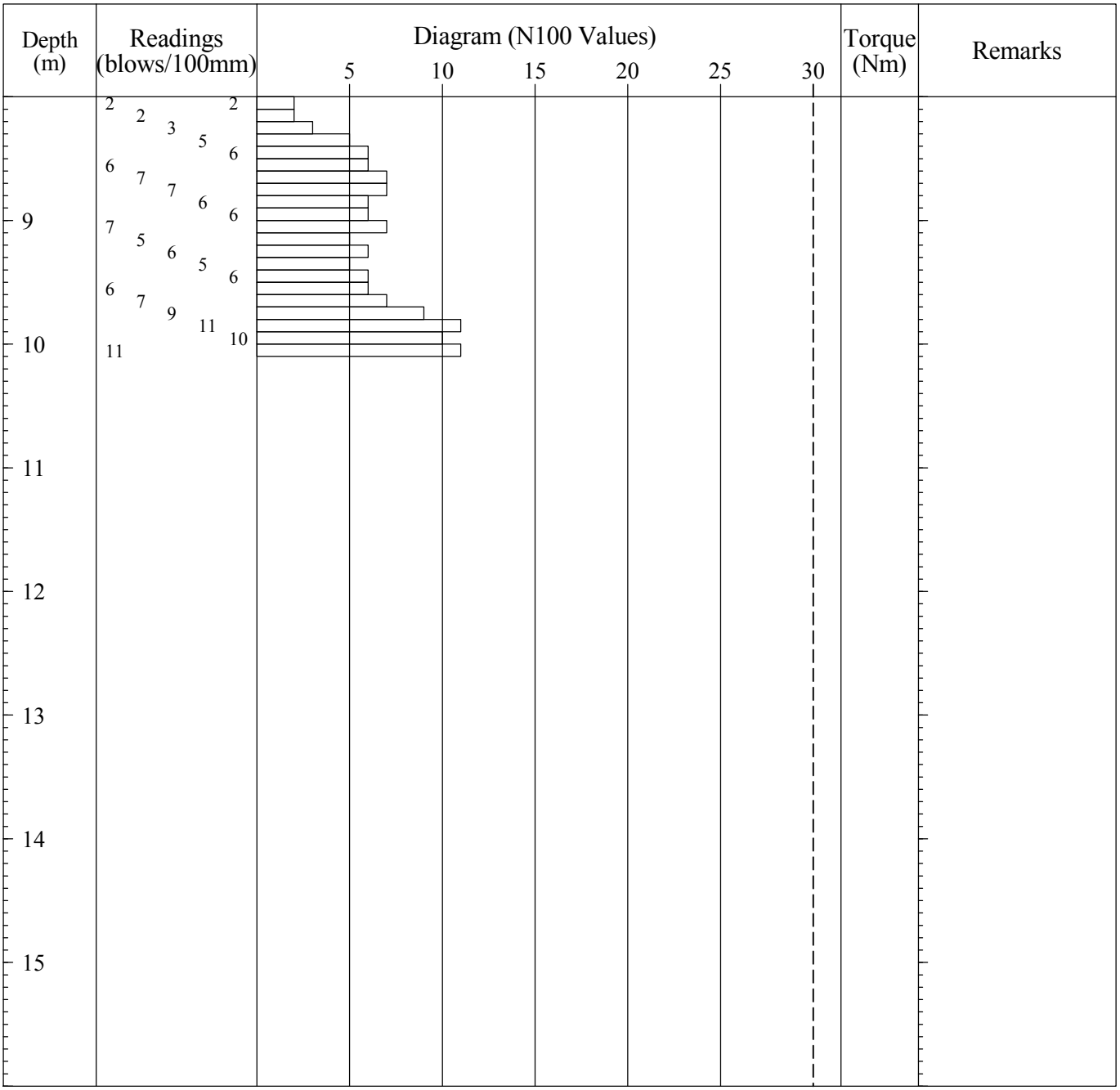
DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS19**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	20-09-13 20-09-13	14.21	E 349,738.6 N 378,603.5	
Contractor				Sheet
				2 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was not encountered. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

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DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS2**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	17-09-13 17-09-13	5.47	E 347,602.8 N 377,170.8	
Contractor				Sheet
				1 of 2

Depth (m)	Readings (blows/100mm)	Diagram (N100 Values)	Torque (Nm)	Remarks
1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	5 10 15 20 25 30		
2	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			
3	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			
4	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			
5	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			
6	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			
7	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			
	1 0 1 0			

Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was encountered at 2.7 m bgl. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

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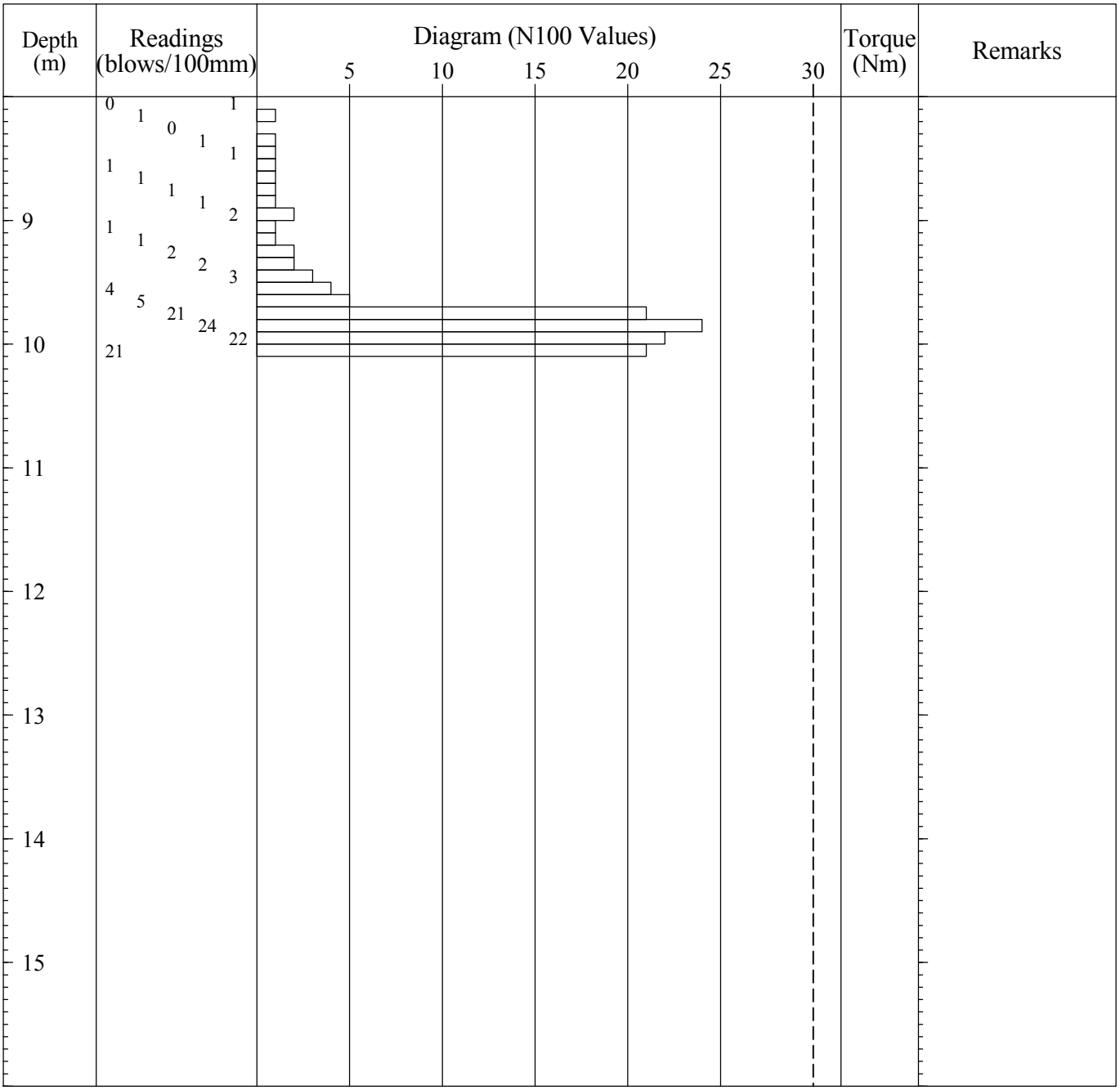
DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS2**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	17-09-13 17-09-13	5.47	E 347,602.8 N 377,170.8	
Contractor				Sheet
				2 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was encountered at 2.7 m bgl. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

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DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS20**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	23-09-13 23-09-13	12.06	E 350,060.5 N 379,063.2	
Contractor				Sheet
				1 of 2

Depth (m)	Readings (blows/100mm)	Diagram (N100 Values) 5 10 15 20 25 30	Torque (Nm)	Remarks
1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			
2	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			
3	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			
4	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			
5	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			
6	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			
7	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			
	0 0 1 0			

Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was encountered at 4.0 m bgl. The borehole was cased to 1 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

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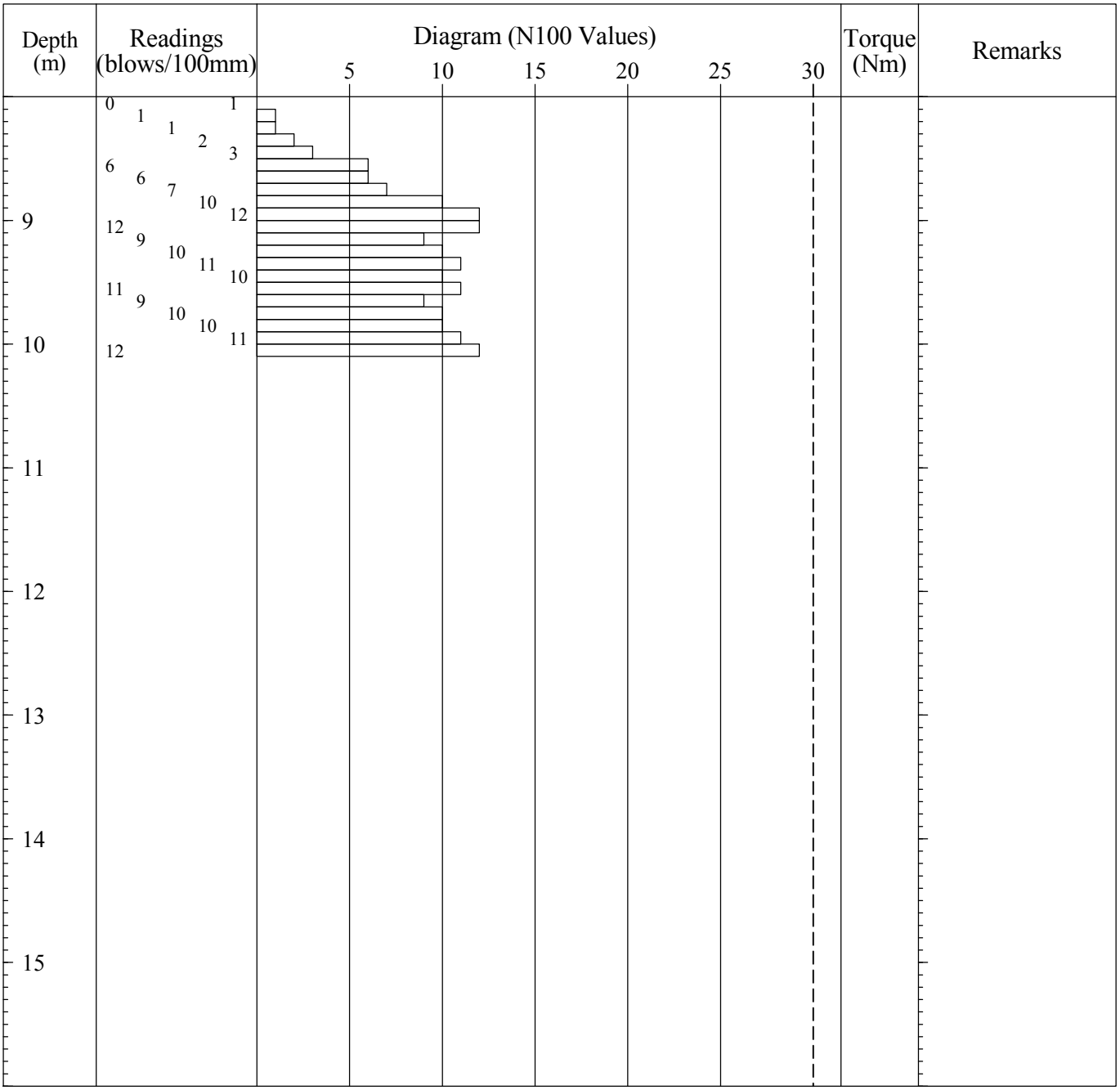
DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS20**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	23-09-13 23-09-13	12.06	E 350,060.5 N 379,063.2	
Contractor				Sheet
				2 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was encountered at 4.0 m bgl. The borehole was cased to 1 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

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DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS3**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	17-09-13 17-09-13	7.11	E 347,354.9 N 377,269.6	
Contractor				Sheet 1 of 2

Depth (m)	Readings (blows/100mm)	Diagram (N100 Values) 5 10 15 20 25 30	Torque (Nm)	Remarks
1	0 0 0 0			
2	0 0 0 0			
3	0 0 0 0			
4	0 0 0 0			
5	0 0 0 0			
6	0 0 0 0			
7	0 0 0 0			
	0 1 0 1			

Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was encountered at 2.9 m bgl. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

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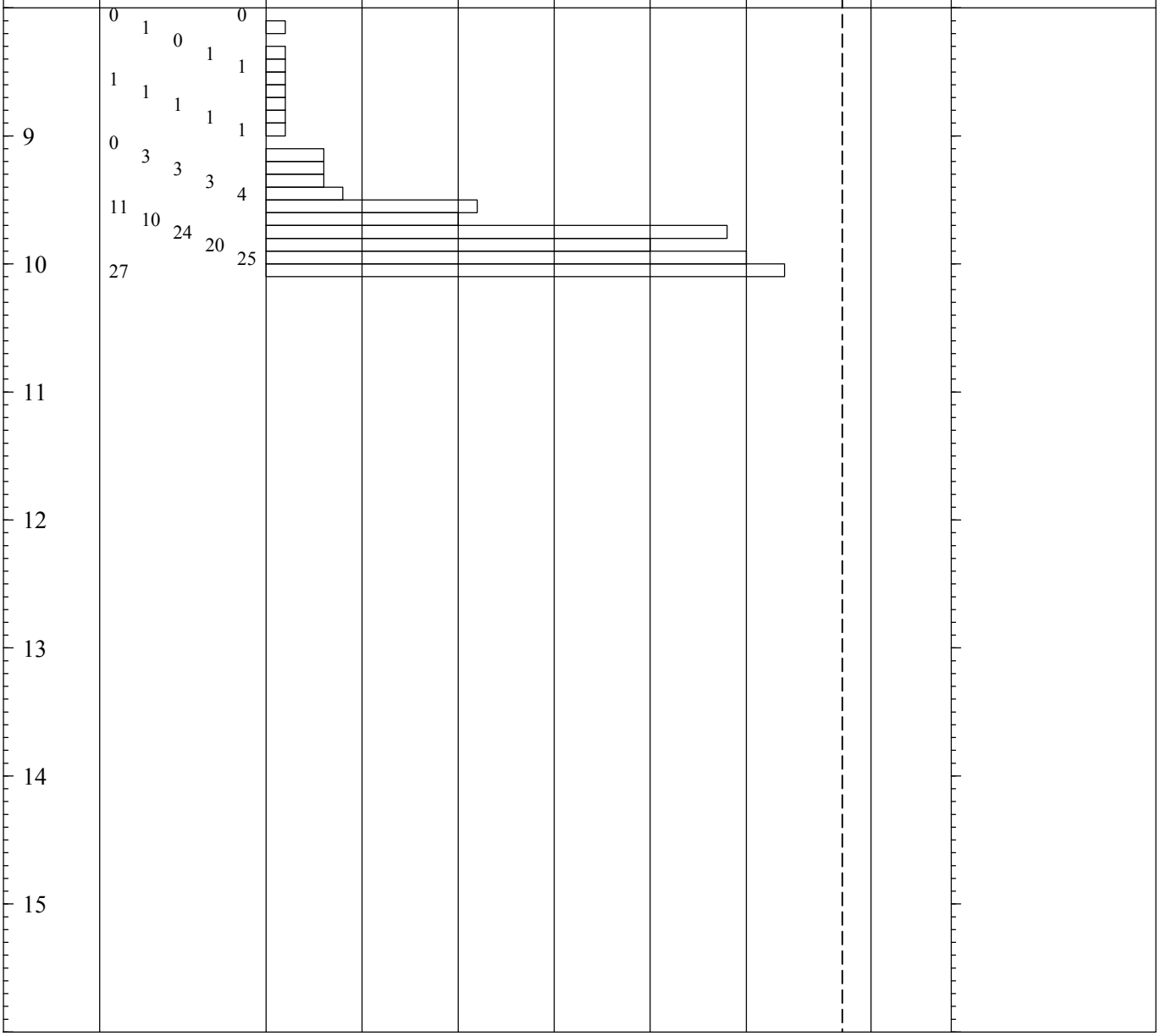
DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS3**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	17-09-13 17-09-13	7.11	E 347,354.9 N 377,269.6	
Contractor				Sheet
				2 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was encountered at 2.9 m bgl. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

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DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS4**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	24-09-13 24-09-13	11.16	E 347,525.3 N 377,610.6	
Contractor				Sheet
				1 of 2

Depth (m)	Readings (blows/100mm)	Diagram (N100 Values) 5 10 15 20 25 30	Torque (Nm)	Remarks
1	0 0 0 0 0			
2	0 0 0 0 0			
3	0 0 0 0 0			
4	0 0 0 0 0			
5	0 0 0 0 0			
6	0 0 0 0 0			
7	0 1 0 1 0			
	1 0 0 1			

Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was encountered at 2.0 m bgl. The borehole was cased to 1 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

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DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS4**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	24-09-13 24-09-13	11.16	E 347,525.3 N 377,610.6	
Contractor				Sheet 2 of 2

Depth (m)	Readings (blows/100mm)	Diagram (N100 Values)	Torque (Nm)	Remarks
9	0 1 1 1 0 3 3 4 3 3 2 2 3 4 3	5 10 15 20 25 30		
10	4 4 3 3 3 3			
11				
12				
13				
14				
15				

Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was encountered at 2.0 m bgl. The borehole was cased to 1 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

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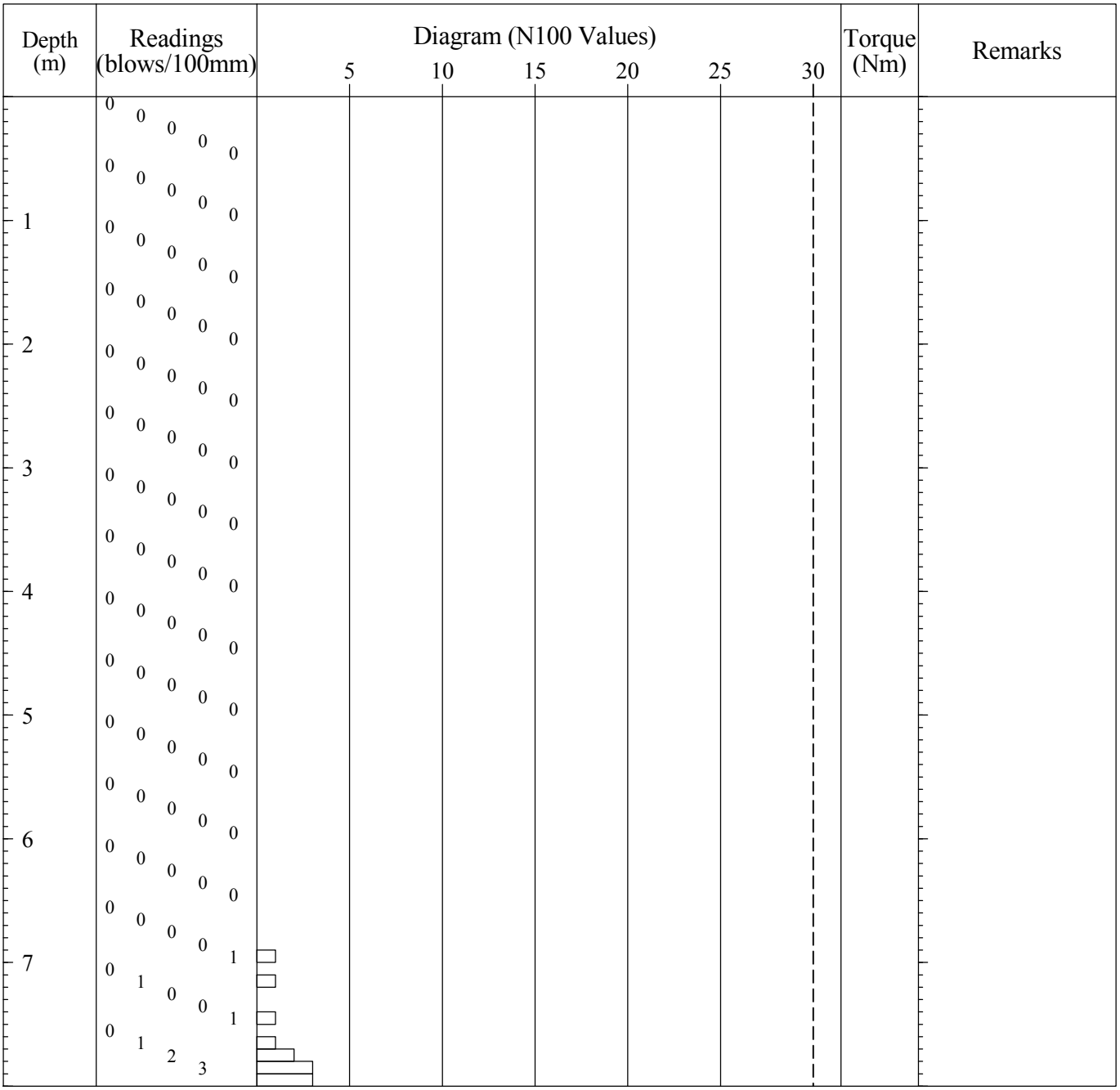
DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS5**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	05-10-13 05-10-13	12.50	E 347,998.0 N 377,904.9	
Contractor				Sheet
				1 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was encountered at 3.0 m bgl. The borehole was cased to 1 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

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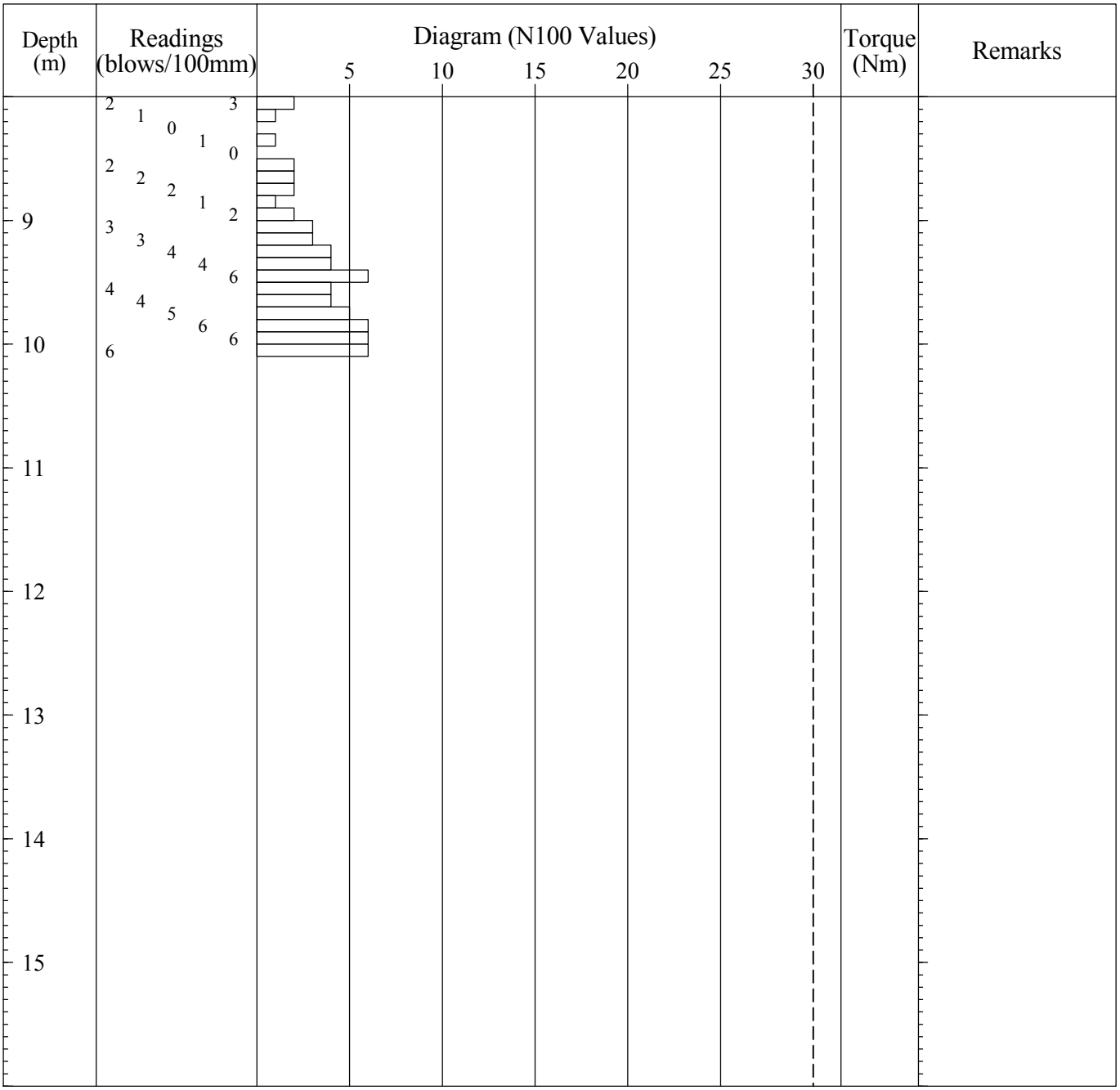
DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS5**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	05-10-13 05-10-13	12.50	E 347,998.0 N 377,904.9	
Contractor				Sheet
				2 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was encountered at 3.0 m bgl. The borehole was cased to 1 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

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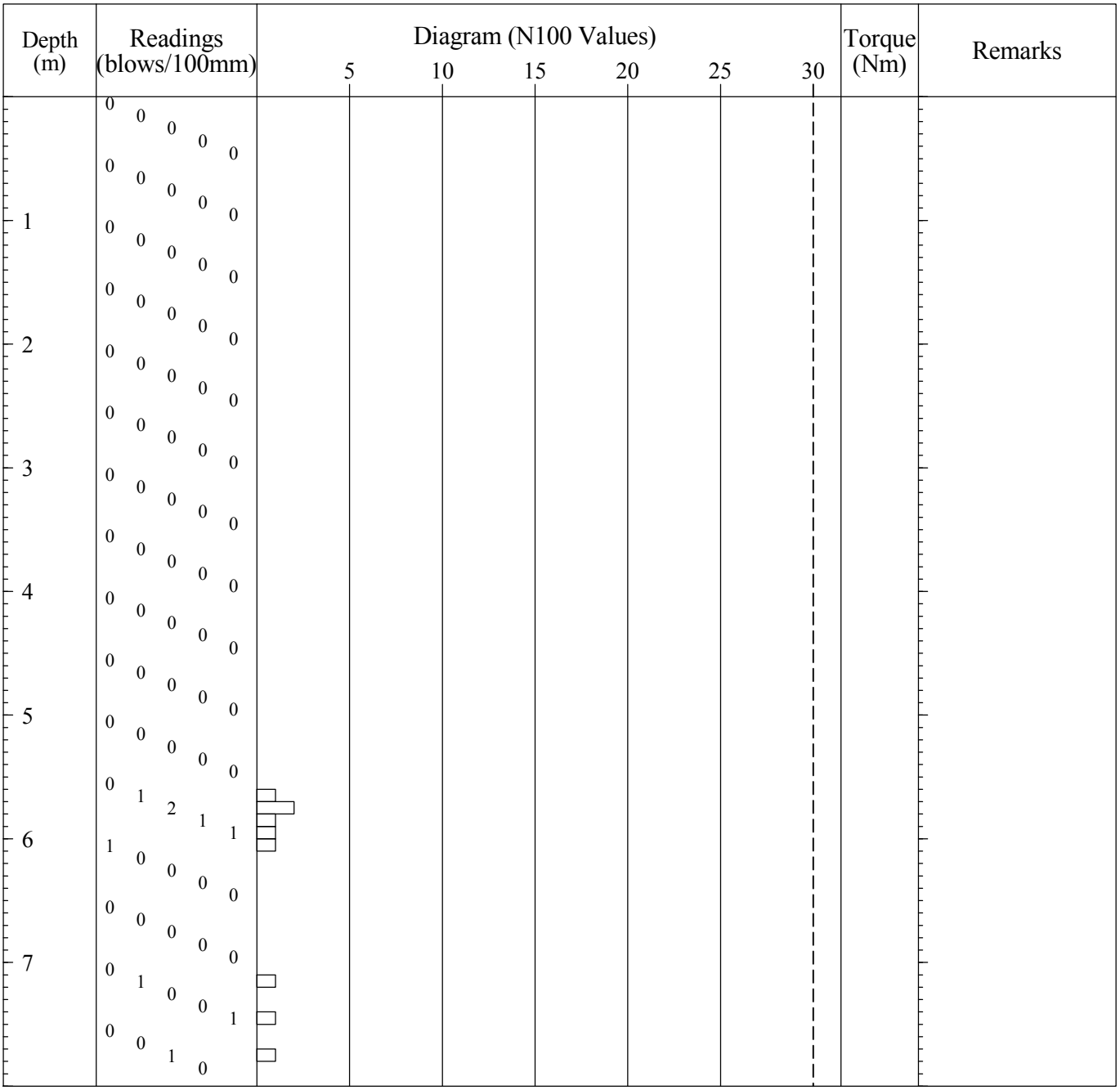
DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS6**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	05-10-13 05-10-13	14.82	E 348,304.0 N 378,069.0	
Contractor				Sheet
				1 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was encountered at 4.0 m bgl. The borehole was cased to 1 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

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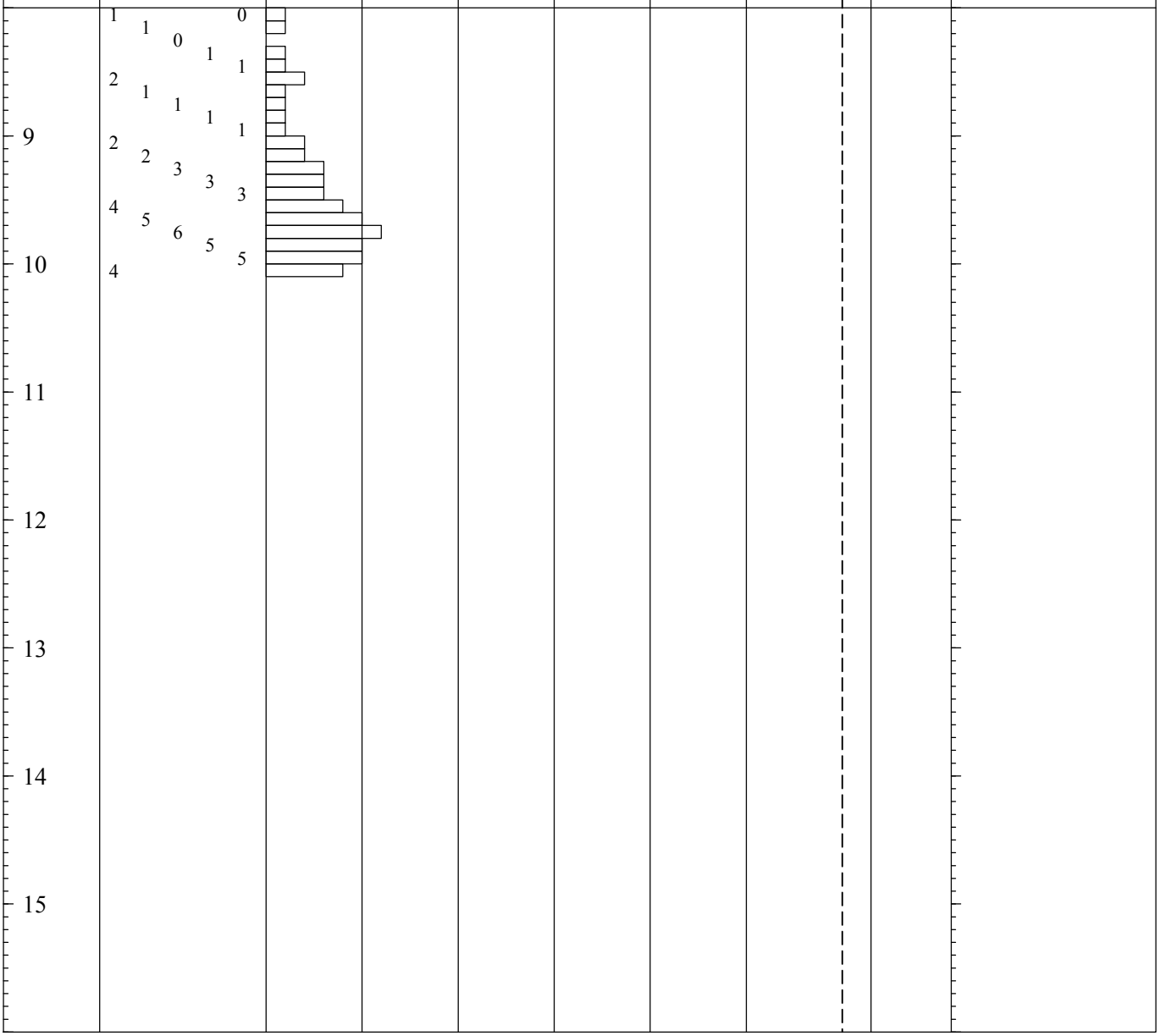
DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS6**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	05-10-13 05-10-13	14.82	E 348,304.0 N 378,069.0	
Contractor				Sheet
				2 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was encountered at 4.0 m bgl. The borehole was cased to 1 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

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DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				WS7
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	18-09-13 18-09-13	5.27	E 348,030.8 N 377,007.9	
Contractor				Sheet 1 of 2

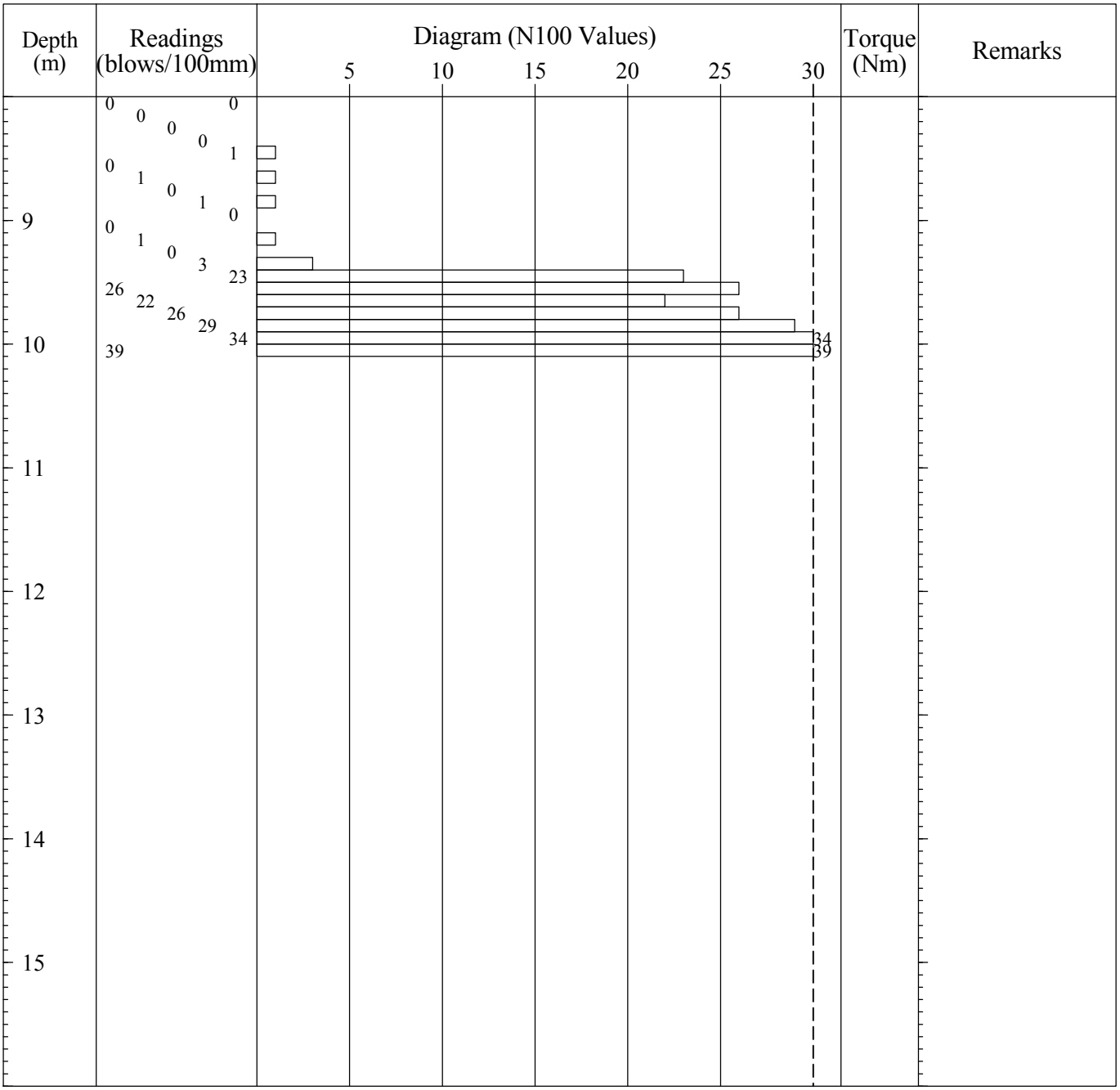
Depth (m)	Readings (blows/100mm)	Diagram (N100 Values) 5 10 15 20 25 30	Torque (Nm)	Remarks
1	0 0 0

Van Elle Limited

Telephone:
Fax:

DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS7**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	18-09-13 18-09-13	5.27	E 348,030.8 N 377,007.9	
Contractor				Sheet
				2 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was encountered at 2.9 m bgl. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

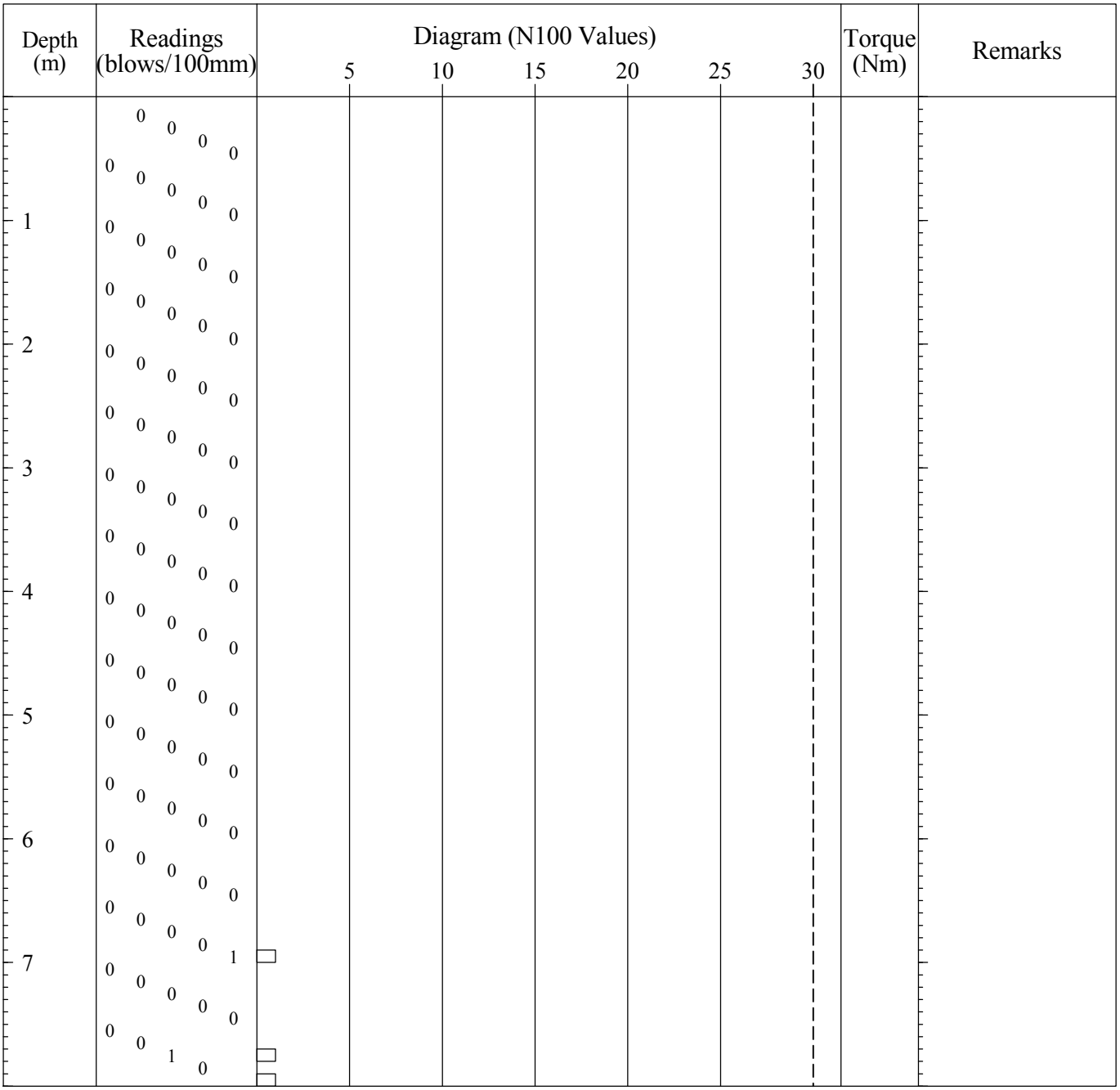
AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

Van Elle Limited

Telephone:
Fax:

DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS8**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	18-09-13 18-09-13	5.31	E 348,454.1 N 377,343.9	
Contractor				Sheet 1 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was encountered at 3.0 m bgl. The borehole was cased to 1 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

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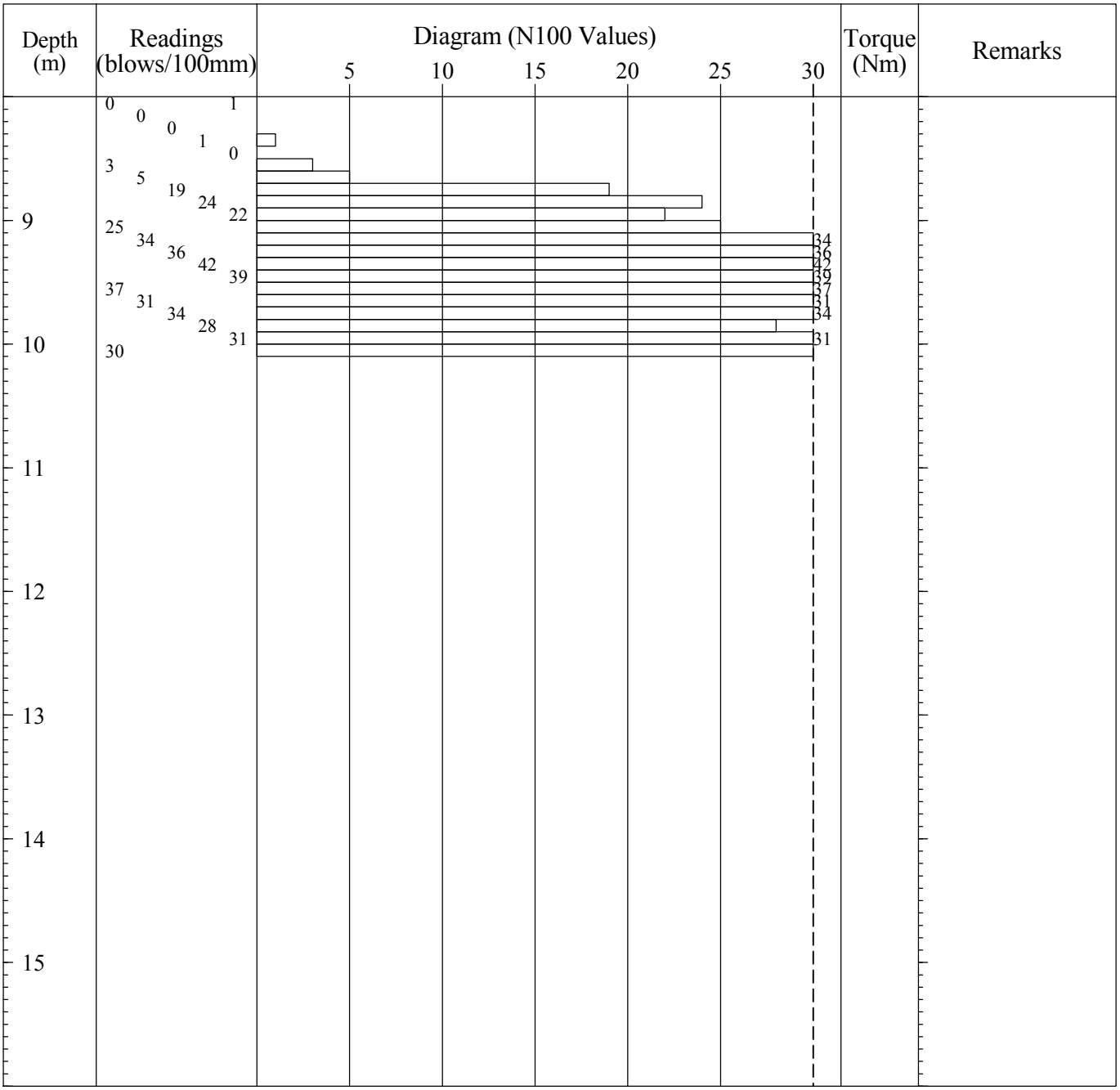
DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS8**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	18-09-13 18-09-13	5.31	E 348,454.1 N 377,343.9	
Contractor				Sheet
				2 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was encountered at 3.0 m bgl. The borehole was cased to 1 m bgl and backfilled with arisings upon completion.

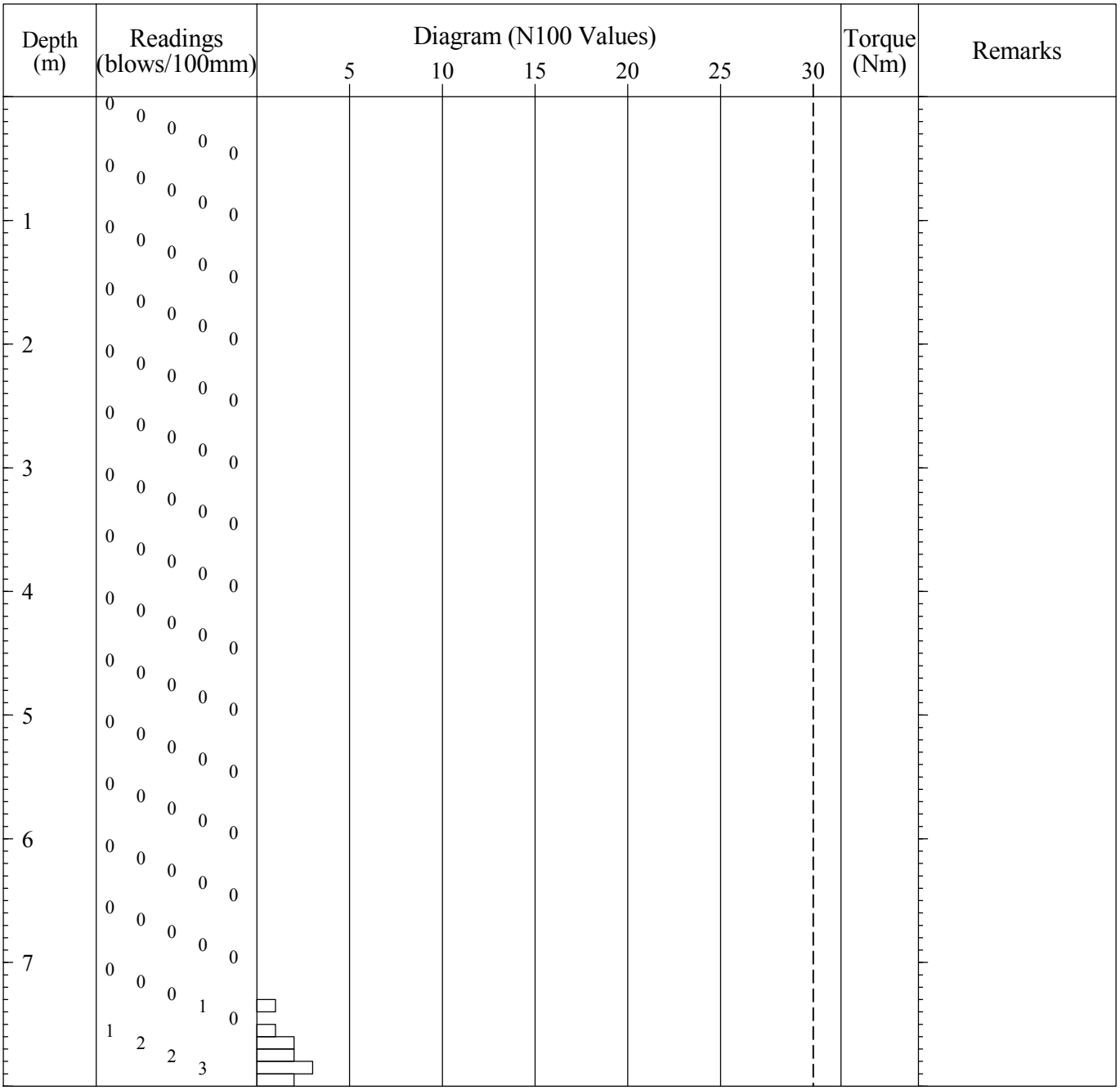
All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

Van Elle Limited

Telephone:
Fax:

DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS9**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	12-09-13 12-09-13	13.22	E 348,830.4 N 377,629.9	
Contractor				Sheet
				1 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was encountered at 3.2 m bgl. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

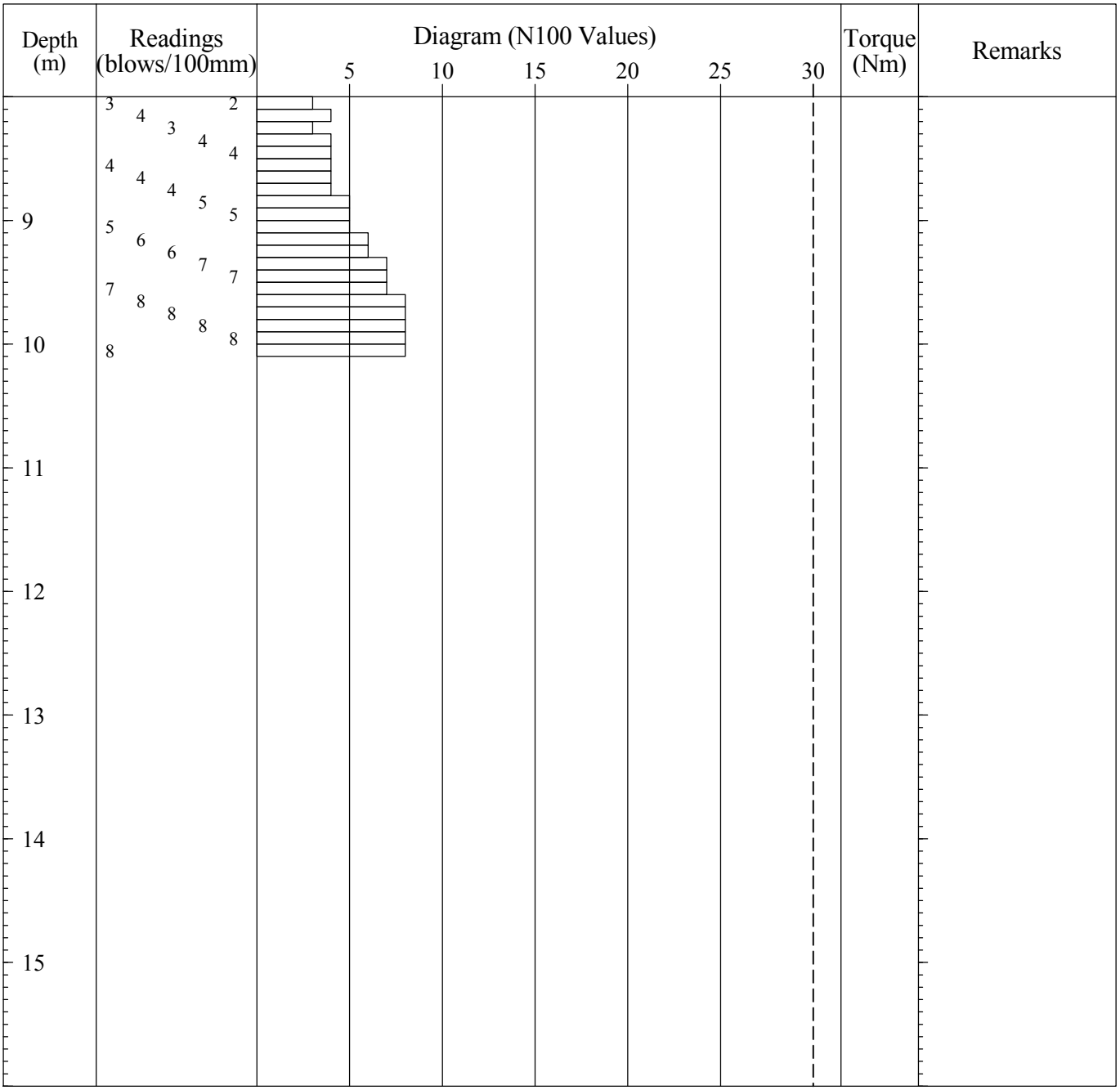
All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

Van Elle Limited

Telephone:
Fax:

DYNAMIC PROBE LOG

Project				PROBE No
Frodsham Wind Farm, Frodsham, Cheshire				**WS9**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	12-09-13 12-09-13	13.22	E 348,830.4 N 377,629.9	
Contractor				Sheet
				2 of 2



Hammer Wt (kg)	63.5
Hammer Drop (mm)	750
Cone Dia (mm)	50.5
Cone Type	Retained
Damper	N/A

GENERAL REMARKS

Groundwater was encountered at 3.2 m bgl. The borehole was cased to 2 m bgl and backfilled with arisings upon completion.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Competitor	Logged By J.Chapman

AGS3 DYNAMIC PROBE G131520.GPJ AGS3_ALL.GDT 18/2/14

Appendix 1: (iii) Cable Percussion

Van Elle Limited

Telephone:
Fax:

BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				SA1
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	23-09-13 29-09-13	10.84	E 347,839.5 N 377,386.7	
Contractor				Sheet
				1 of 4

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
0.05	D1				0.20	Dark brown silty CLAY. MADE GROUND		
0.20	D2				0.50	Dark brown sandy SILT. Sand is fine to medium. MADE GROUND.		
0.50-1.00	B4					Very soft dark brown locally dark grey silty CLAY. Slight hydrocarbon odour. MADE GROUND.		
0.50	D3							
1.00	CD5							
1.20-1.70	B7							
1.20-1.65	SD6							
2.10-2.60	B9	N=0						
2.10-2.55	SD8	N=1						
3.00-3.45	SD10	N=0			(6.30)			
4.00-4.45	SD11	N=0						
5.00-5.50	B13							
5.00-5.45	SD12	N=1						
6.10	CD15							
6.10	D14							
6.30-6.75	SD16	N=1			6.80			
6.70	D17							
6.80	D18					Light brownish grey mottled orange silty CLAY. Occasional organic material.		
6.90-7.45	U19	10/100%			(0.70)			
7.45	D20				7.50			
7.50	CD21							
7.50	D22							

Boring Progress and Water Observations						Chiselling			Water Added	
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To

GENERAL REMARKS

Groundwater was encountered at 10.2 m and 11.0 m bgl with no rise. The borehole was cased to 30.0 m bgl and installed as per log.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Dando 2000	Logged By J.Chapman

AGS3 UK BH G131520.GPJ AGS3_ALL.GDT 17/2/14

Van Elle Limited

Telephone:
Fax:

BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				SA1
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	23-09-13 29-09-13	10.84	E 347,839.5 N 377,386.7	
Contractor				Sheet
				2 of 4

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
8.00-8.40 8.00-8.45	B24 SD23	N=4				Very soft, becoming soft with depth, dark brown occasionally stained dark grey silty CLAY. From 7.5m to 8m bgl and 11.9m to 12.8m bgl; occasional fine sand bands. From 12.3 m bgl; becoming soft. *(continued)*		
9.00	D25							
9.50-9.95	SD26	N=2						
			1		(5.10)			
10.30	D27							
			2					
11.00-11.50	B29							
11.00-11.45	SD28	N=4						
11.90	D30							
12.30-12.75	SD31	N=5			12.60			
12.80	D32				(0.50)	Dark brown silty PEAT. Very frequent organic material.		
12.90-13.40	B34				13.10			
12.90-13.35	SD33	N=9			(0.60)	Loose light greyish brown very sandy SILT. Sand is fine to medium.		
13.70	D35				13.70			
14.20-14.65	SD36	N=9			(1.30)	Firm light greyish brown sandy silty CLAY. Sand is fine to medium.		
15.00-15.50	B39				15.00			
15.00	D37					Medium dense, becoming very dense with depth, dark brown SAND. Sand is fine to medium. From 16.45 m bgl; becoming dense.		
15.00-15.45	SD38	N=13				From 18.0 m bgl; becoming very dense.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Groundwater was encountered at 10.2 m and 11.0 m bgl with no rise. The borehole was cased to 30.0 m bgl and installed as per log.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Dando 2000	Logged By J.Chapman

Van Elle Limited

Telephone:
Fax:

BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				SA1
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	23-09-13 29-09-13	10.84	E 347,839.5 N 377,386.7	
Contractor				Sheet
				3 of 4

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
16.00	D40					Medium dense, becoming very dense with depth, dark brown SAND. Sand is fine to medium. From 16.45 m bgl; becoming dense. From 18.0 m bgl; becoming very dense. *(continued)*		
16.45-16.90	SD41	N=34						
16.50-17.00	B42				(4.20)			
17.50	D43							
18.00-18.45	SD44	N=52						
					19.20			
19.20	D45					Stiff, becoming very stiff with depth, dark brown silty CLAY. Occasional fine to medium sub rounded sandstone gravels. From 19.2m to 20.3m bgl; slightly sandy. From 23.5 m bgl; becoming very stiff.		
19.30-19.75	U46	27/100%						
19.95	D47							
20.30	D48							
20.80-21.25	SD49	N=26						
21.70	D50							
22.20-22.65	U51	31/100%						
22.85	D52							
23.20	D53							
23.50-23.95	SD54	N=31						

Boring Progress and Water Observations					
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Chiselling			Water Added	
From	To	Hours	From	To

GENERAL REMARKS

Groundwater was encountered at 10.2 m and 11.0 m bgl with no rise. The borehole was cased to 30.0 m bgl and installed as per log.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Dando 2000	Logged By J.Chapman

Van Elle Limited

Telephone:
Fax:

BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				SA1
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	23-09-13 29-09-13	10.84	E 347,839.5 N 377,386.7	
Contractor				Sheet
				4 of 4

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
					(10.00)	Stiff, becoming very stiff with depth, dark brown silty CLAY. Occasional fine to medium sub rounded sandstone gravels. From 19.2m to 20.3m bgl; slightly sandy. From 23.5 m bgl; becoming very stiff. *(continued)*		
24.40	D55							
25.15-25.60	SD57	N=32						
25.40	D56							
26.10	D58							
26.20-26.65	U59	35/100%						
26.85	D60							
27.00	D61							
27.80-28.25	U62	34/100%						
28.45	D63							
28.60	D64				29.20			
29.20-29.70	B67					Reddish brown SANDSTONE.		
29.20	D65							
29.20-29.60	SD66	N=44			(1.70)			
30.50-30.90	SD68	N=50/275mm			30.90			

Boring Progress and Water Observations					
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Chiselling			Water Added	
From	To	Hours	From	To
30.2	30.5	0100		

GENERAL REMARKS

Groundwater was encountered at 10.2 m and 11.0 m bgl with no rise. The borehole was cased to 30.0 m bgl and installed as per log.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Dando 2000	Logged By J.Chapman

Van Elle Limited

Telephone:
Fax:

BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				SA2
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	19-09-13 21-09-13	12.21	E 348,347.3 N 377,727.2	
Contractor				Sheet
				1 of 3

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
0.25	D1				(0.40) 0.40	Light brown silty SAND. Sand is fine to medium. Frequent organic material. MADE GROUND.		
0.40	D2					Very soft dark grey sandy silty CLAY. Sand is fine to medium. Occasional organic material. MADE GROUND.		
0.50-1.00	B3							
0.50-1.00	CD4							
1.20-1.70	B6				(1.65)			
1.20-1.65	SD5	N=1						
					2.05			
2.05-2.50	SD7	N=0				Very soft dark grey locally light brown silty CLAY. MADE GROUND.		
2.10-2.60	B8							
3.00-3.45	SD9	N=0						
4.10-4.55	SD10	N=0						
5.00-5.45	SD11	N=0	1		(6.45)			
6.10	D12							
6.30-6.75	SD13	N=1						
7.50-7.95	SD14	N=1						

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Groundwater was encountered at 5.0 m, 9.4 m and 9.8 m bgl with no rise. The borehole was cased to 20.0 m bgl and installed as per log.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Dando 2000	Logged By J.Chapman

AGS3 UK BH G131520.GPJ AGS3_ALL.GDT 17/2/14

Van Elle Limited

Telephone:
Fax:

BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				SA2
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	19-09-13 21-09-13	12.21	E 348,347.3 N 377,727.2	
Contractor				Sheet
				2 of 3

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
8.00-8.50	CD15				8.50	Very soft dark grey locally light brown silty CLAY. MADE GROUND. *(continued)*		
8.50	D16					Very soft light brown mottled orange and grey silty CLAY. Rare organic fragments.		
8.50-8.95	U17	12/100%						
9.00	D18							
9.40-9.85	SD19	N=2	2 3		(1.80)			
					10.30			
10.30	D20					Loose dark brown silty PEAT. Very frequent organic material.		
10.30-10.75	SD21	N=8			(0.90)			
					11.20			
11.20	D22					Firm light grey sandy silty CLAY. Sand is fine. Rare organic fragments.		
11.25-11.70	U23	6/100%						
11.95	D24							
12.60-13.10	B26							
12.60-13.05	SD25	N=8						
13.00	CD27				(4.40)			
13.50	D28							
14.00-14.45	SD29	N=8						
					15.60			
15.60-16.10	B32					Medium dense light grey silty SAND. Sand is fine to medium. From 16.6m bgl; rare fine gravels.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Groundwater was encountered at 5.0 m, 9.4 m and 9.8 m bgl with no rise. The borehole was cased to 20.0 m bgl and installed as per log.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Dando 2000	Logged By J.Chapman

Van Elle Limited

Telephone:
Fax:

BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				SA2
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	19-09-13 21-09-13	12.21	E 348,347.3 N 377,727.2	
Contractor				Sheet
				3 of 3

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
15.60	D30					Medium dense light grey silty SAND. Sand is fine to medium. From 16.6m bgl; rare fine gravels. *(continued)*		
15.60-16.05	SD31	N=22						
16.50	D33				(2.10)			
17.00-17.50	B35							
17.00-17.45	SD34	N=22			17.70			
17.70	D36					Dense, becoming very dense with depth, light brown SAND. Sand is fine to medium. From 17.9 m bgl; occasional fine to medium sub rounded to sub angular gravels. From 19.0 m bgl; becoming very dense.		
17.90-18.40	B38							
17.90-18.35	SD37	N=36						
19.00-19.45	SD39	N=50/200mm			(2.75)			
20.00-20.35	SD40	N=50/175mm			20.45			

Boring Progress and Water Observations					
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Chiselling			Water Added	
From	To	Hours	From	To
18.7	20	0230		

GENERAL REMARKS

Groundwater was encountered at 5.0 m, 9.4 m and 9.8 m bgl with no rise. The borehole was cased to 20.0 m bgl and installed as per log.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Dando 2000	Logged By J.Chapman

AGS3 UK BH G131520.GPJ AGS3_ALL.GDT 17/2/14

Van Elle Limited

Telephone:
Fax:

BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				SA3
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	30-09-13 06-10-13	4.80	E 348,741.8 N 377,234.6	
Contractor				Sheet
				1 of 5

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
0.30	D1				(1.10)	Dark brown stained reddish brown SILT. Frequent rootlets.		
0.60-1.10	CD3							
0.60	D2				1.10			
1.10	D4				(0.60)	Very softy light greyish brown silty CLAY.		
1.20-1.70	B6							
1.20-1.65	SD5	N=1			1.70			
1.70	D7				1.90	Very loose dark brown peaty clayey SILT.		
1.90-2.40	B9				(1.70)	Very loose dark brown silty PEAT. Very frequent organic material.		
1.90-2.35	SD8	N=0						
2.90-3.35	SD10	N=1						
3.40	D11				3.60			
3.60-4.10	B13				(4.20)	Very soft light grey sandy silty CLAY. Sand is fine to medium.		
3.60-4.00	CD14							
3.60-4.05	SD12	N=0						
4.60-5.05	SD15	N=0						
5.60	D16							
6.00-6.45	SD17	N=0						
7.30-7.75	SD18	N=1						
7.80	D19				7.80			

Boring Progress and Water Observations					
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Chiselling			Water Added	
From	To	Hours	From	To

GENERAL REMARKS

Groundwater was encountered at 8.7 m and 10.0 m bgl rising to 5.6 m and 8.2 m bgl respectively after 20 minutes and at 11.4 m bgl with no rise. The borehole was cased to 32.0 m bgl and installed as per log.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Dando 2000	Logged By J.Chapman

Van Elle Limited

Telephone:
Fax:

BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				SA3
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	30-09-13 06-10-13	4.80	E 348,741.8 N 377,234.6	
Contractor				Sheet
				2 of 5

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
8.00-8.50	B21		2			Very soft, becoming stiff with depth, dark brown locally light grey silty CLAY. Frequent organic material. From 8.0 m bgl; becoming dark greyish brown. From 8.7 m bgl; becoming stiff. *(continued)*		
8.00-8.45	SD20	N=1						
			1					
8.70-9.15	SD22	N=23			(2.10)			
9.70	D23		2		9.90			
9.90	D24					Medium dense light brown gravelly silty SAND. Sand is fine to medium. Gravel is fine to medium sub rounded to sub angular.		
10.00-10.50	B26							
10.00-10.45	SD25	N=20						
11.10	D27		3		(2.40)			
11.50-11.95	SD28	N=20						
					12.30			
12.30	D29				(0.50)	Reddish brown silty CLAY. Occasional fine to medium sands.		
					12.80			
12.80-13.30	B32					Medium dense light orange brown silty SAND. Sand is fine to medium with a little coarse.		
12.80	D30							
12.80-13.25	SD31	N=25						
					(2.50)			
14.30-14.80	B34							
14.30-14.75	SD33	N=28						
					15.30			
					15.55	Dark brown silty CLAY. Rare fine to medium sub rounded gravels.		
15.55-16.00	SD35	N=33				Dense light orange brown silty SAND. Sand is fine to medium.		

Boring Progress and Water Observations						Chiselling			Water Added	
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To

GENERAL REMARKS

Groundwater was encountered at 8.7 m and 10.0 m bgl rising to 5.6 m and 8.2 m bgl respectively after 20 minutes and at 11.4 m bgl with no rise. The borehole was cased to 32.0 m bgl and installed as per log.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Dando 2000	Logged By J.Chapman

Van Elle Limited

Telephone:
Fax:

BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				SA3
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	30-09-13 06-10-13	4.80	E 348,741.8 N 377,234.6	
Contractor				Sheet
				3 of 5

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
16.20 16.25-16.70	D36 U37	27/100%			(1.40) 16.95	Dense light orange brown silty SAND. Sand is fine to medium. *(continued)*		
16.95 17.30 17.60-18.05 18.25	D38 D39 U40 D41	34/100%			(1.55) 18.50	Dark brown silty CLAY. Rare fine gravels.		
18.50	D42				(0.55) 19.05	Light orange brown silty SAND. Sand is fine to medium.		
19.05 19.20-19.65 20.00 20.50-20.95 21.00 22.00-22.45 23.00 23.50-23.95	D43 SD44 D45 SD46 D47 SD48 D49 U50	N=25 N=28 N=23 27/100%				Stiff dark brown sandy CLAY. Sand is fine to medium. Occasional fine to medium sub rounded to sub angular sandstone gravels.		

Boring Progress and Water Observations						Chiselling			Water Added	
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To

GENERAL REMARKS

Groundwater was encountered at 8.7 m and 10.0 m bgl rising to 5.6 m and 8.2 m bgl respectively after 20 minutes and at 11.4 m bgl with no rise. The borehole was cased to 32.0 m bgl and installed as per log.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Dando 2000	Logged By J.Chapman

Van Elle Limited

Telephone:
Fax:

BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				SA3
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	30-09-13 06-10-13	4.80	E 348,741.8 N 377,234.6	
Contractor				Sheet
				4 of 5

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
24.15	D51					Stiff dark brown sandy CLAY. Sand is fine to medium. Occasional fine to medium sub rounded to sub angular sandstone gravels. *(continued)*		
24.60	D52							
25.00-25.45	SD53	N=23			(12.75)			
26.00	D54							
26.50-26.95	SD55	N=24						
27.50	D56							
28.00-28.45	U57	32/100%						
28.65	D58							
29.00	D59							
29.20-29.65	U60	35/100%						
29.85	D61							
30.30	D62							
31.00-31.45	SD63	N=30						
					31.80			
31.80	D64					Reddish brown SANDSTONE.		

Boring Progress and Water Observations						Chiselling			Water Added	
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To

GENERAL REMARKS

Groundwater was encountered at 8.7 m and 10.0 m bgl rising to 5.6 m and 8.2 m bgl respectively after 20 minutes and at 11.4 m bgl with no rise. The borehole was cased to 32.0 m bgl and installed as per log.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Dando 2000	Logged By J.Chapman

Van Elle Limited

Telephone:
Fax:

BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				SA3
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	30-09-13 06-10-13	4.80	E 348,741.8 N 377,234.6	
Contractor				Sheet
				5 of 5

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
					(0.60) 32.40	Reddish brown SANDSTONE. *(continued)*		
32.30- 32.40	SD65	N=50/50mm						

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Groundwater was encountered at 8.7 m and 10.0 m bgl rising to 5.6 m and 8.2 m bgl respectively after 20 minutes and at 11.4 m bgl with no rise. The borehole was cased to 32.0 m bgl and installed as per log.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Dando 2000	Logged By J.Chapman

Van Elle Limited

Telephone:
Fax:

BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				SA4
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	07-10-13 11-10-13	10.84	E 350,566.7 N 378,346.2	
Contractor				Sheet
				1 of 4

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
0.20-0.60 0.20	CD2 D1				(0.60) 0.60	Light brown sandy SILT. Sand is fine. Frequent rootlets. MADE GROUND.		
0.60-1.00 0.60	CD4 D3					Very loose dark grey locally light brown silty CLAY. MADE GROUND.		
1.20-1.70 1.20-1.65	B6 SD5	N=0						
2.10-2.55	SD7	N=0						
3.00-3.45	SD8	N=0						
4.05-4.50	SD9	N=1			(7.70)			
5.10-5.55	SD10	N=1						
6.00	D11							
6.40-6.90 6.40-6.85	B13 SD12	N=1						
7.50	D14							
7.80-8.25	SD15	N=1						

Boring Progress and Water Observations						Chiselling			Water Added	
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To

GENERAL REMARKS

Groundwater was encountered at 13.1 m and 26.7 m bgl rising to 11.2 m and 9.5 m bgl respectively after 20 minutes. The borehole was cased to 29.7 m bgl and was installed as per log.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Dando 2000	Logged By J.Chapman

Van Elle Limited

Telephone:
Fax:

BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				SA4
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	07-10-13 11-10-13	10.84	E 350,566.7 N 378,346.2	
Contractor				Sheet
				2 of 4

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
					8.30			
8.30	D16					Very soft light greyish brown very sandy SILT. Sand is fine to medium.		
8.40-8.90	B18							
8.40-8.85	SD17	N=0						
			2		(2.00)			
9.50	D19							
9.80-10.30	CD21							
9.80-10.25	SD20	N=1			10.30			
10.30	D22					Very loose dark brown silty PEAT. Very frequent organic material.		
10.50-11.00	B24							
10.50-10.95	SD23	N=1	1					
11.50	D25				(3.00)			
12.00-12.45	SD26	N=1						
13.00	D27		1		13.30			
13.20	D28					Firm, becoming stiff with depth, light greyish brown silty CLAY. Occasional fine gravels. From 13.2 m to 13.4 m bgl; frequent fine to medium sub rounded to sub angular gravels. From 16.1 m bgl; becoming stiff.		
13.30-13.70	B30							
13.30-13.65	SD29	N=11						
14.20	D31							
14.50-14.95	SD32	N=15						
					(3.30)			
15.40	D33							

Boring Progress and Water Observations						Chiselling			Water Added	
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To

GENERAL REMARKS

Groundwater was encountered at 13.1 m and 26.7 m bgl rising to 11.2 m and 9.5 m bgl respectively after 20 minutes. The borehole was cased to 29.7 m bgl and was installed as per log.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Dando 2000	Logged By J.Chapman

Van Elle Limited

Telephone:
Fax:

BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				SA4
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	07-10-13 11-10-13	10.84	E 350,566.7 N 378,346.2	
Contractor				Sheet
				3 of 4

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
16.10-16.55	SD34	N=17			16.60			
16.60	D35					Dense, becoming very dense with depth, light orange brown gravelly silty SAND. Sand is fine to medium with a little coarse.		
17.00-17.50	B37					From 18.5 m bgl; becoming very dense.		
17.00-17.45	SD36	N=36				From 21.05 m bgl; becoming less gravelly.		
17.90	D38							
18.50-18.95	SD39	N=50						
19.40	D40				(6.10)			
20.00-20.45	SD41	N=51						
21.05	D42							
21.50-21.95	SD43	N=50/275mm						
22.50	D44				22.70			
22.70	D45					Very stiff dark brown silty CLAY. Occasional fine to medium sub rounded to sub angular sandstone gravels.		
22.80-23.25	U46	48/100%						
23.40	D47							
23.70	D48							

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Groundwater was encountered at 13.1 m and 26.7 m bgl rising to 11.2 m and 9.5 m bgl respectively after 20 minutes. The borehole was cased to 29.7 m bgl and was installed as per log.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Dando 2000	Logged By J.Chapman

AGS3 UK BH G131520.GPJ AGS3_ALL.GDT 17/2/14

Van Elle Limited

Telephone:
Fax:

BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				SA4
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	07-10-13 11-10-13	10.84	E 350,566.7 N 378,346.2	
Contractor				Sheet
				4 of 4

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
24.30-24.75	SD49	N=20				Very stiff dark brown silty CLAY. Occasional fine to medium sub rounded to sub angular sandstone gravels. *(continued)*		
25.30	D50							
25.60-26.05	U51							
26.25	D52				(7.30)			
26.50	D53							
26.70-27.20	B55							
26.70-27.15	SD54	N=32						
27.60	D56							
28.20-28.65	SD57	N=50/285mm						
29.10	D58							
29.70-30.00	SD59	N=50/125mm			30.00			

Boring Progress and Water Observations						Chiselling			Water Added	
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To

GENERAL REMARKS

Groundwater was encountered at 13.1 m and 26.7 m bgl rising to 11.2 m and 9.5 m bgl respectively after 20 minutes. The borehole was cased to 29.7 m bgl and was installed as per log.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Dando 2000	Logged By J.Chapman

AGS3 UK BH G131520.GPJ AGS3_ALL.GDT 17/2/14

Van Elle Limited

Telephone:
Fax:

BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				SA5
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	11-10-13 22-10-13	11.68	E 350,215.5 N 379,331.6	
Contractor				Sheet
				1 of 6

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
0.20-0.60	CD2					Dark orange brown sandy SILT. Sand is fine to medium. MADE GROUND.		
0.20	D1				(1.20)	From 0.6 m bgl; becoming dark brown with occasional rootlets.		
0.60-1.10	B4							
0.60	D3				1.20			
1.20-1.70	B6					Very soft dark grey locally dark brown slightly sandy silty CLAY. Sand is fine to medium. Slight hydrocarbon odour. MADE GROUND. From 4.5 m to 5.3 m bgl; becoming more sandy		
1.20-1.65	SD5	N=1						
1.95-2.50	B8							
1.95-2.30	SD7	N=1						
2.90-3.35	SD9	N=1	▼1					
3.40-3.90	B11							
3.40	D10							
3.40-3.85	SPT	N=1						
4.30-4.80	B15				(6.10)			
4.30	D12							
4.30-4.75	SD13	N=1						
5.30-5.75	SD16	N=2						
6.50-6.95	SD17	N=2						
7.30-7.80	B20				7.30			
7.30	D18							
7.30-7.75	SD19	N=4						

Boring Progress and Water Observations						Chiselling			Water Added	
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To

GENERAL REMARKS

Groundwater was encountered at 2.9 m bgl with no rise, and at 9.95 m and 26.9 m bgl rising to 8.4 m and 14.1 m bgl respectively after 20 mins. The borehole was cased to 42.0 m bgl and installed as per log.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Dando 2000	Logged By J.Chapman

AGS3 UK BH G131520.GPJ AGS3_ALL.GDT 17/2/14

Van Elle Limited

Telephone:
Fax:

BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				SA5
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	11-10-13 22-10-13	11.68	E 350,215.5 N 379,331.6	
Contractor				Sheet
				2 of 6

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
8.00-8.50 8.00-8.45	B22 SD21	N=3	1			Very soft, becoming firm with depth, dark greyish brown silty CLAY. Frequent organic fragments. Occasional fine sand bands. From 9.0 m bgl; organic fragments becoming absent. From 9.95 m bgl; becoming soft. From 10.5 m bgl; becoming firm. *(continued)*		
9.00	D23							
9.50-9.95	SD24	N=5	2					
9.95	D25				(5.50)			
10.50-10.95	SD26	N=10						
11.00	D27							
12.00-12.45	SD28	N=12						
					12.80			
12.80	D29				(0.60)	Medium dense dark grey clayey SAND. Sand is fine to coarse.		
					13.40			
13.40-13.85	SD31	N=16				Stiff dark greyish brown silty sandy CLAY. Occasional fine sand bands. Occasional fine to medium sub rounded to sub angular flint gravels.		
14.00	D32		2					
					(2.60)			
15.00-15.45	SD33	N=21						
					16.00			

Boring Progress and Water Observations						Chiselling			Water Added	
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To

GENERAL REMARKS

Groundwater was encountered at 2.9 m bgl with no rise, and at 9.95 m and 26.9 m bgl rising to 8.4 m and 14.1 m bgl respectively after 20 mins. The borehole was cased to 42.0 m bgl and installed as per log.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Dando 2000	Logged By J.Chapman

Van Elle Limited

Telephone:
Fax:

BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				SA5
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	11-10-13 22-10-13	11.68	E 350,215.5 N 379,331.6	
Contractor				Sheet
				3 of 6

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
16.00-16.50	B35					Firm dark grey stained orange brown silty CLAY. From 17.0 m bgl; staining becoming absent.		
16.00	D34							
16.00-16.45	SPT	N=10						
17.00	D36				(2.10)			
17.50-18.00	B38							
17.50-17.95	SD37	N=11			18.10			
18.10	D39					Dense dark grey sandy GRAVEL & COBBLES. Sand is fine to medium. Gravel is fine to medium sub rounded to sub angular siltstone and mudstone. Abundant sub angular to sub rounded siltstone cobbles.		
18.20-18.70	B40							
18.20-18.65	CPT	N=22						
19.80-20.30	B41				(3.70)			
19.80-20.25	CPT	N=24						
21.20-21.65	CPT	N=28			21.80			
21.80	D42					Dark reddish brown silty CLAY. Occasional fine sand bands. Occasional fine to medium sub rounded to sub angular gravels.		
21.90-22.40	B43							
21.90-22.35	U100	19/0%			(1.20)			
23.00	D44				23.00			
23.10-23.60	B46					Medium dense dark reddish brown SAND. Sand is fine to coarse. Rare fine to medium sub rounded to sub angular siltstone fragments.		
23.10-23.55	SD45	N=15						

Boring Progress and Water Observations					
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Chiselling			Water Added	
From	To	Hours	From	To
23.6	23.8	0045		

GENERAL REMARKS

Groundwater was encountered at 2.9 m bgl with no rise, and at 9.95 m and 26.9 m bgl rising to 8.4 m and 14.1 m bgl respectively after 20 mins. The borehole was cased to 42.0 m bgl and installed as per log.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Dando 2000	Logged By J.Chapman

Van Elle Limited

Telephone:
Fax:

BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				SA5
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	11-10-13 22-10-13	11.68	E 350,215.5 N 379,331.6	
Contractor				Sheet
				4 of 6

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
24.10-25.05	SD47	N=26			(2.40)	Medium dense dark reddish brown SAND. Sand is fine to coarse. Rare fine to medium sub rounded to sub angular siltstone fragments. *(continued)*		
24.60-25.00	B48							
					25.40			
25.40	D49					Dark brown slightly silty CLAY.		
26.10-26.55	U50	49/95%			(1.50)			
26.60	D51		3					
					26.90			
26.90	D52					Dense, becoming medium dense with depth, dark reddish brown SAND. Sand is fine to coarse. From 30.0 m bgl; becoming medium dense.		
27.00-27.50	B54							
27.00-27.45	SD53	N=30						
28.40-28.85	SD55	N=34						
					(5.70)			
30.00-30.50	B57							
30.00-30.45	SD56	N=21						
31.00	D58							
31.50-31.95	SD59	N=25						

Boring Progress and Water Observations					
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Chiselling			Water Added	
From	To	Hours	From	To
24.4	24.6	0100		

GENERAL REMARKS

Groundwater was encountered at 2.9 m bgl with no rise, and at 9.95 m and 26.9 m bgl rising to 8.4 m and 14.1 m bgl respectively after 20 mins. The borehole was cased to 42.0 m bgl and installed as per log.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Dando 2000	Logged By J.Chapman

Van Elle Limited

Telephone:
Fax:

BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				SA5
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	11-10-13 22-10-13	11.68	E 350,215.5 N 379,331.6	
Contractor				Sheet
				5 of 6

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
					32.60	Dense, becoming medium dense with depth, dark reddish brown SAND. Sand is fine to coarse. From 30.0 m bgl; becoming medium dense. *(continued)*		
32.60	D60					Stiff, becoming very stiff with depth, dark brown boulder CLAY. From 43.0 m bgl; becoming very stiff.		
33.00-33.45	U61	29/100%						
33.65	D62							
34.00	D63							
35.00-35.45	SD64	N=20						
36.00	D65							
36.50-36.95	U66	35/100%						
37.50	D67							
37.60	D68				(10.85)			
38.20-38.65	SD69	N=24						
38.70	D70							
39.20-39.65	SD71	N=25						

Boring Progress and Water Observations					
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Chiselling			Water Added	
From	To	Hours	From	To

GENERAL REMARKS

Groundwater was encountered at 2.9 m bgl with no rise, and at 9.95 m and 26.9 m bgl rising to 8.4 m and 14.1 m bgl respectively after 20 mins. The borehole was cased to 42.0 m bgl and installed as per log.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Dando 2000	Logged By J.Chapman

Van Elle Limited

Telephone:
Fax:

BOREHOLE LOG

Project				BOREHOLE No
Frodsham Wind Farm, Frodsham, Cheshire				SA5
Job No	Date	Ground Level (m)	Co-Ordinates ()	
G131520	11-10-13 22-10-13	11.68	E 350,215.5 N 379,331.6	
Contractor				Sheet
				6 of 6

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Legend	Depth (Thick-ness)	DESCRIPTION		
40.20	D72					Stiff, becoming very stiff with depth, dark brown boulder CLAY. From 43.0 m bgl; becoming very stiff. *(continued)*		
41.70-42.15	U73	30/100%						
42.60	D74							
43.00-43.45	SD75	N=34			43.45			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
						41	43	0300			Groundwater was encountered at 2.9 m bgl with no rise, and at 9.95 m and 26.9 m bgl rising to 8.4 m and 14.1 m bgl respectively after 20 mins. The borehole was cased to 42.0 m bgl and installed as per log.

All dimensions in metres Scale 1:50	Client Peel Wind Farms (Frodsham) Ltd	Method/ Plant Used Dando 2000	Logged By J.Chapman

LEGEND

U	Undisturbed driven tube sample, 100mm nominal diameter unless noted
P	Undisturbed pushed piston sample, 100mm nominal diameter unless noted
TW	Thin wall tube (pushed)
CBR	CBR mould sample
BLK	Block sample
D	Small disturbed sample
B	Disturbed bulk sample
S	Standard Penetration Test sample
J	Jar Sample
WS	Water sample
C	Core sample
	Test results
N	Standard penetration test, split spoon sampler
N	Standard penetration test, solid cone
K	Field permeability test, kFH indicates falling head, kPI indicates packer injection
V	Field vane test [natural (n) remoulded (r)]
I_a or I_d	Point load strength quoted for axial (a) and diameter (d)
CS	Core sample for laboratory testing
PP	Pocket Penetrometer

Appendix 1: (iv) CPT Results

LANKELMA

PROJECT:	Frodsham Windfarm

CLIENT:	Van Elle

FIELDWORK

CPT Rig	18 tonne capacity track mounted CPT unit (UK8)
Operator(s)	Anthony Davis, Joe Bourne and Walter Geddes
Date started	12th September 2013
Date completed	19th September 2013
Lankelma's Project Manager	Chris Dimelow
Client's Site Manager	Andy Johnston

REPORT

	Revision	**Date**	**Name**
Prepared	1	23rd September 2013	Emma Stickland
Checked	1	24th September 2013	Chris Dimelow
Approved	1	26th September 2013	Carlton Hall

CONTENTS

TABLES

CPT Test Summary

APPENDICES

APPENDIX A General Information
APPENDIX B Cone Penetration Test Results – Raw Data Plots
APPENDIX C Standard Interpretation Results

1 INTRODUCTION

At the request of Van Elle, a CPT led soils investigation was carried out on project *Frodsham Windfarm*.

Site location:

Land off Moorditch Lane
Frodsham
Cheshire

21 cone penetration tests (CPTs) with dynamic pore water measurement
Provision of a factual report with soil behaviour type and geotechnical parameters

Please refer to the *Tables* section for general testing details and quantities.

2 FIELDWORK

The Cone Penetration Tests were performed with an 18 tonne track mounted CPT unit (UK8) equipped with a 20 tonne capacity hydraulic ram set.

An electric piezocone of a type conforming to the requirements of clause 3.1 of BS1377: 1990: Part 9 was used on this project. Cone measurements included cone tip resistance, friction sleeve resistance and dynamic pore water pressure (Piezometer) sampled at a 10mm resolution. Cone maintenance, checks and calibrations were carried out in accordance with recommendations of the International Reference Procedure for CPTU (ISSMGE, 1999). Copies of all calibration certificates for the cones used are presented in Appendix A. Refer to the cone calibration certificates for the cone type and dimensional data.

The filter element was located in the u_2 position between the cone and friction sleeve and was replaced after every test. The pore pressure system was saturated with 1000cSt glycerine oil.

The magnetometer used in the Lankelma Magcone system comprises of a Bartington Instrument 3 Axis Flux Gate magnetometer that is capable of measuring disturbances in the Earth's field of less than 1 part in a million. Buried ferrous items, such as UXO, result in localized distortions of the magnetic field. The detection radius is dependent upon the level of background disturbances at the site and the size of the object.

The magnetometer probe is pushed into the soil using a standard CPT rig up to a maximum applied pressure of 15 tonnes. Where soils comprise made ground, it may be necessary to prepare each test position in advance either by excavation or drilling prior to the Magcone test.

The magcone was deployed due to the low risk of buried UXO on the site. For the safety of the Lankelma personnel this method was utilised; were a UXO to be detected, CPT testing would cease immediately.

3 POSITIONING

All positions were set out by the Client's representative on site.

4 RAW DATA REDUCTION AND PRESENTATION

The CPT results are presented in Appendix B. The corrected cone resistance (qt), local side friction, porewater pressure, friction ratio and inclination are all presented against depth and elevation in accordance with recommendations of the International Reference Procedure for CPTU (ISSMGE, 1999). CPT data and the associated derived geotechnical parameters are included in the AGS 3.1 data file provided.

Penetration length readings are corrected for inclination and sleeve readings are depth corrected for the dimensional offset between cone tip and sleeve during post processing. An additional shift of -80mm is applied to the sleeve to account for tip failure zone offset (see 'CPT Interpretation Notes'). 'Rod spikes' (artefacts of the 1m interval pause for rod string addition) are filtered from the cone tip and sleeve data.

5 INTERPRETATIVE DATA

The in-situ total and effective stress states are calculated based on an assumed total unit weight of soil of 17.5 kN/m^3 and hydrostatic pore pressure state. The depth of the piezometric surface has been assumed at a generic 1.5mBGL across the site based on interpretation of piezocone measurements. The data are applied in calculation of stress normalised geotechnical parameters.

The Soil Behaviour Type (SBT) is presented as the Soil Behaviour Type Index, I_C, for both stress-normalised and non-normalised evaluations according to the charts of Robertson (1998 & 2010) applicable to predominantly silicate soils.

The I_c provides a continuous profile of SBT variation with depth such that the end user may choose appropriate stratigraphic subdivisions. The basis of I_c and its approximation of the original chart classification zones may be seen from Appendix A figure 'CPT Soil Behaviour Type Chart'. The loss of fidelity is dominantly in zones 1 (*sensitive fine grained)* and zones 8 & 9 (*overconsolidated or cemented*). To account for this approximation a profile of sensitivity and OCR is provided in the Standard Interpretation Results (see section 'Geotechnical Parameters').

Non-stress normalised SBT index I_C:

$$I_c = \left[\left(3.47 - \log\left(\frac{q_c}{\sigma_{atm}}\right)^2\right)^2 + (\log R_f + 1.22)^2\right]^{0.5}$$

Stress-normalised SBT index I_C:

$$I_c = [(3.47 - \log(Q_t)^2)^2 + (\log F_r + 1.22)^2]^{0.5}$$

(See glossary of terms and symbols Appendix A)

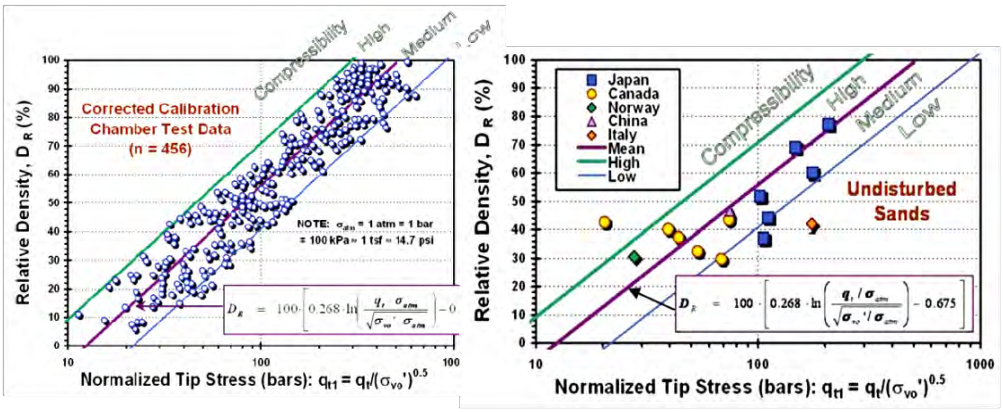
The results are presented on the plots of Appendix C – *Standard Interpretation Results*.

The relative density of sands is calculated based on an empirical relationship proposed by Jamiolkowski *et al.* (2001) based on a large database of undisturbed frozen samples and calibration chamber tests. The expected accuracy may be evaluated from the distribution of calibration data in the figures presented below. The relationship has the following form:

$$D_r = 100\left[0.268 \cdot \ln\left(\frac{q_t/\sigma_{atm}}{\sqrt{\sigma_{vo}'/\sigma_{atm}}}\right) - k\right]$$

(See glossary of terms and symbols Appendix A)

K = Compressibility dependant constant. For medium compressibility = -0.675 (applied generic value), for high compressibility and sands with significant carbonate or calcareous composition <=1, for low compressibility >=-2.0



Relative density with normalised tip stress and sand compressibility from calibration chamber tests (left) and undisturbed frozen samples (right). Jamiolkowski *et al.* (2001) (Reproduced from NCHRP Synthesis 368 (2007)).

The results are presented on the plots of Appendix C – *Standard Interpretation Results*.

S_u is estimated from the net cone tip resistance using the following equation:

$$s_u \quad \frac{(q_c \quad _{vo})}{N_k} \text{ (Lunne } et\ al.\text{ (1981))}$$

where N_k is an empirical cone factor.

Research has shown that the cone factor N_k varies between 11 and 21 for normally to moderately overconsolidated soils with an average value of 15. For moderately to heavily overconsolidated soils the N_k factor may range from 20 to 30+. S_U values are presented for N_k factors of 15 and 20.

The results are presented on the plots of Appendix C – *Standard Interpretation Results*.

The preconsolidation stress of clays is calculated based on the method proposed by Mayne (1995) and Demers and Leroueil (2002) and has the following form:

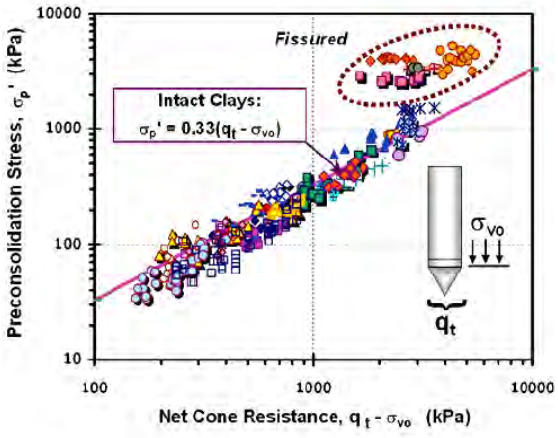
$$\sigma_p' = k \cdot (q_t - \sigma_{vo}) = 0.33(q_t - \sigma_{vo})$$

$$OCR = \sigma_p'/\sigma_{v0}'$$

(See glossary of terms and symbols Appendix A)

The factor k may be expected to lie in the range 0.2 to 0.5 with 0.33 representing the average.

Higher values of k are recommended for aged heavily overconsolidated clays (Robertson, 2009) and may be calibrated accordingly. The figure below demonstrates the expected accuracy of the above methods in prediction of preconsolidation stress, of particular note is the under prediction for fissured clays.



Preconsolidation stress from net cone resistance in clays (Reproduced from Mayne (2007)).

The sensitivity of the soil, as defined by the ratio of undrained shear strength to remoulded shear strength, is calculated using the factored normalised cone resistance (S_u) and remoulded shear strength taken as equal to the direct friction sleeve measurement. The relationship has the following form (Mayne, 2007):

$$s_t = 0.073 \cdot (q_t - \sigma_{v0})/f_s$$

(See glossary of terms and symbols Appendix A)

The results are presented on the plots of Appendix C – *Standard Interpretation Results*.

6 CPT DATA INTERPRETATION NOTES

Provided below is an inexhaustive set of cautionary notes on interpretation of the acquired CPT data with reference to examples within the dataset where appropriate.

SOIL BEHAVIOUR TYPE

The soil behaviour type (SBT) as defined by Robertson *et al.* (1986) is not intended to replace soil classification based on particle size fractions. Rather, the SBT will generally show bias in the classification towards the soil fraction that dominates soil behaviour in response to cone penetration (Cone tip: analogous to bearing capacity failure, friction sleeve: analogous to remoulded S_u or simple shear). In general the stress-normalised SBT will be more accurate, but may be less reliable at very shallow depths (1-2m) due to the particular stress normalisation procedure applied.

DRAINED AND UNDRAINED SOIL BEHAVIOUR

Geotechnical parameters appropriate for drained and undrained cone penetration conditions are derived for drained and undrained soil behaviour types (SBTs) respectively, however to account for uncertainty in the SBT correlation with drainage behaviour, all parameters are derived over the range of mixed soil types 'Silt Mixtures' and 'Sand Mixtures' or *Ic* 2.05-2.95 (Robertson, 2010). For partially drained conditions, or for partially saturated low permeability soils, error will be introduced within derived parameters.

Piezocone dynamic pore water pressures behaviour, dissipations or other site specific observations may be used to identify the appropriate limits of application. Dissipations to t_{50} exceeding 30 seconds indicate undrained penetration behaviour (Kim *et al.*, 2010).

DYNAMIC PORE PRESSURE DATA

During penetration, strong dilation in shear at the cone shoulder may result in cavitation and desaturation of the piezo system and may take time to recover (up to 1m penetration). Penetration through soils of partial saturation will provide unrepresentative readings and may desaturate the piezo system introducing variable error.

CONE TIP AND SLEEVE OFFSET

The accuracy of the SBT is sensitive to offset error in the friction ratio. Penetration through zones of anisotropic soil stiffness may lead to offset of the cone tip and sleeve readings due to variation in the tip failure zone shape/depth. For low to moderate risk projects this is generally insignificant. The friction ratio is often inaccurate in heavily disturbed soils with a 'blocky' macro fabric.

For this investigation a friction sleeve depth offset correction of -80mm was applied together with a 5 data point moving average on the friction ratio to minimise the influence of this effect on derived parameters.

CONE TYPE

The reference cone type has a 10cm^2 projected cone tip area and 150cm^2 friction sleeve area (S10 cone). In practice it is common to use an alternative cone having a 15cm^2 tip area with a 200 – 225cm^2 sleeve area (S15 cone) for improved sensitivity and penetration depth potential. Use of the S15 cone will have the following known influences on data with respect to the reference S10:

More pronounced transitions zones and thin layer effects (larger zone of influence and failure zone).

Possible marginal increase in u_2 position dynamic pore pressures in undrained/partially drained penetration.

TRANSITION ZONES AND THIN LAYER EFFECTS

During penetration at the boundary between soils of contrasting stiffness, a transition zone is often evident prior to mobilization of the true soil stiffness. These should be cautiously ignored in assessment of soil behaviour type and parameter evaluation. Where the stiff layer is thin (<~0.5m) the true stiffness will not be fully mobilised. The effect for thin low stiffness layers is less significant. Procedures for thin-layer effect correction are provided by Robertson and Wride (1998). In choosing characteristic values of the tip, sleeve and derived parameter results, large scale peak and trough values may be more representative of the local value.

GRAVELS

The presence of gravel or larger clasts in a soil is often characterised by short peaks in the CPT tip and sleeve readings, possibly with associate inclinometer ‘shake’ and/or sharp reductions in pore water readings due to dilation effects. Frequent gravels in soft or loose soils may generate highly erroneous friction ratio values. Where gravels are matrix supported the tip and sleeve peaks may be ignored or filtered in choosing characteristic values for bulk behaviour.

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CPT Test Summary

HOLE ID	FINAL DEPTH (mBGL)	Cone ID {C=Cone tip; F=Friction Sleeve; I= Inclination; P = Piezo; S=Subtraction cone; 15/10 = cone projected area (cm2))}	CPT RIG	PRE DRILLED / INSPECTION PIT	CASING DEPTH	REFUSAL FACTOR	DISSIPATIONS	SEISMIC CONE	SAMPLES	EASTING	NORTHING	ELEVATION	DATE OF TEST	REMARKS
CPT01	24.28	S15-CFIP.908	UK8			Total cone load							12/09/2013	
CPT02	17.41	S15-CFIP.908	UK8			Total cone load							12/09/2013	
CPT03	22.44	S15-CFIP.908	UK8			Total cone load							12/09/2013	
CPT04	18.06	S15-CFIP.901	UK8			Inclination							13/09/2013	
CPT05	16.13	S15-CFIP.901	UK8			Tip load							16/09/2013	
CPT06	14.76	S15-CFIP.901	UK8			Tip load							16/09/2013	
CPT07	13.59	S15-CFIP.901	UK8			Tip load							16/09/2013	
CPT08	14.73	S15-CFIP.901	UK8			Tip load							16/09/2013	
CPT09	13.12	S15-CFIP.901	UK8			Tip load							17/09/2013	
CPT10	15.24	S15-CFIP.901	UK8			Tip load							17/09/2013	
CPT11	11.21	S15-CFIP.901	UK8			Tip load							19/09/2013	
CPT12	11.67	S15-CFIP.901	UK8			Tip load							19/09/2013	
CPT13	12.71	S15-CFIP.901	UK8			Tip load							19/09/2013	
CPT14	18.16	S15-CFIP.901	UK8			Tip load							18/09/2013	
CPT15	24.48	S15-CFIP.901	UK8			Tip load							18/09/2013	
CPT16	23.16	S15-CFIP.901	UK8			Tip load							18/09/2013	
CPT17	6.78	S15-CFIP.901	UK8			Data error							18/09/2013	
CPT17a	16.55	S15-CFIP.901	UK8			Tip load							18/09/2013	
CPT18	14.00	S15-CFIP.901	UK8			Tip load							19/09/2013	
CPT19	17.05	S15-CFIP.901	UK8			Tip load							19/09/2013	
CPT20	12.63	S15-CFIP.901	UK8			Tip load							18/09/2013	

Cone Calibration Certificate

LANKELMA

Cone number	S15-CFIP.908
Type	Subtraction 150kN, 1500mm²
Calibration date	17/08/2013
Calibration expiry	16/11/2013
Engineer	A Harman

[redacted] gitally signed by Alastair rman N: cn=Alastair Harman, c=GB, Lankelma Ltd, ou=Instrument gineer, mail=Alastairharman@lankelm com ason: I attest to the accuracy d integrity of this document ate: 2013.08.17 13:32:06 +01'00'

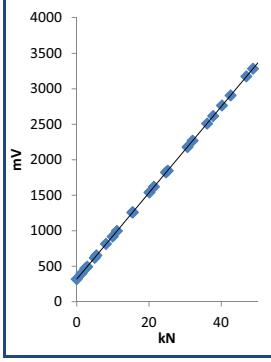
Signed and dated by:

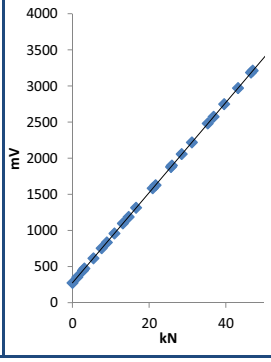
Checked and dated by:

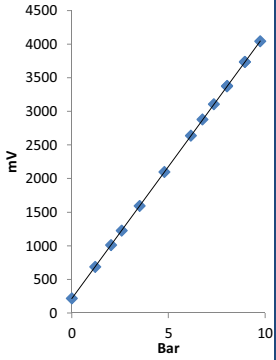
	Serial number	Last Calibration Date	Max error	Error unit
Load cell	47305	17/04/2013	0.1	% of rec value
DMM (load cell)	096526	28/11/2012	0.017@ 200mV	% of rec value
DMM (cone)	097936	28/11/2012	0.020@ 20V	% of rec value
Power supply	510C0Z4G2	28/11/2012	≤0.01 Regulation	% of rec value
Pressure meter	2371385	28/11/2012	+/- 0.01 bar	@ Full range

Load qc [kN]	Output qc [mV]	Load fs [kN]	Output fs [mV]	Load pp [bar]	Output pp [mV]	Inclination [degrees]	Output inc [mV]
0.000	316.6	0.000	273.6	0.00	218.0		*X*
1.339	397.7	1.264	354.3	1.21	686.8	0	2434
2.918	491.8	2.706	445.1	2.03	1011.0		
4.978	616.9	5.464	613.8	2.58	1226.5		
9.950	916.7	8.950	833.7	3.51	1593.2		*Y*
15.537	1258.1	14.652	1186.6	4.79	2098.2	0	2563
20.132	1537.9	21.679	1626.3	6.16	2638.1		
25.197	1844.7	25.703	1878.8	7.35	3106.0		
30.661	2177.7	31.155	2218.3	8.03	3371.5		
36.099	2507.8	36.826	2573.5	8.96	3734.1		
42.612	2905.0	43.195	2969.9	9.75	4042.2		
48.805	3281.4	47.025	3211.4	8.95	3735.5		
53.967	3594.9	52.667	3561.6	8.04	3378.6		
46.955	3172.8	46.578	3185.5	6.76	2879.0		
40.210	2763.1	39.576	2748.1	5.90	2542.7		
37.777	2615.2	35.289	2480.7	4.73	2083.7		
32.079	2267.9	28.480	2056.6	4.37	1934.4		
24.703	1820.8	25.935	1898.3	2.95	1379.1		
21.373	1618.1	20.922	1583.7	2.24	1099.7		
15.392	1256.2	16.581	1313.9	1.76	909.1		
11.125	996.0	13.126	1096.9	0.00	218.3		
8.094	813.2	10.939	957.5				
5.442	651.4	7.605	753.6				
2.396	468.5	3.091	472.3				
0.000	316.8	0.000	273.9				
Zeroshift mV	**317**	**274**	**218**				
Zeroshift Difference mV	-0.2	-0.3	-0.3				
mV at Nominal	3354	3395	8078				
Best Fit Slope	60.75239915	62.4310734	392.9869162				
Linearity Load	0.999999	0.999999	0.999996				
Linearity Unload	0.999998	0.999997	0.999994				
% Max Hysteresis Error	0.0559	0.1064	0.0001				
Nominal *F* kN	**50**	**50**	**20**				**25**
Maximum *F* kN	150	150	30				25
Calibration No.	**3038**	**3122**	**7860**				

Input Load and Unload (kN) vs. Output (mV) to show linearity







	Dimensional Values in mm					
	Straightness	Sleeve Ø	Sleeve T/B Ødiff	Tip Ø	Tip Definition	Crosstalk MΩ
Tolerance	0.5mm	43.6 Min.	0.3 Max	43.4 Min.	Qualitative Ass.	Must be None
Actual	0.1	43.95	0	43.65	pass	pass
Replaced						

Note : Check all dimensions before testing as the tip and sleeve are consumable items.

LANKELMA

Cone Calibration Certificate

Cone number	S15-CFIP.901
Type	Subtraction 150kN, 1500mm²
Calibration date	29/07/2013
Calibration expiry	28/10/2013
Engineer	A Harman

[redacted]

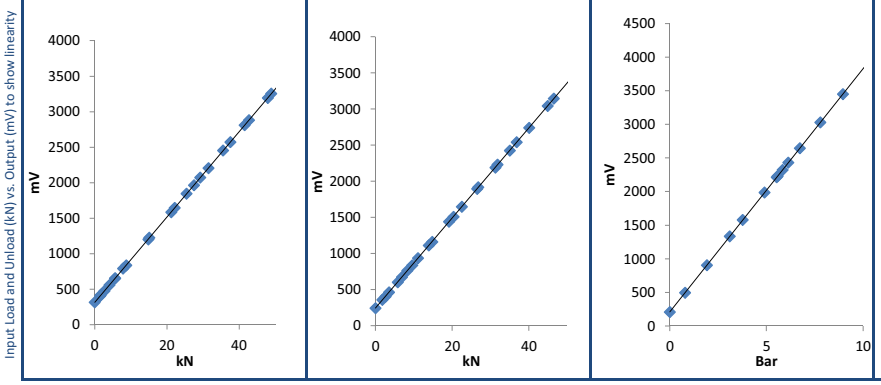
Digitally signed by Alastair Harman
DN: cn=Alastair Harman, c=GB, o=Lankelma Ltd, ou=Instrument Engineer, email=Alastairharman@lankelma.com
Reason: I attest to the accuracy and integrity of this document
Date: 2013.07.29 11:22:04 +01'00'

Signed and dated by:

Checked and dated by:

	Serial number	Last Calibration Date	Max error	Error unit
Load cell	47305	17/04/2013	0.1	% of rec value
DMM (load cell)	096526	28/11/2012	0.017@ 200mV	% of rec value
DMM (cone)	097936	28/11/2012	0.020@ 20V	% of rec value
Power supply	510C0Z4G2	28/11/2012	≤0.01 Regulation	% of rec value
Pressure meter	2371385	28/11/2012	+/- 0.01 bar	@ Full range

Load qc [kN]	Output qc [mV]	Load fs [kN]	Output fs [mV]	Load pp [bar]	Output pp [mV]	Inclination [degrees]	Output inc [mV]
0.000	314.0	0.000	241.8	0.00	207.7		*X*
1.519	403.7	2.619	402.6	0.79	495.1	0	2537
2.688	473.0	3.533	461.5	1.92	904.2		
5.683	653.0	5.802	600.2	3.10	1334.1		
8.742	835.1	9.590	835.3	3.77	1578.1		*Y*
14.853	1200.1	14.811	1159.3	4.90	1985.7	0	2516
21.195	1583.3	20.369	1506.4	5.53	2212.6		
27.489	1963.4	26.531	1893.3	6.73	2644.0		
31.504	2204.4	31.289	2187.7	7.79	3028.3		
37.555	2570.6	35.051	2423.4	8.96	3448.8		
42.710	2879.8	40.097	2738.3	10.05	3841.0		
47.922	3193.2	44.939	3040.9	6.13	2430.3		
53.135	3505.7	51.287	3436.3	5.84	2321.4		
48.872	3253.9	46.530	3143.0	5.58	2229.7		
41.504	2809.6	36.836	2539.0	4.94	1999.9		
35.528	2452.7	31.841	2229.1	3.26	1390.8		
29.200	2071.6	26.808	1915.4	2.88	1250.5		
25.412	1844.5	22.535	1645.5	2.35	1060.5		
22.148	1644.5	19.173	1438.7	1.95	913.3		
15.103	1224.0	13.903	1110.3	1.69	819.9		
7.842	789.7	11.083	934.2	0.00	207.6		
5.575	649.6	8.299	761.3				
4.080	556.9	6.886	671.1				
1.715	420.7	1.777	357.4				
0.000	314.7	0.000	242.0				
Zeroshift mV	**314**		**242**		**208**		
Zeroshift Difference mV	-0.7		-0.2		0.1		
mV at Nominal	3320		3357		7443		
Best Fit Slope	60.11549342		62.30358945		361.7590354		
Linearity Load	0.999997		0.999998		0.999995		
Linearity Unload	0.999996		0.999997		0.999998		
% Max Hysteresis Error	0.1277		0.0494		-0.1158		
Nominal *F* kN	**50**		**50**		**20**		**25**
Maximum *F* kN	150		150		30		25
Calibration No.	**3006**		**3115**		**7235**		



	Dimensional Values in mm					
	Straightness	Sleeve Ø	Sleeve T/B Ødiff	Tip Ø	Tip Definition	Crosstalk MΩ
Tolerance	0.5mm	43.6 Min.	0.3 Max	43.4 Min.	Qualitative Ass.	Must be None
Actual	0.2	43.95	0	43.6	pass	pass
Replaced						

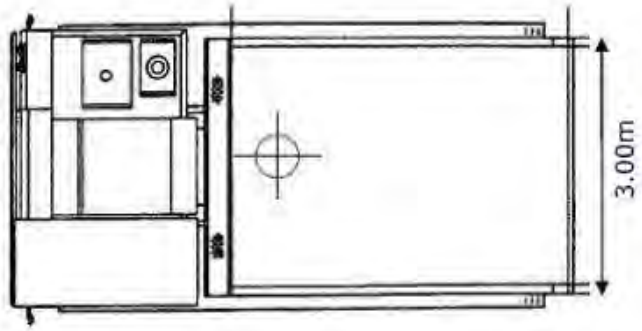
Note : Check all dimensions before testing as the tip and sleeve are consumable items.

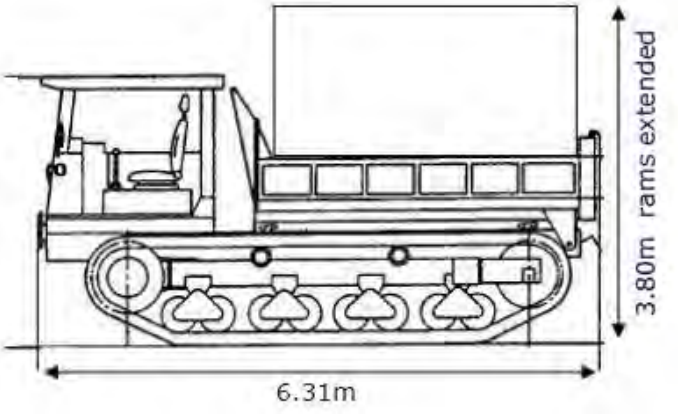
UK8

Rubber-tracked crawler

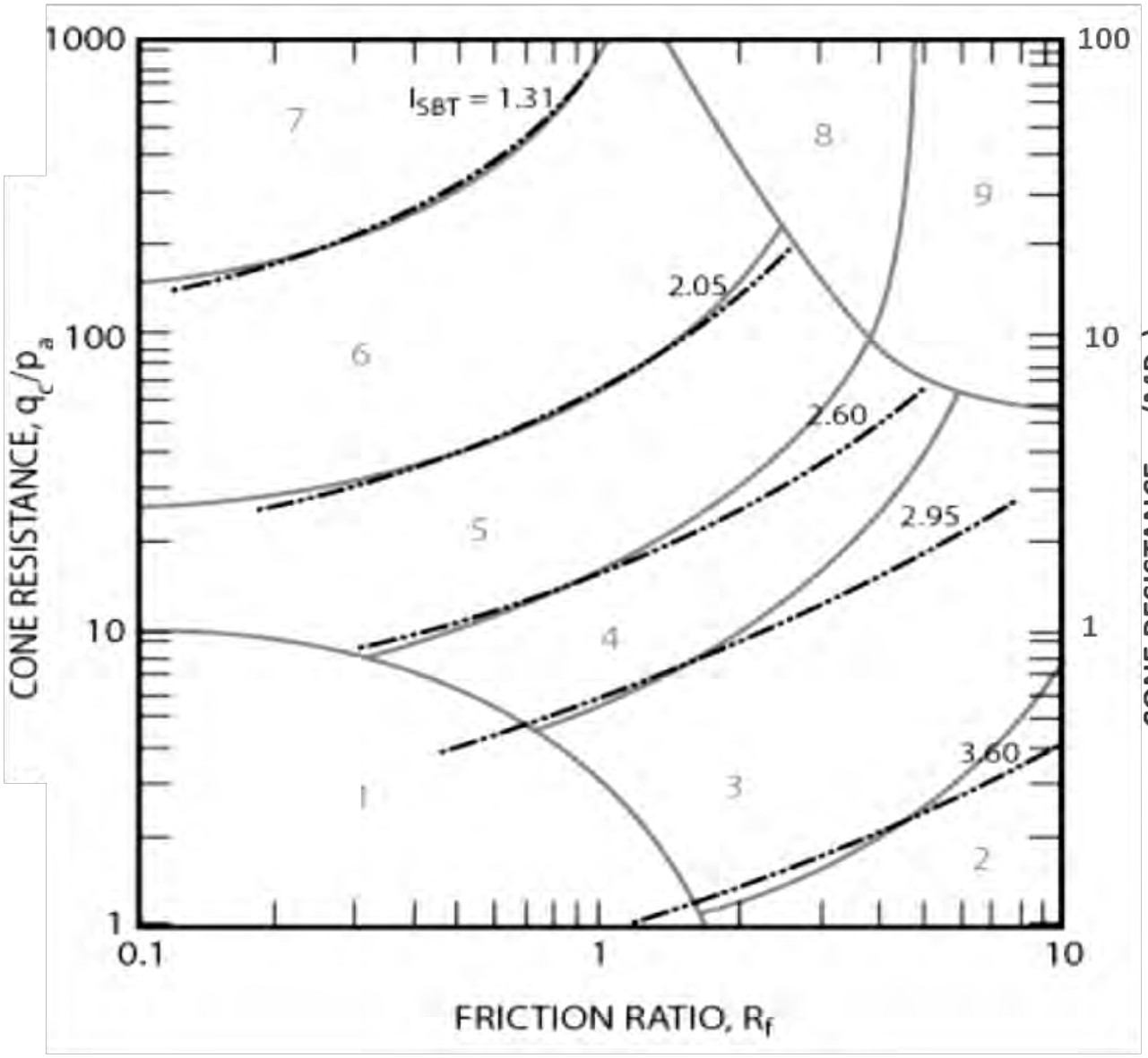
18 tonnes

- extremely soft terrain
- high ground clearance
- low kPa





Tel: +44 (0)1797 280050 Fax: +44 (0)1797 280195 Email: info@lankelma.com
Lankelma Ltd, Cold Harbour Barn, Cold Harbour Lane, Iden, E. Sussex, TN31 7UT, U.K



et al.

Ic

Zone	
1	
2	
3	
4	
5	*Overconsolidated or cemented*

SYMBOLS

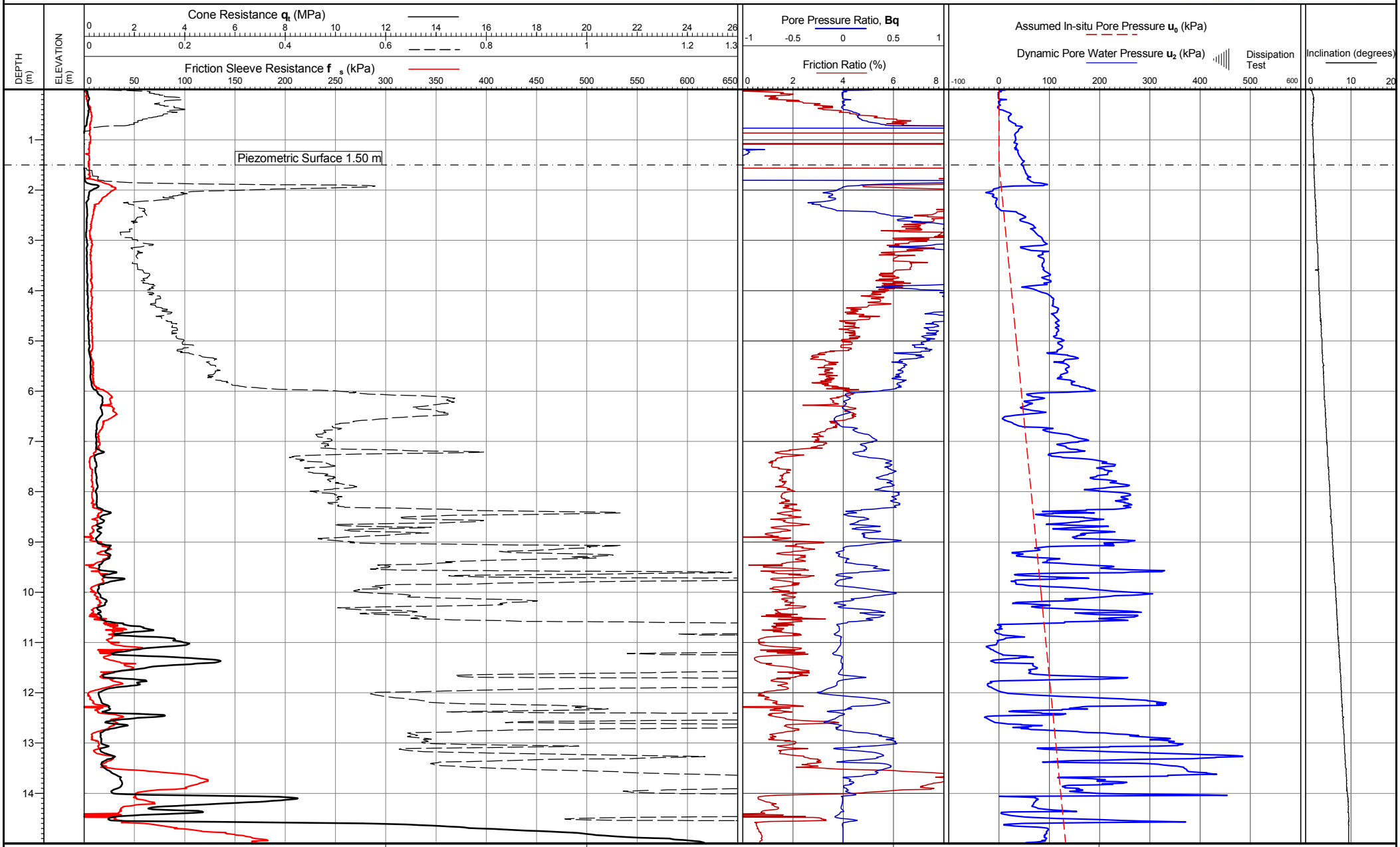
I_c

TERMS

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
Cone ID: S15-CFIP.908
Operator: Anthony Davis
Date of test: 12/09/2013 09:59:38

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Refusal criteria: Total cone load

Date of plot: 20-09-13

Lankelma Project Ref: P105742

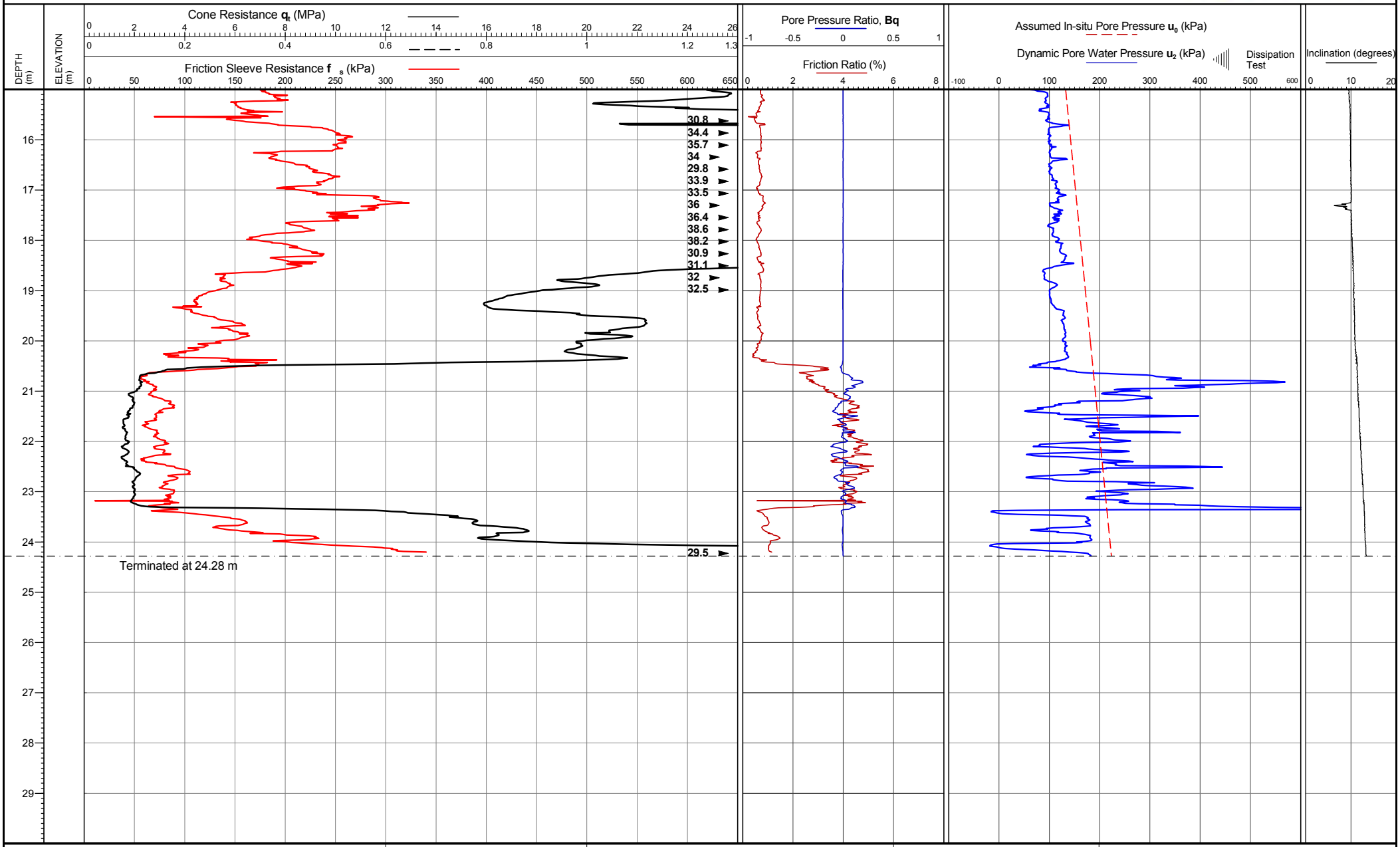
Checked by: Emma Stickland

TEST ID: CPT01

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



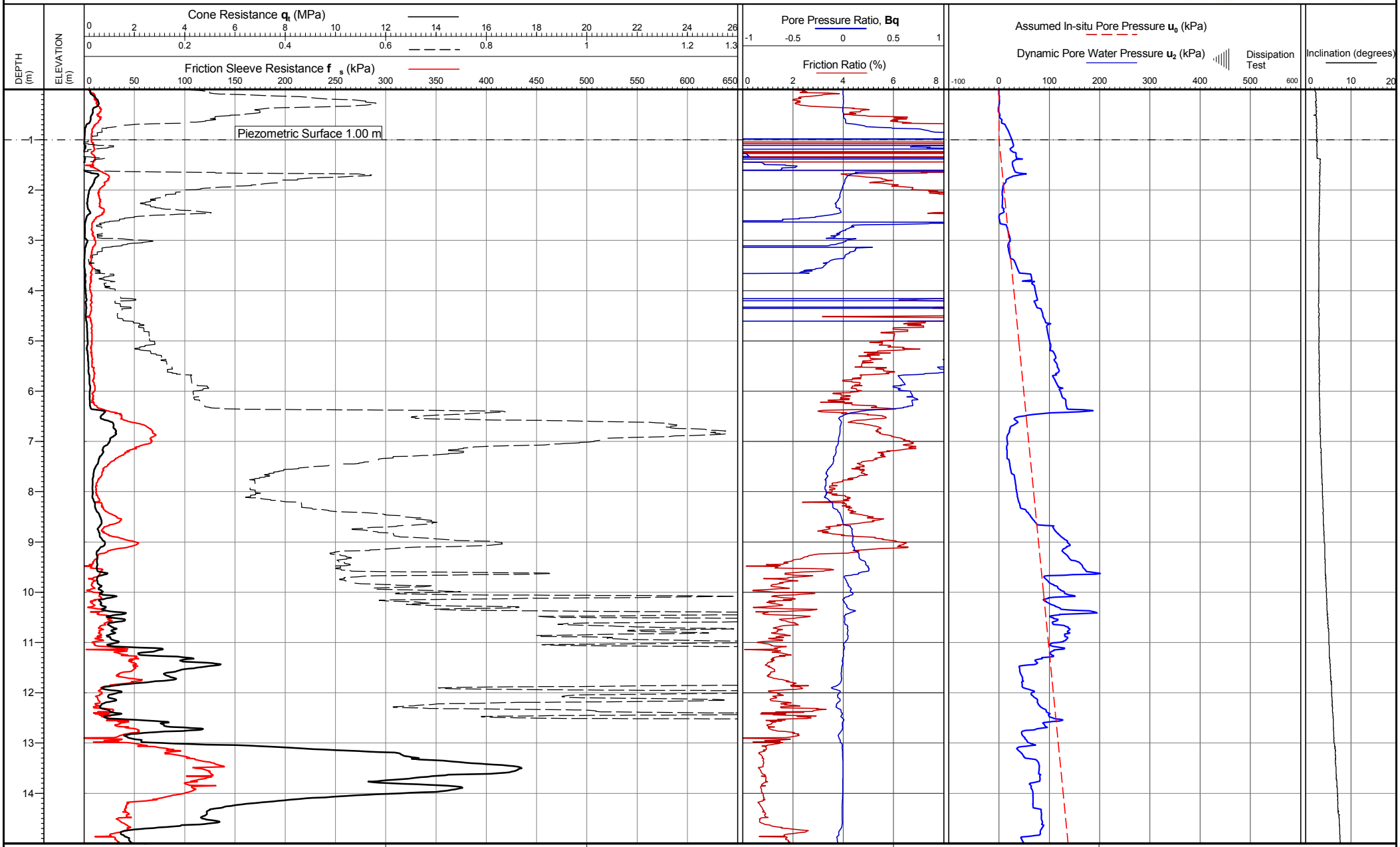
Cone area (mm2):1500	Location: Cheshire	Remarks:	Date of plot: 20-09-13	Lankelma Project Ref: P105742
Cone ID: S15-CFIP.908	Coordinates: ,			
Operator: Anthony Davis	Elevation:		Checked by: Emma Stickland	
Date of test: 12/09/2013 09:59:38	Coordinate system:	Refusal criteria: Total cone load		

TEST ID: CPT01

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
Cone ID: S15-CFIP.908
Operator: Anthony Davis
Date of test: 12/09/2013 14:06:31

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Refusal criteria: Total cone load

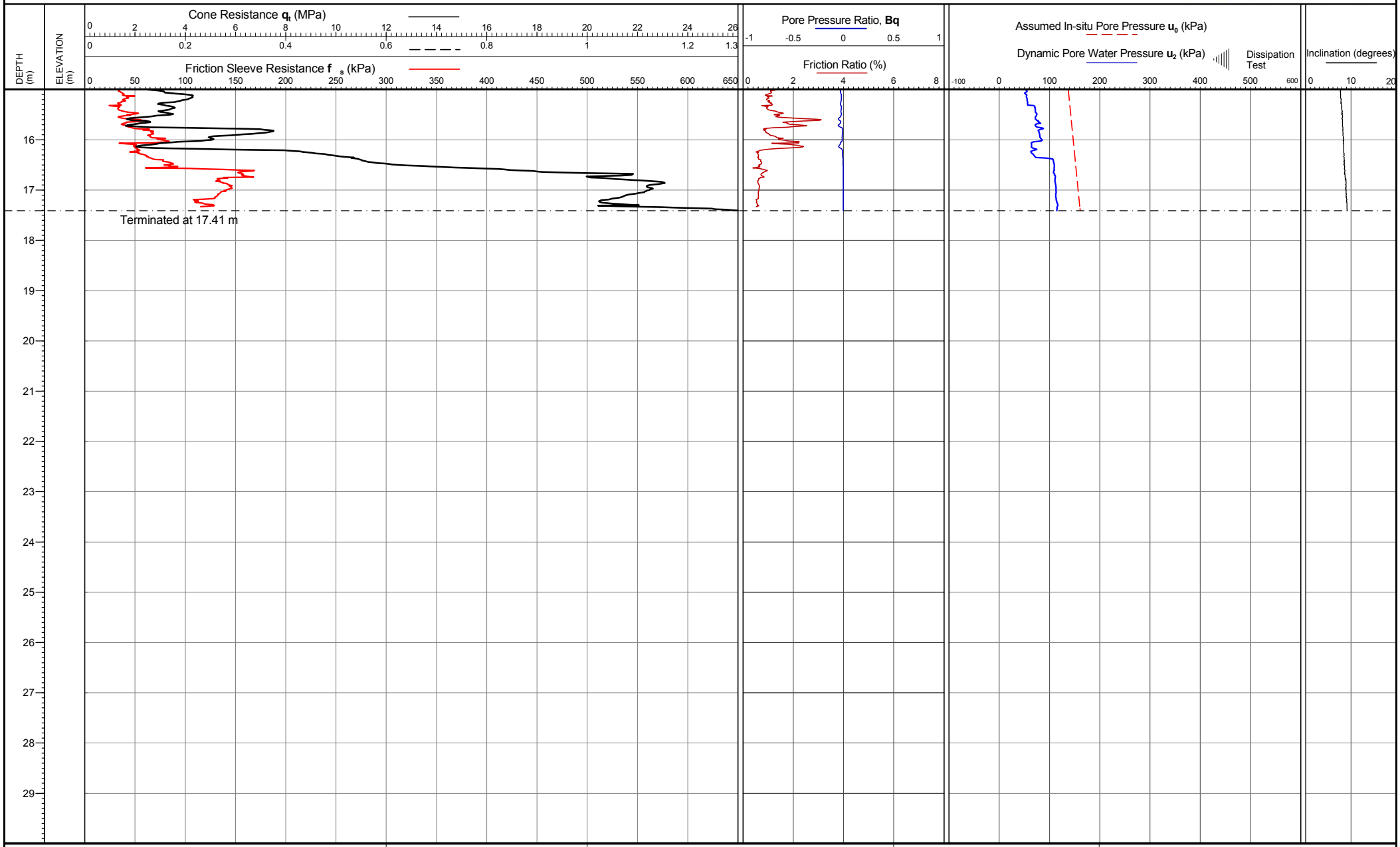
Date of plot: 20-09-13
Lankelma Project Ref: P105742
Checked by: Emma Stickland

TEST ID: CPT02

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



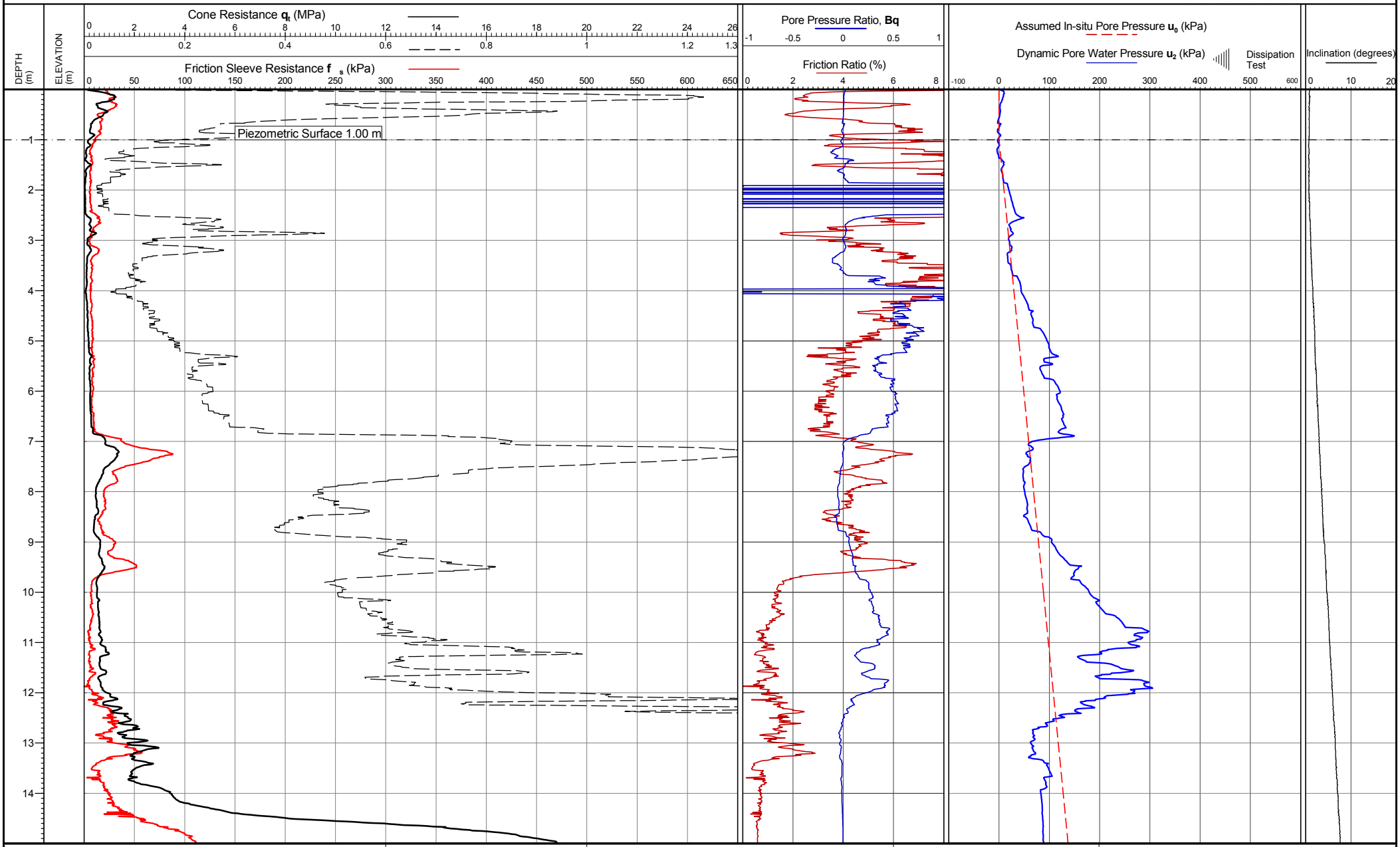
Cone area (mm2):1500 Cone ID: S15-CFIP.908 Operator: Anthony Davis Date of test: 12/09/2013 14:06:31	Location: Cheshire Coordinates: , Elevation: Coordinate system:	Remarks: Refusal criteria: Total cone load	Date of plot: 20-09-13 Checked by: Emma Stickland	Lankelma Project Ref: P105742

TEST ID: CPT02

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
Cone ID: S15-CFIP.908
Operator: Anthony Davis
Date of test: 12/09/2013 15:26:00

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Refusal criteria: Total cone load

Date of plot: 20-09-13

Lankelma Project Ref: P105742

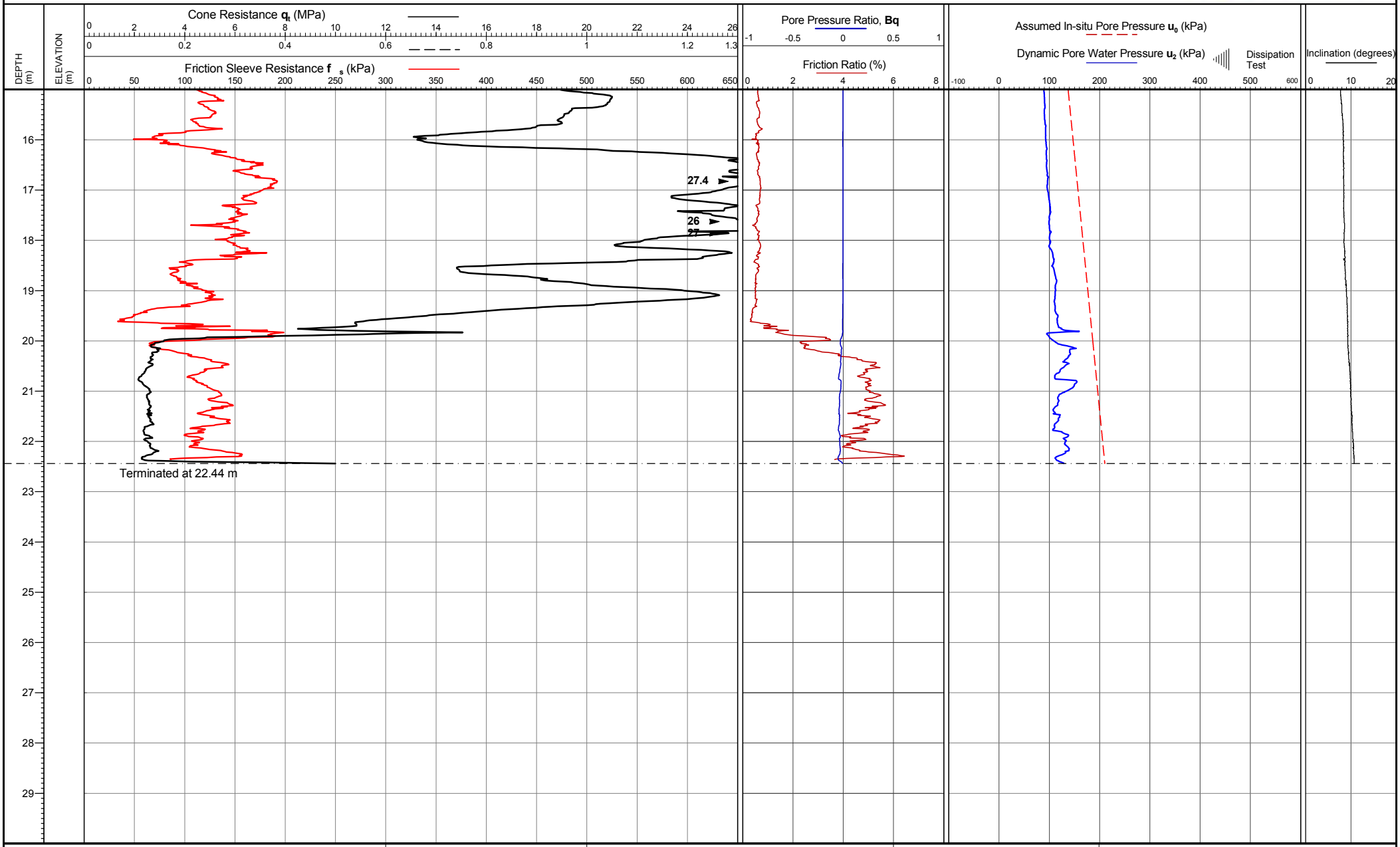
Checked by: Emma Stickland

TEST ID: CPT03

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



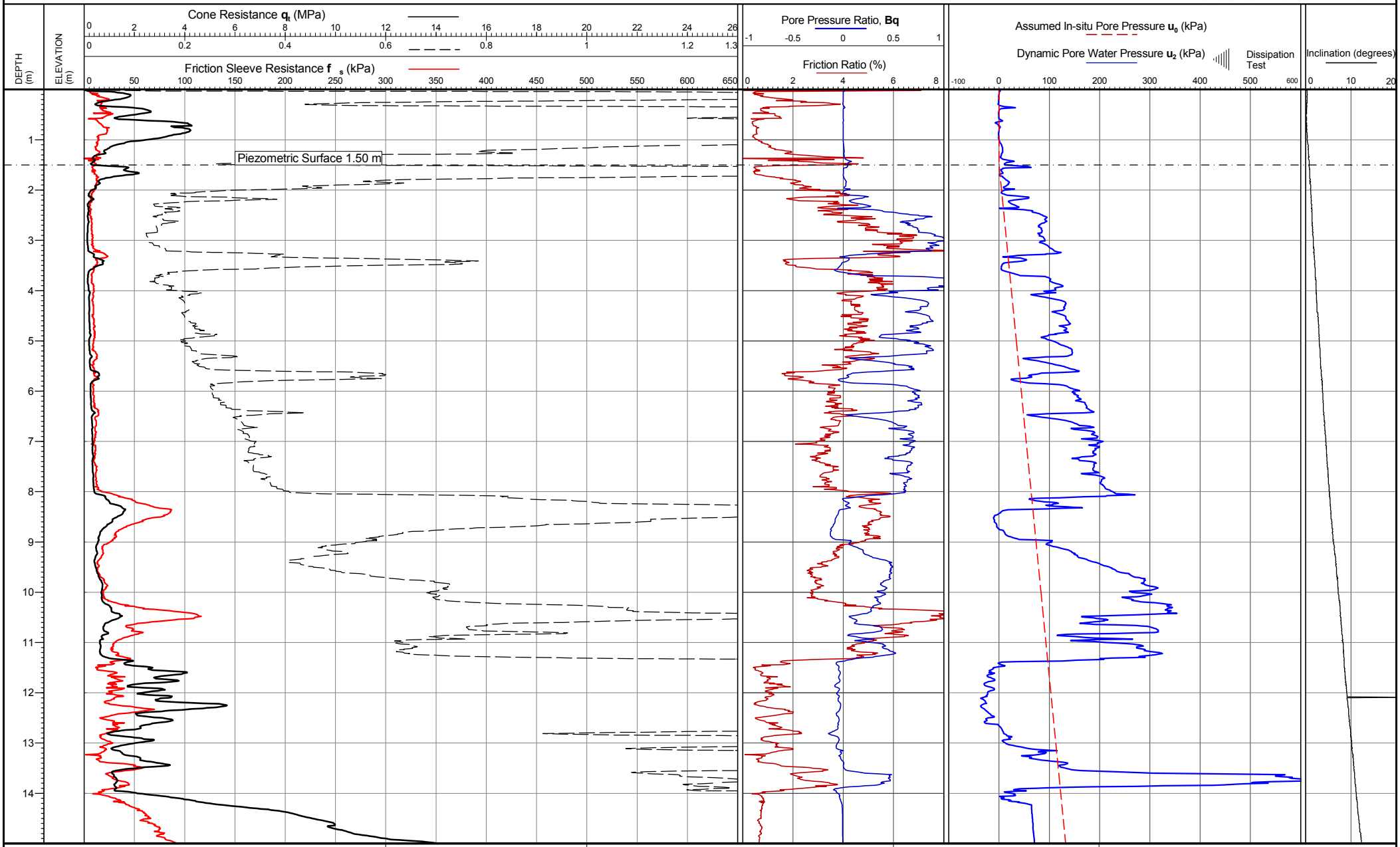
Cone area (mm2):1500	Location: Cheshire	Remarks:	Date of plot: 20-09-13	Lankelma Project Ref: P105742
Cone ID: S15-CFIP.908	Coordinates: ,			
Operator: Anthony Davis	Elevation:		Checked by: Emma Stickland	
Date of test: 12/09/2013 15:26:00	Coordinate system:	Refusal criteria: Total cone load		

TEST ID: CPT03

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



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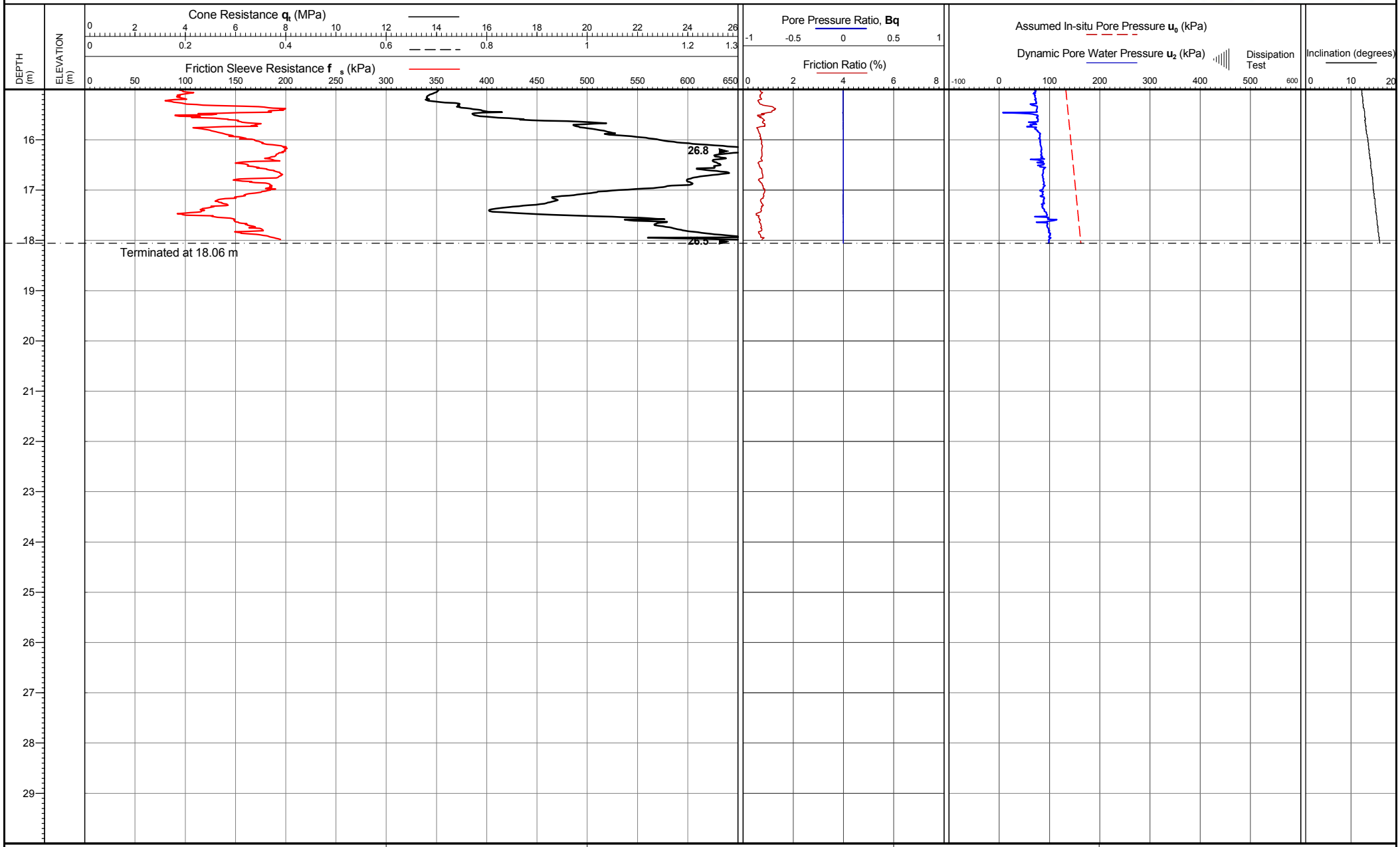
Cone ID: S15-CFIP.901	Coordinates: ,			
Operator: Anthony Davis	Elevation:		Checked by: Emma Stickland	
Date of test: 13/09/2013 13:03:03	Coordinate system:	Refusal criteria: Inclination		

TEST ID: CPT04

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



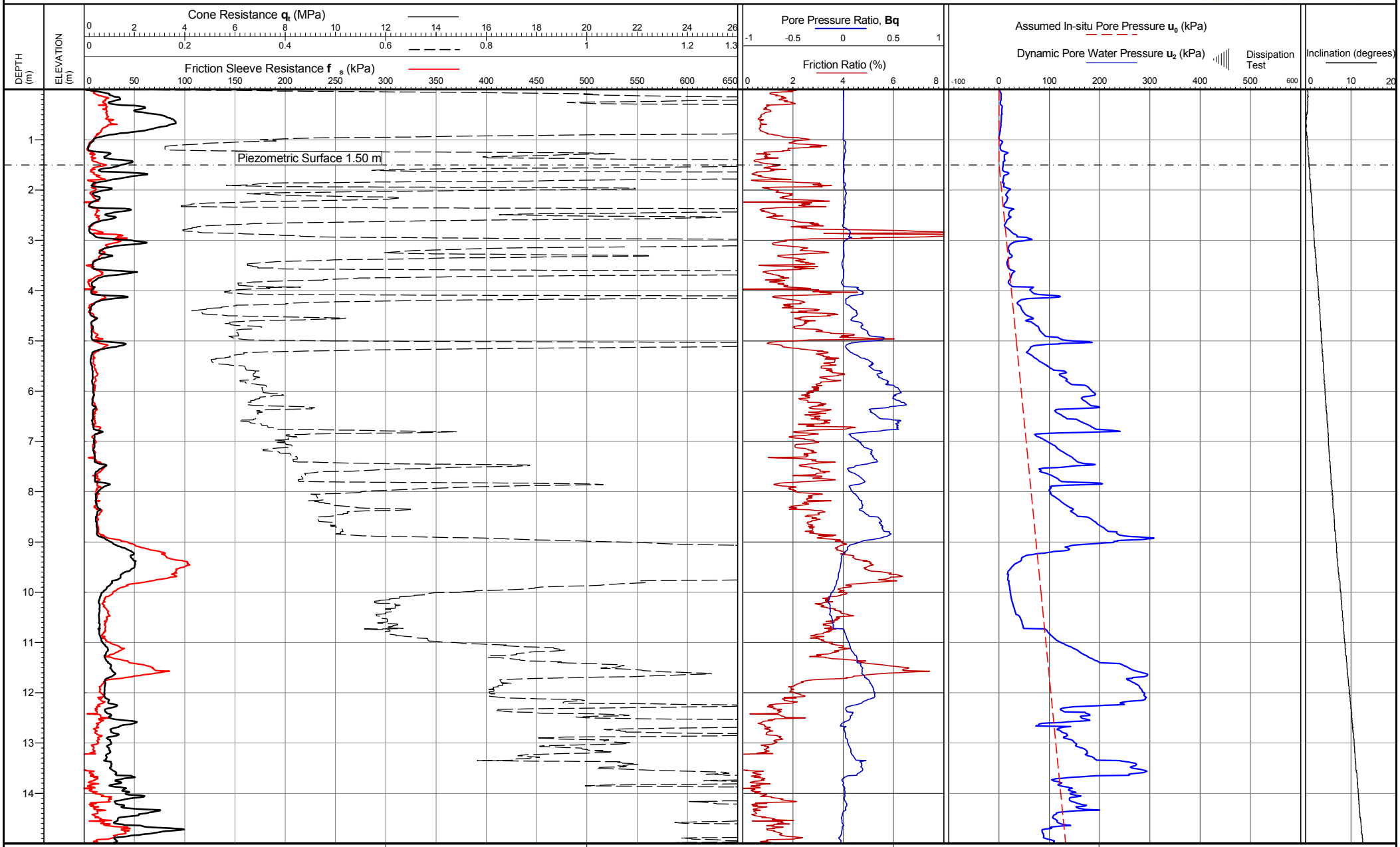
Cone area (mm2):1500	Location: Cheshire	Remarks:	Date of plot: 20-09-13	Lankelma Project Ref: P105742
Cone ID: S15-CFIP.901	Coordinates: ,			
Operator: Anthony Davis	Elevation:		Checked by: Emma Stickland	
Date of test: 13/09/2013 13:03:03	Coordinate system:	Refusal criteria: Inclination		

TEST ID: CPT04

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



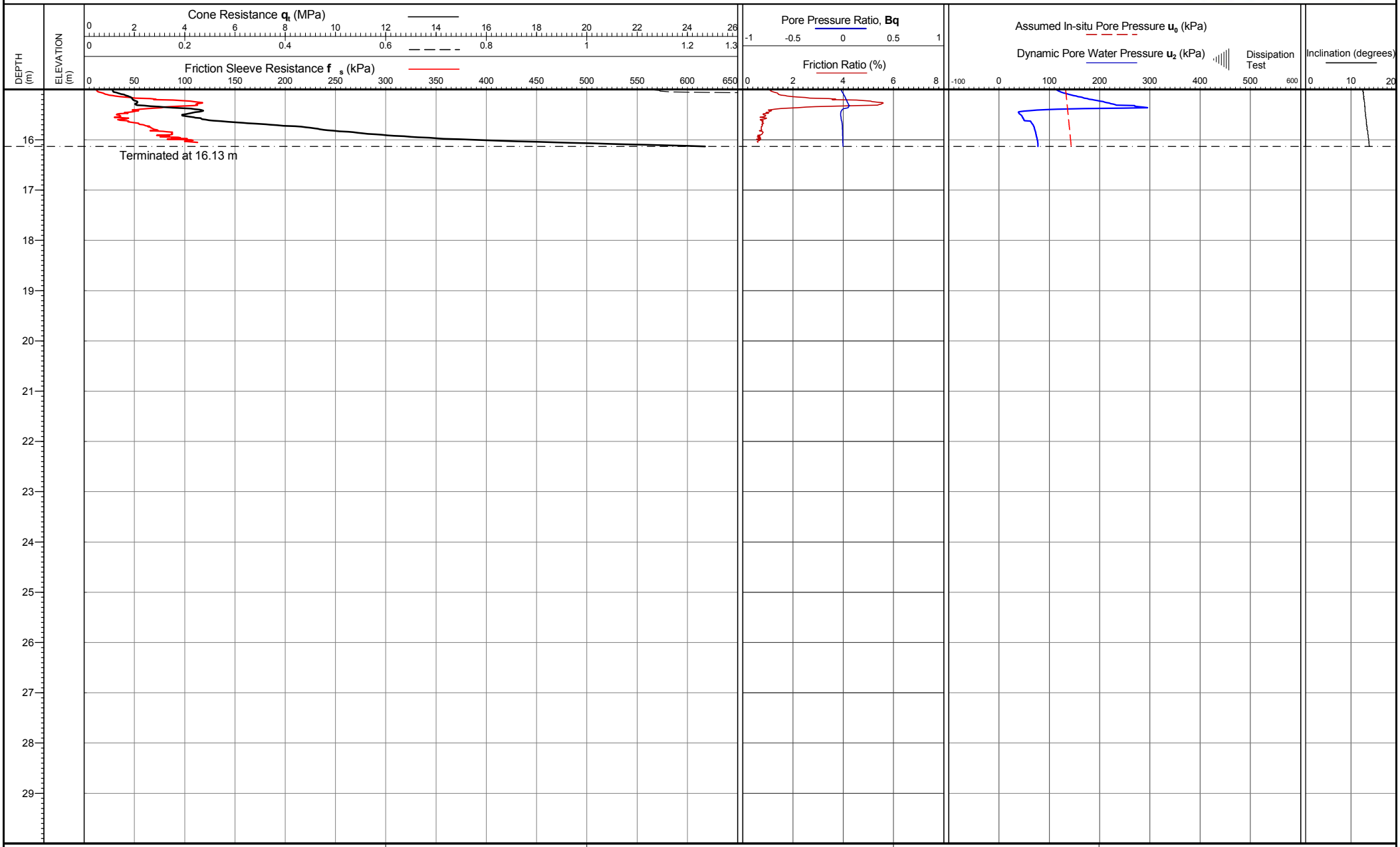
Cone area (mm2):1500	Location: Cheshire	Remarks:	Date of plot: 20-09-13	Lankelma Project Ref: P105742
Cone ID: S15-CFIP.901	Coordinates: ,			
Operator: Walter Geddes	Elevation:		Checked by: Emma Stickland	
Date of test: 16/09/2013 10:33:08	Coordinate system:	Refusal criteria: Tip load		

TEST ID: CPT05

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



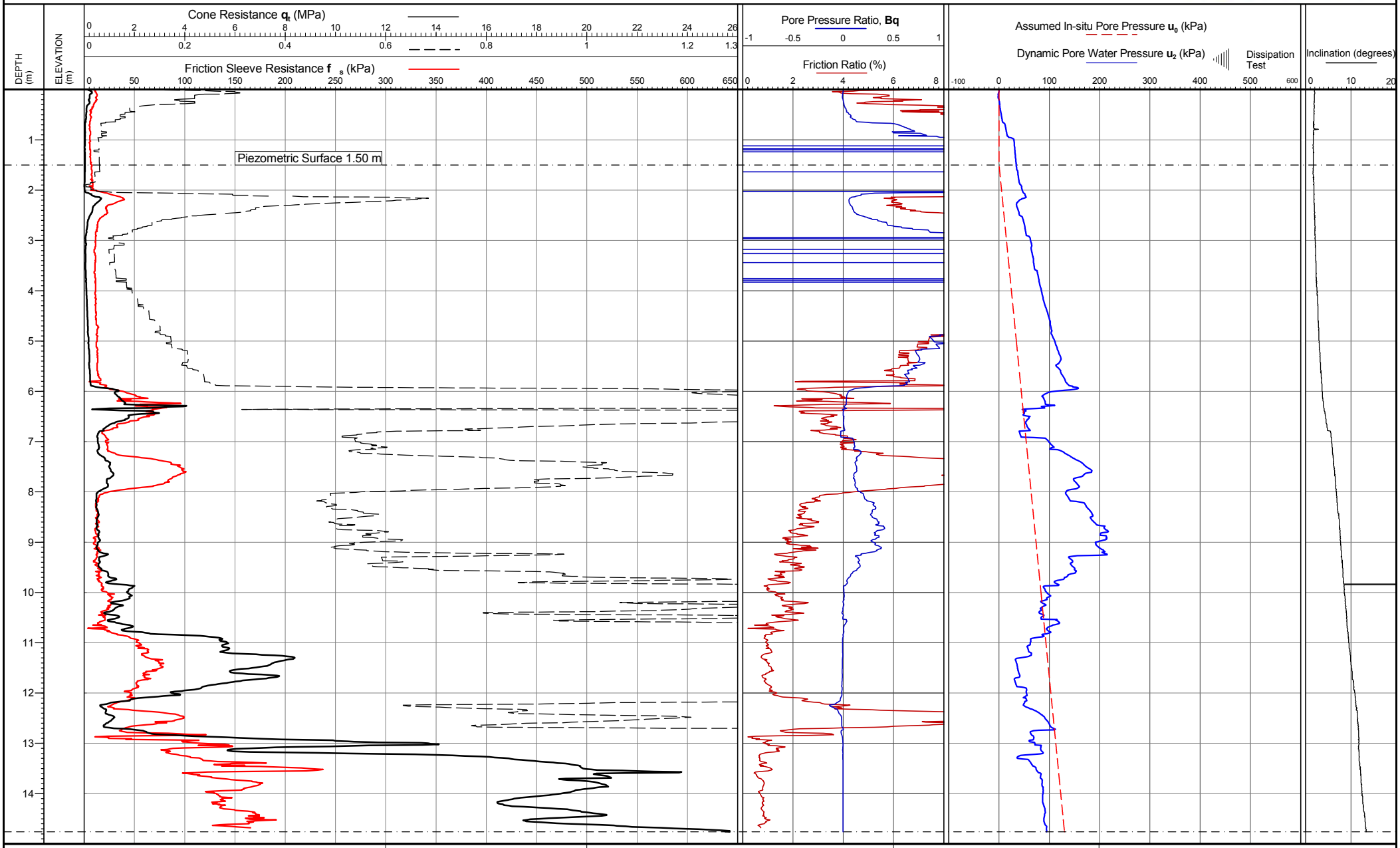
Cone area (mm2):1500	Location: Cheshire	Remarks:	Date of plot: 20-09-13	Lankelma Project Ref: P105742
Cone ID: S15-CFIP.901	Coordinates: ,			
Operator: Walter Geddes	Elevation:		Checked by: Emma Stickland	
Date of test: 16/09/2013 10:33:08	Coordinate system:	Refusal criteria: Tip load		

TEST ID: CPT05

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



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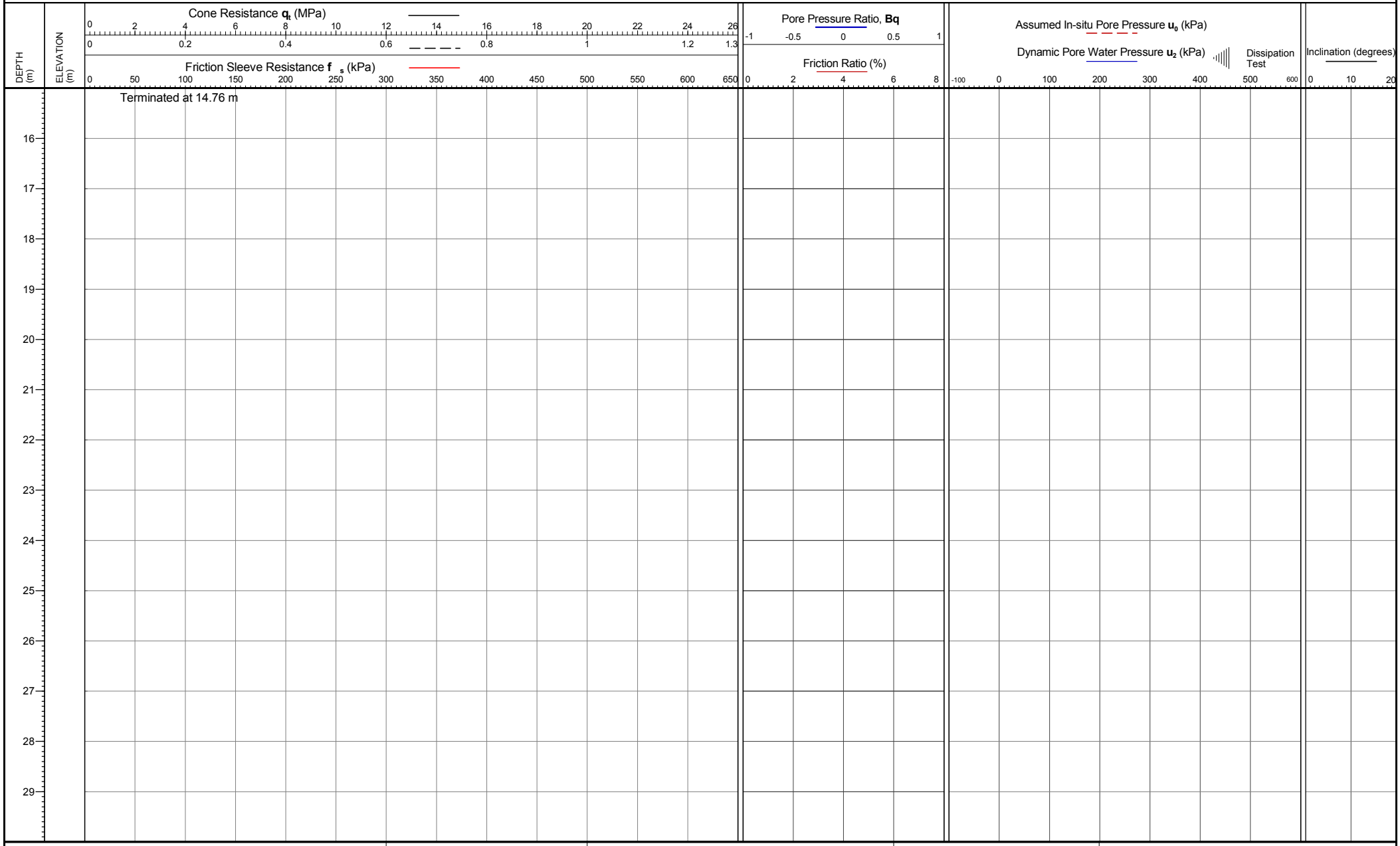
Cone ID: S15-CFIP.901	Coordinates: ,			
Operator: Walter Geddes	Elevation:		Checked by: Emma Stickland	**TEST ID: CPT06**
Date of test: 16/09/2013 11:54:05	Coordinate system:	Refusal criteria: Tip load		Page 1 of 2

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
Cone ID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 16/09/2013 11:54:05

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Refusal criteria: Tip load

Date of plot: 20-09-13
Lankelma Project Ref: P105742

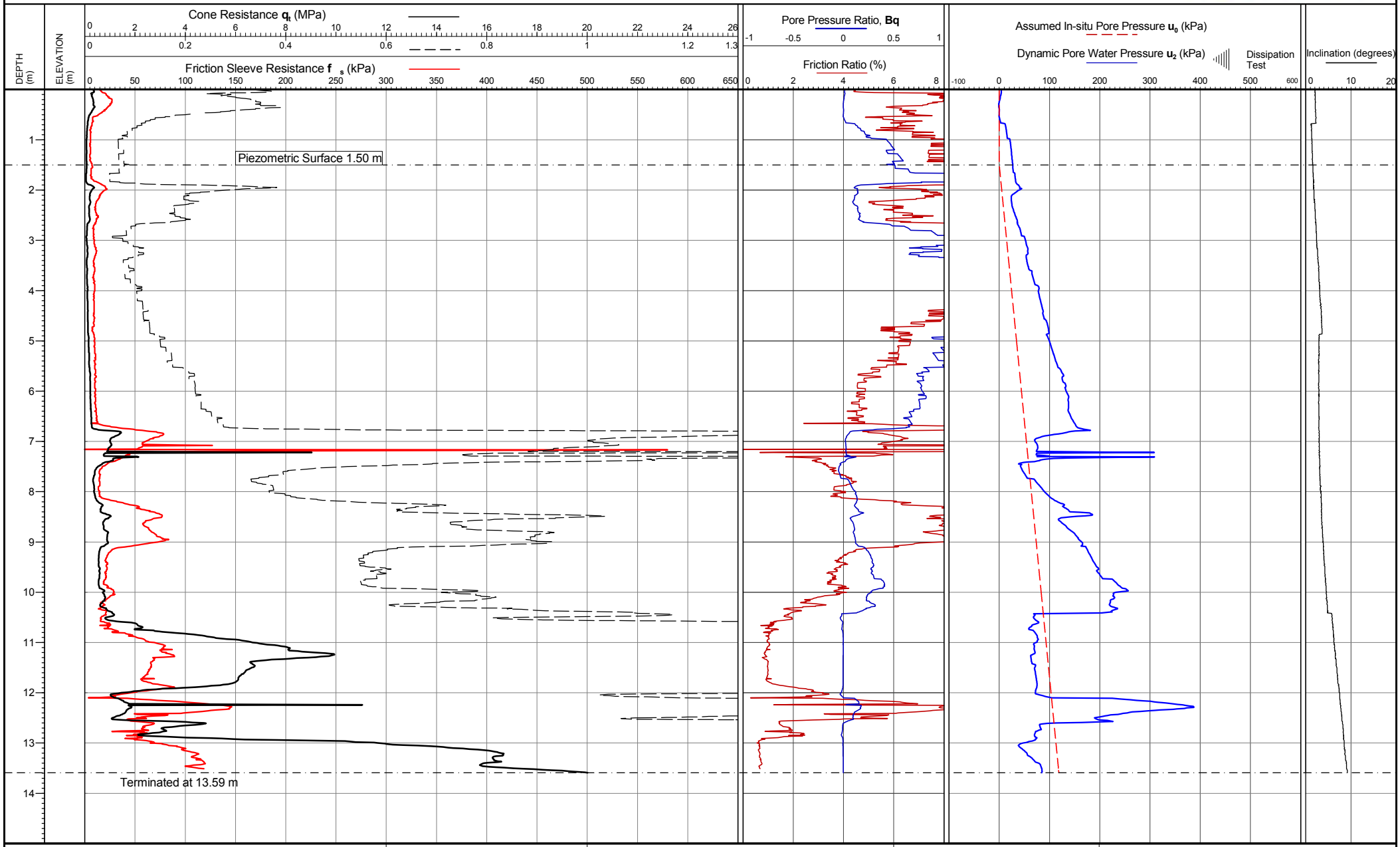
Checked by: Emma Stickland

TEST ID: CPT06

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



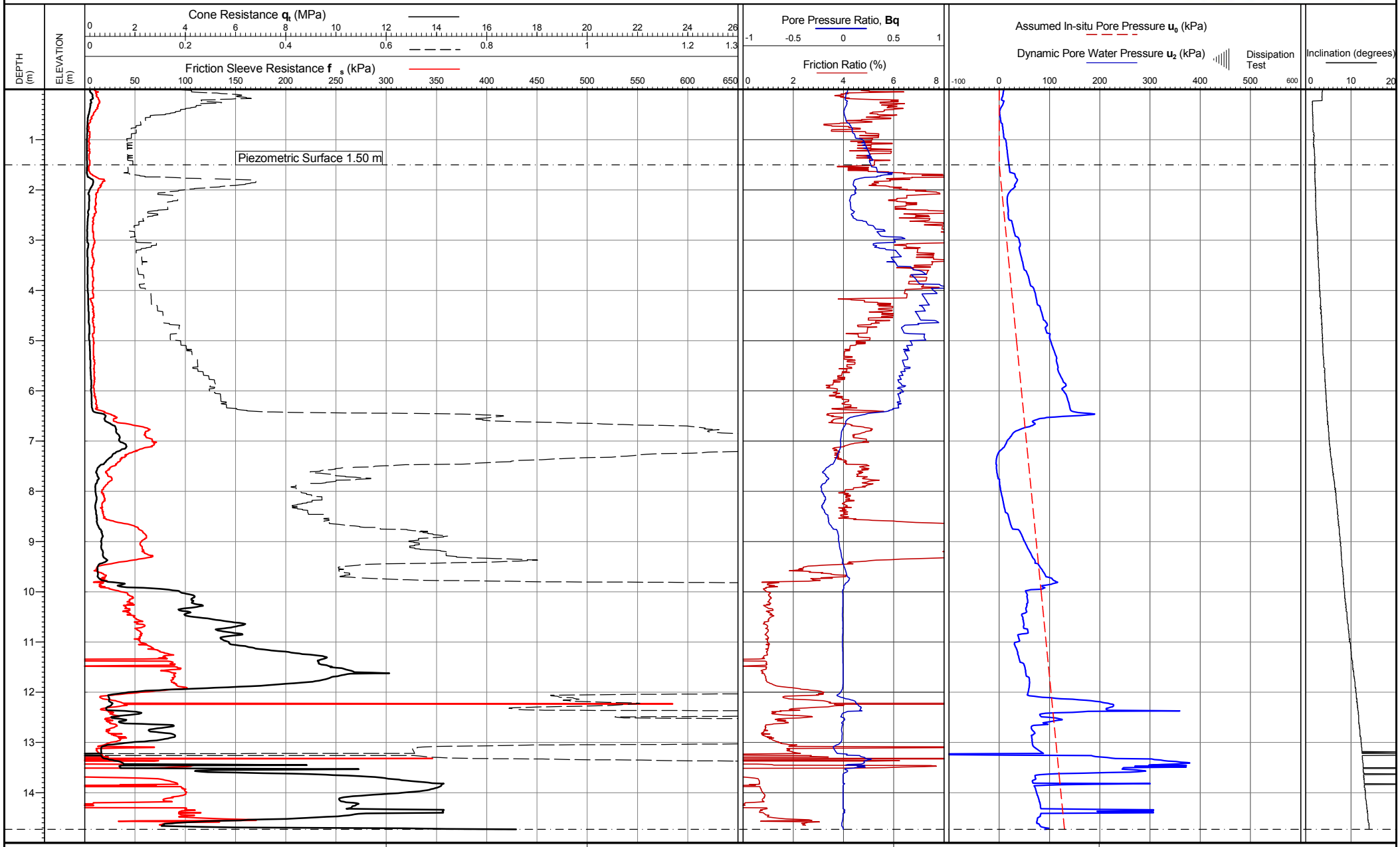
Cone area (mm2):1500	Location: Cheshire	Remarks:	Date of plot: 20-09-13	Lankelma Project Ref: P105742
Cone ID: S15-CFIP.901	Coordinates: ,			
Operator: Walter Geddes	Elevation:		Checked by: Emma Stickland	
Date of test: 16/09/2013 14:19:31	Coordinate system:	Refusal criteria: Tip load		

TEST ID: CPT07

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



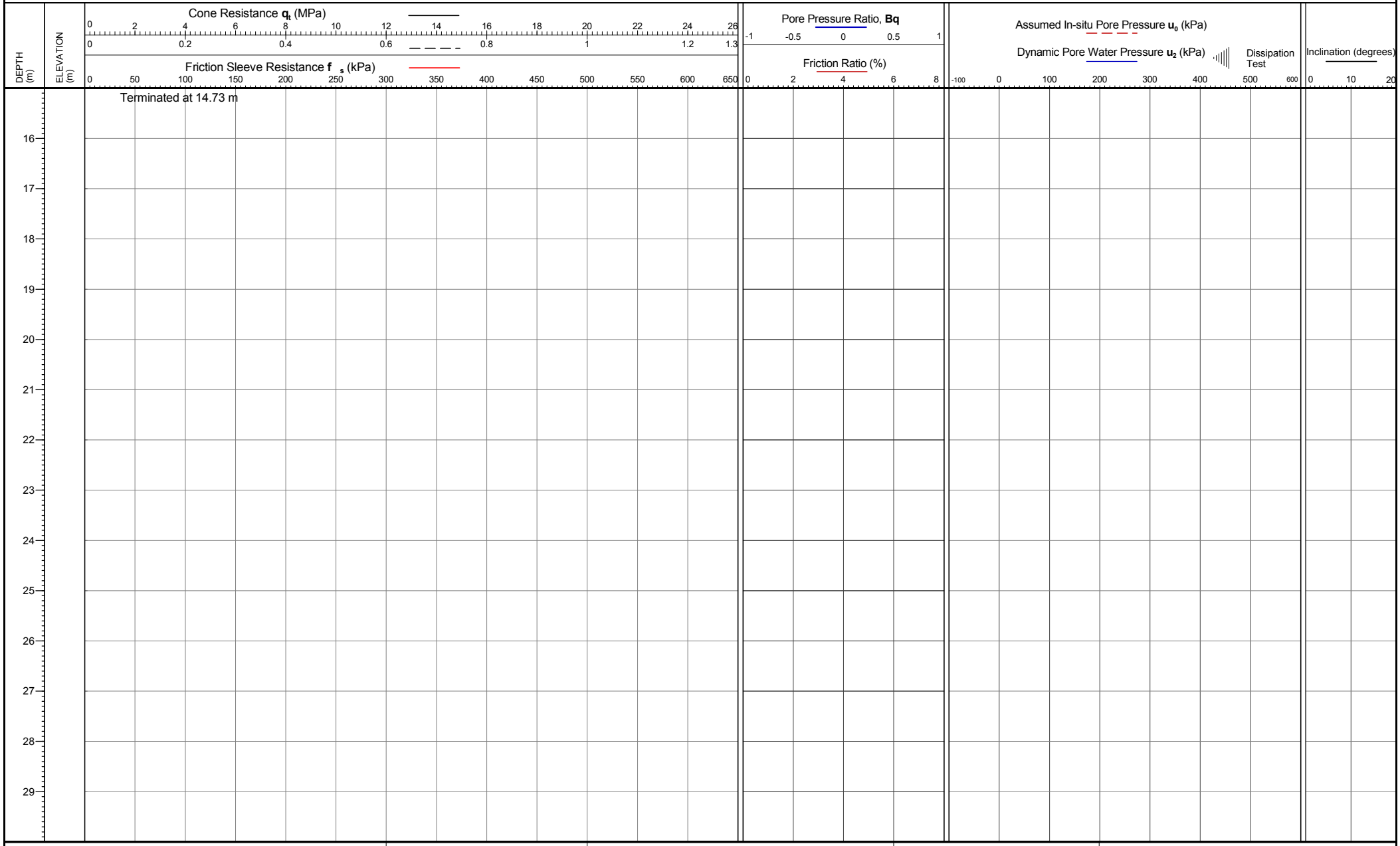
Cone area (mm2):1500	Location: Cheshire	Remarks:	Date of plot: 20-09-13	Lankelma Project Ref: P105742
Cone ID: S15-CFIP.901	Coordinates: ,			
Operator: Walter Geddes	Elevation:		Checked by: Emma Stickland	
Date of test: 16/09/2013 16:01:44	Coordinate system:	Refusal criteria: Tip load		

TEST ID: CPT08

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
Cone ID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 16/09/2013 16:01:44

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Refusal criteria: Tip load

Date of plot: 20-09-13
Lankelma Project Ref: P105742

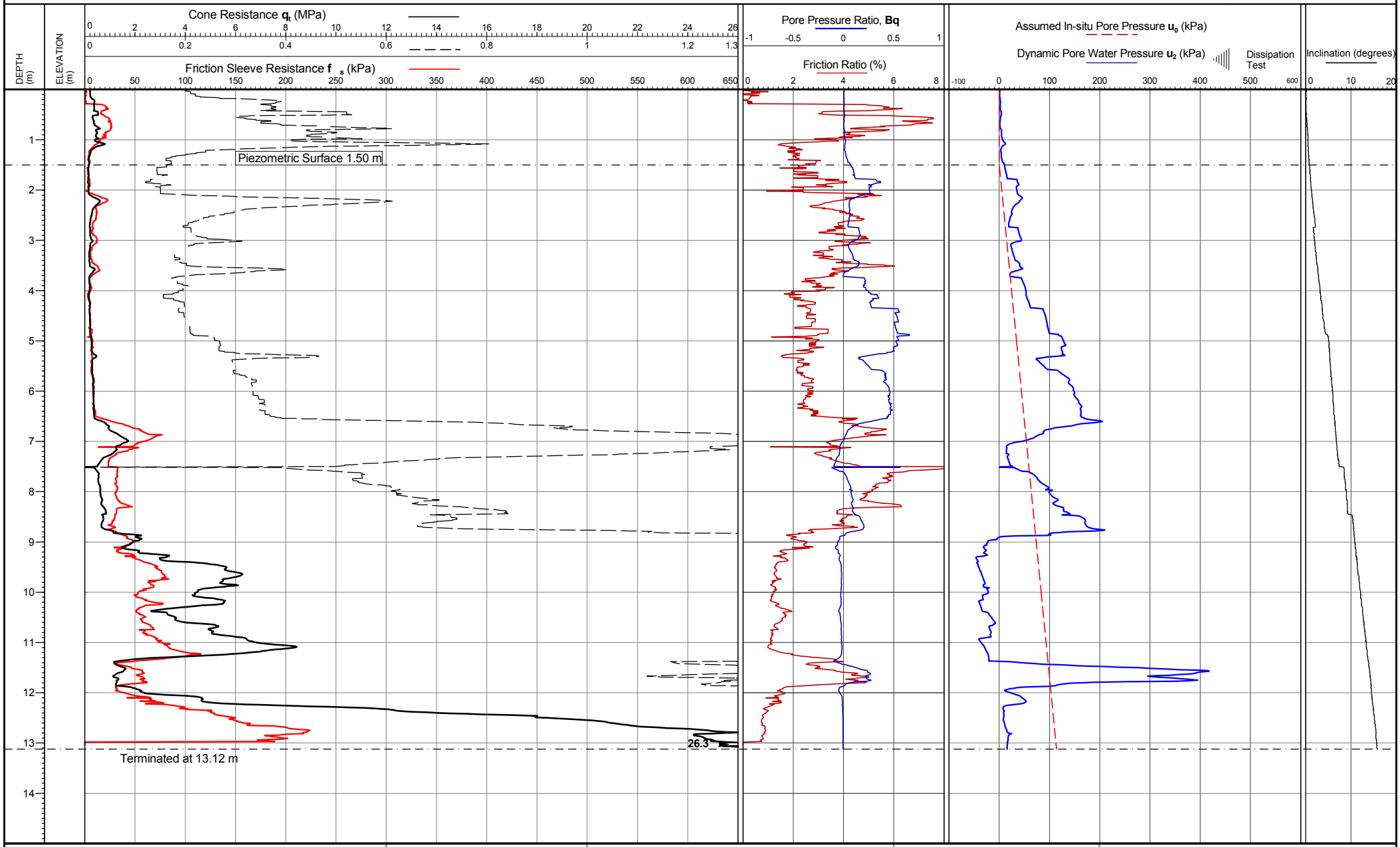
Checked by: Emma Stickland

TEST ID: CPT08

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



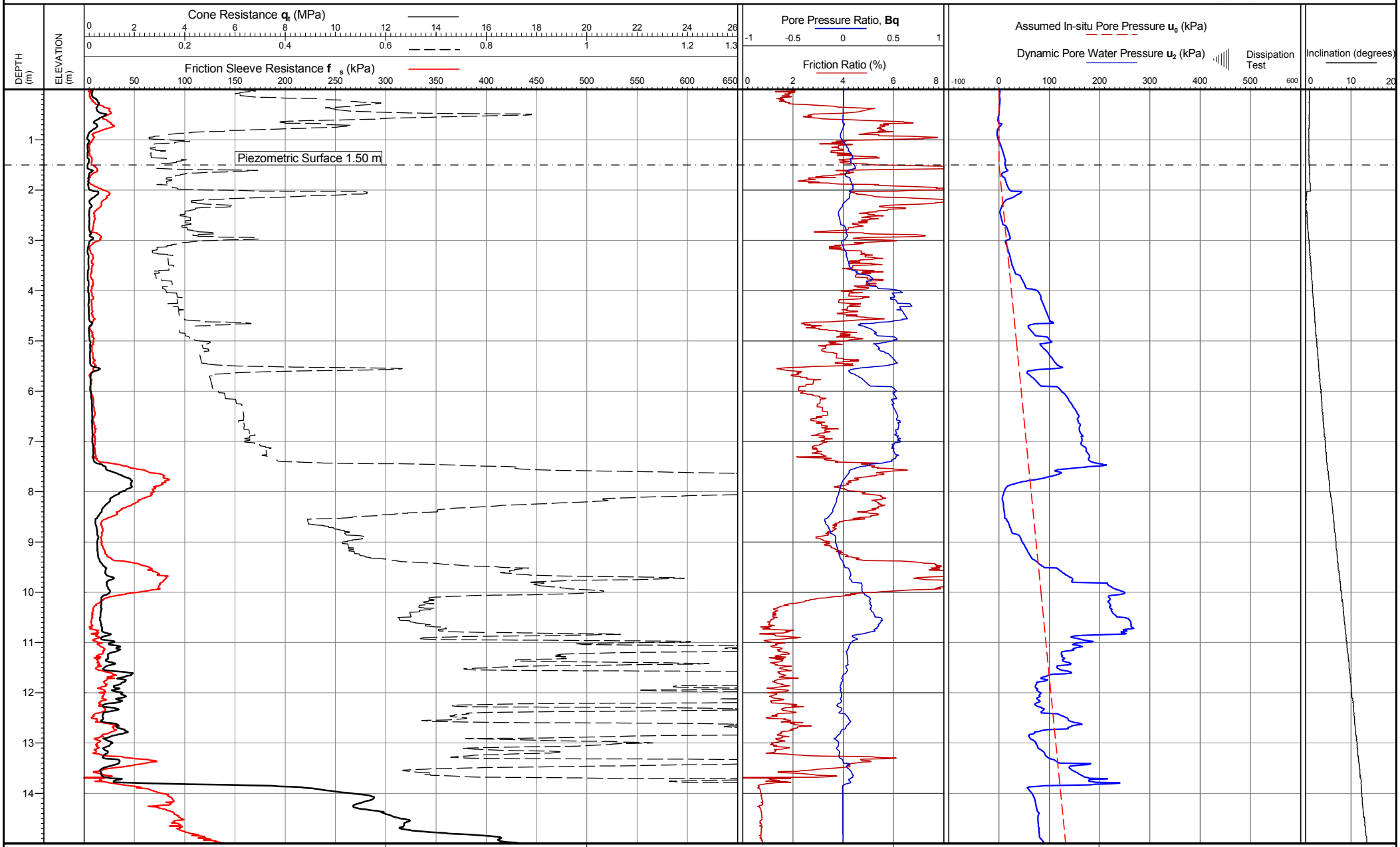
Cone area (mm2):1500	Location: Cheshire	Remarks:	Date of plot: 20-09-13	Lankelma Project Ref: P105742
Cone ID: S15-CFIP.901	Coordinates: ,			
Operator: Walter Geddes	Elevation:		Checked by: Emma Stickland	
Date of test: 17/09/2013 10:45:57	Coordinate system:	Refusal criteria: Tip load		

TEST ID: CPT09

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



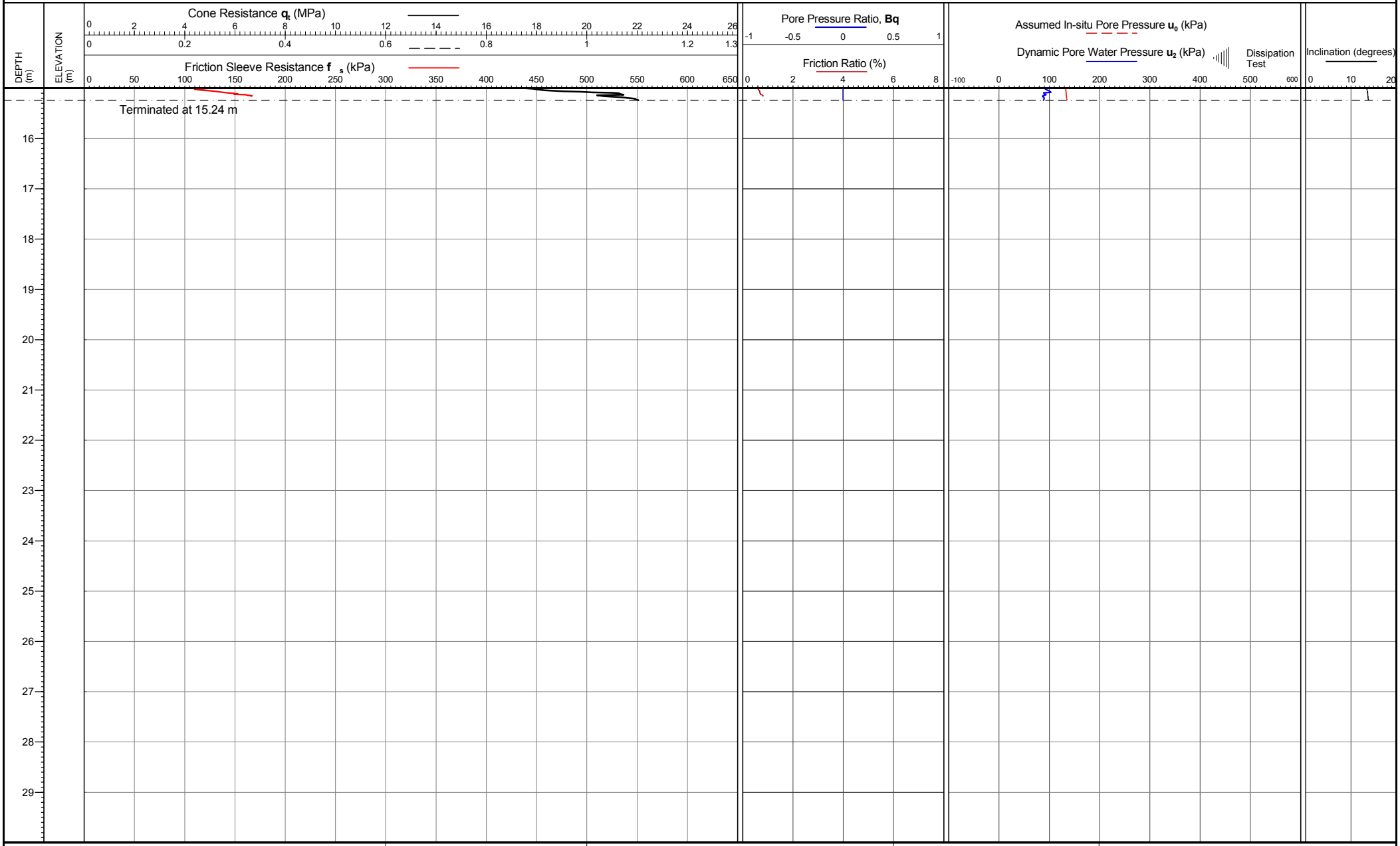
Cone area (mm2):1500	Location: Cheshire	Remarks:	Date of plot: 20-09-13	Lankelma Project Ref: P105742
Cone ID: S15-CFIP.901	Coordinates: ,			
Operator: Walter Geddes	Elevation:		Checked by: Emma Stickland	
Date of test: 17/09/2013 12:50:07	Coordinate system:	Refusal criteria: Tip load		

TEST ID: CPT10

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
Cone ID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 17/09/2013 12:50:07

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Refusal criteria: Tip load

Date of plot: 20-09-13
Lankelma Project Ref: P105742

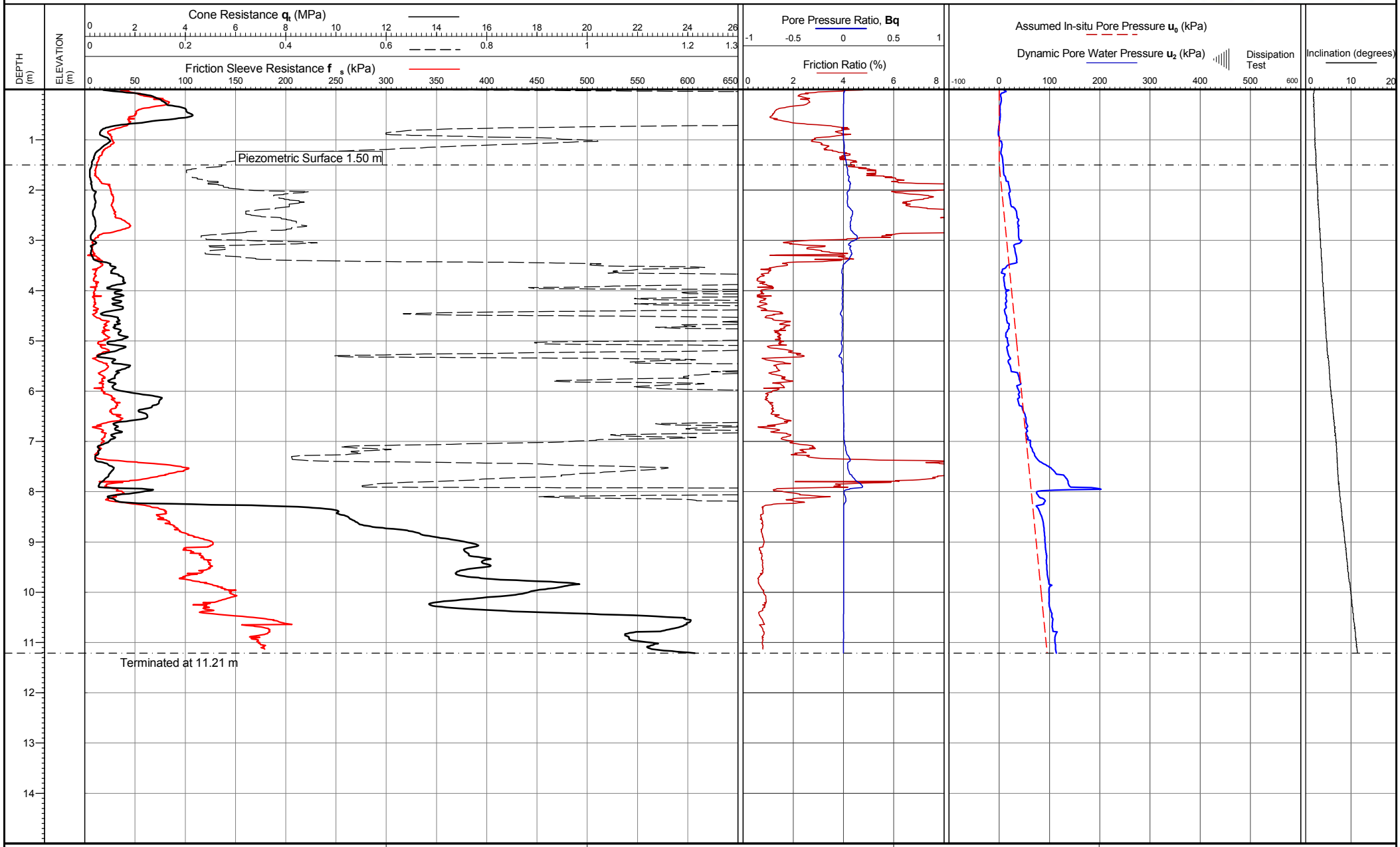
Checked by: Emma Stickland

TEST ID: CPT10

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA

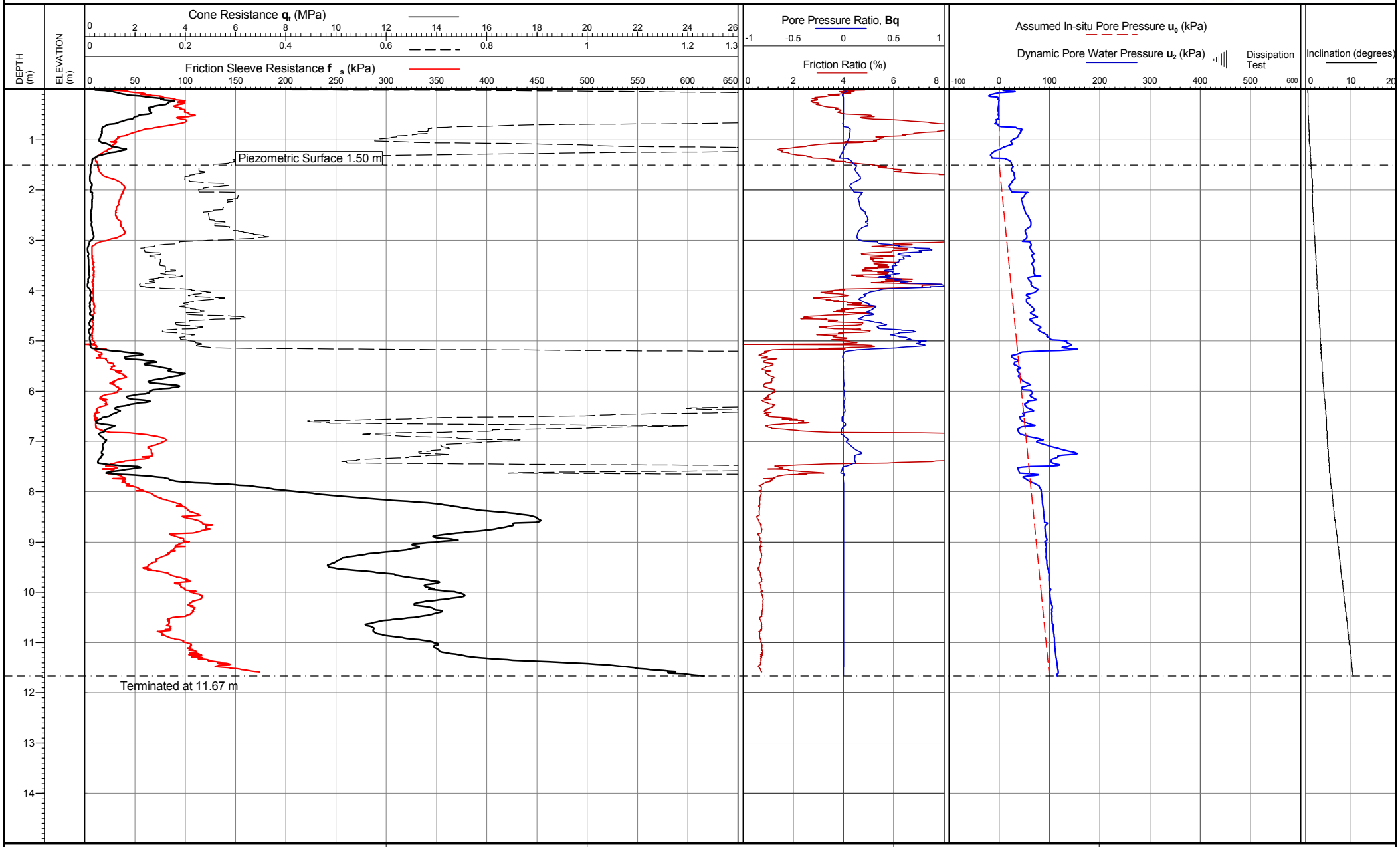


Cone area (mm2):1500	Location: Cheshire	Remarks:	Date of plot: 20-09-13	Lankelma Project Ref: P105742
Cone ID: S15-CFIP.901	Coordinates: ,			
Operator: Walter Geddes	Elevation:		Checked by: Emma Stickland	**TEST ID: CPT11**
Date of test: 19/09/2013 13:46:35	Coordinate system:	Refusal criteria: Tip load		Page 1 of 1

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



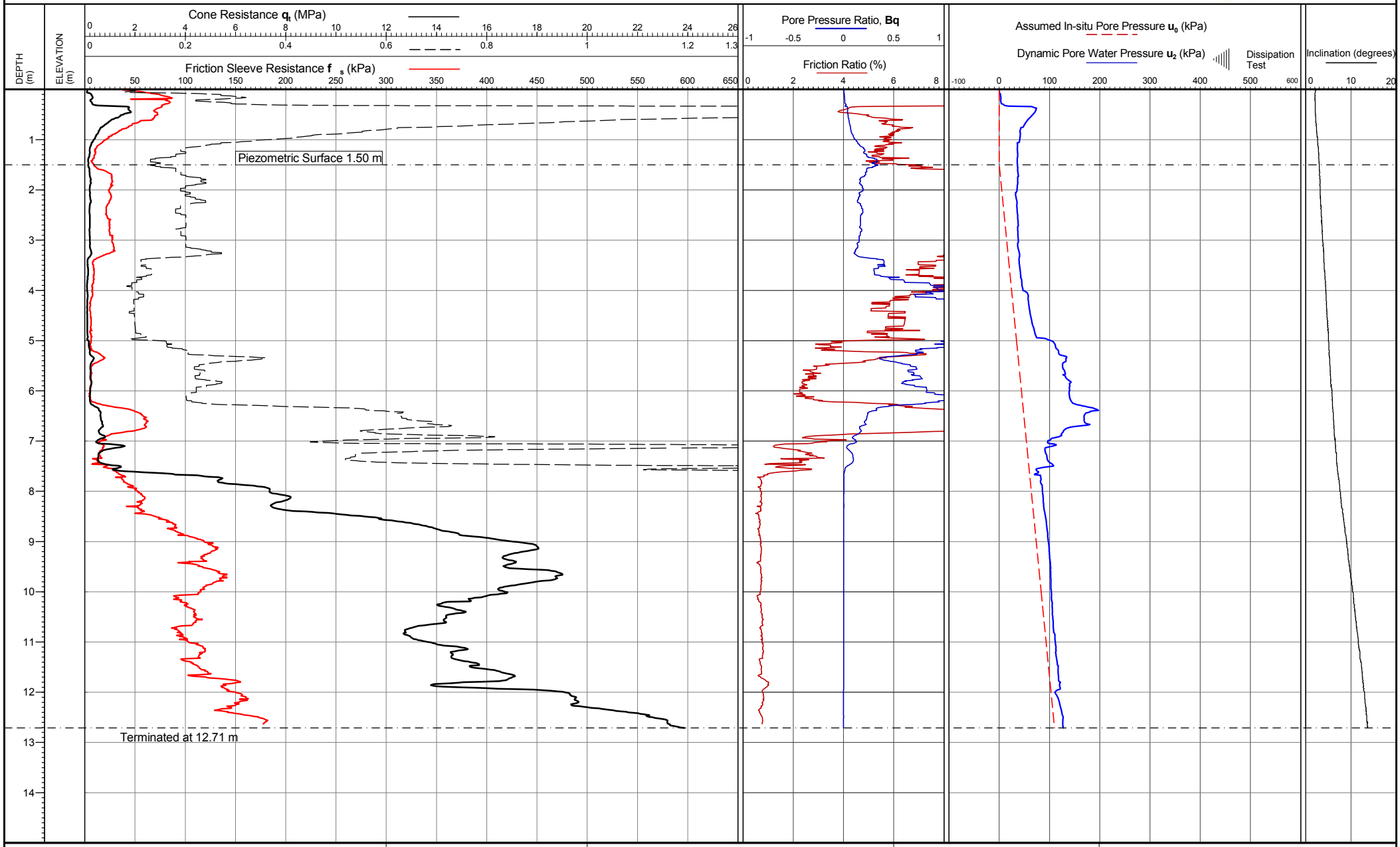
Cone area (mm2):1500	Location: Cheshire	Remarks:	Date of plot: 20-09-13	Lankelma Project Ref: P105742
Cone ID: S15-CFIP.901	Coordinates: ,			
Operator: Walter Geddes	Elevation:		Checked by: Emma Stickland	
Date of test: 19/09/2013 14:52:53	Coordinate system:	Refusal criteria: Tip load		

TEST ID: CPT12

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA

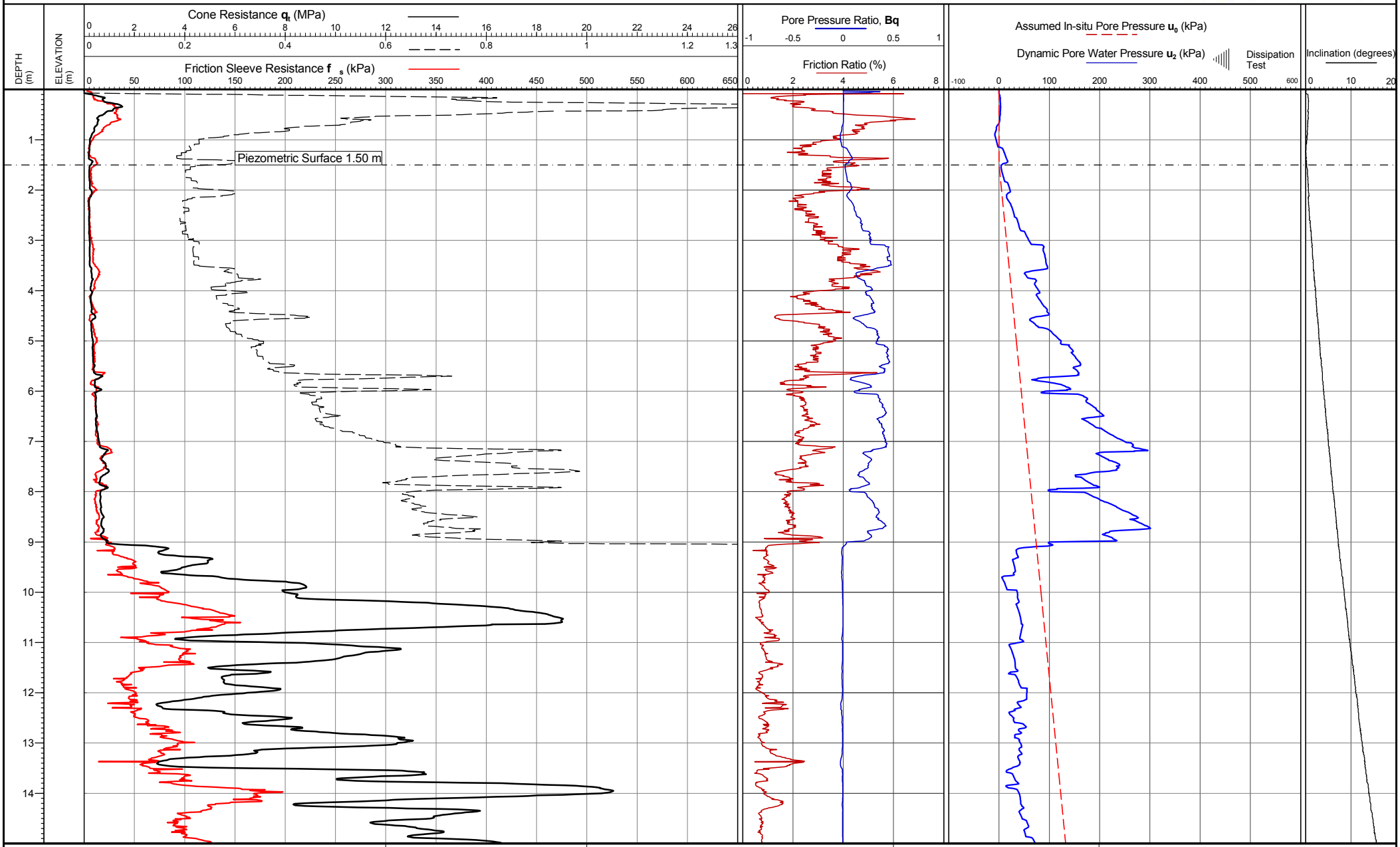


Cone area (mm2):1500	Location: Cheshire	Remarks:	Date of plot: 20-09-13	Lankelma Project Ref: P105742
Cone ID: S15-CFIP.901	Coordinates: ,			
Operator: Walter Geddes	Elevation:		Checked by: Emma Stickland	**TEST ID: CPT13**
Date of test: 19/09/2013 16:14:09	Coordinate system:	Refusal criteria: Tip load		Page 1 of 1

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



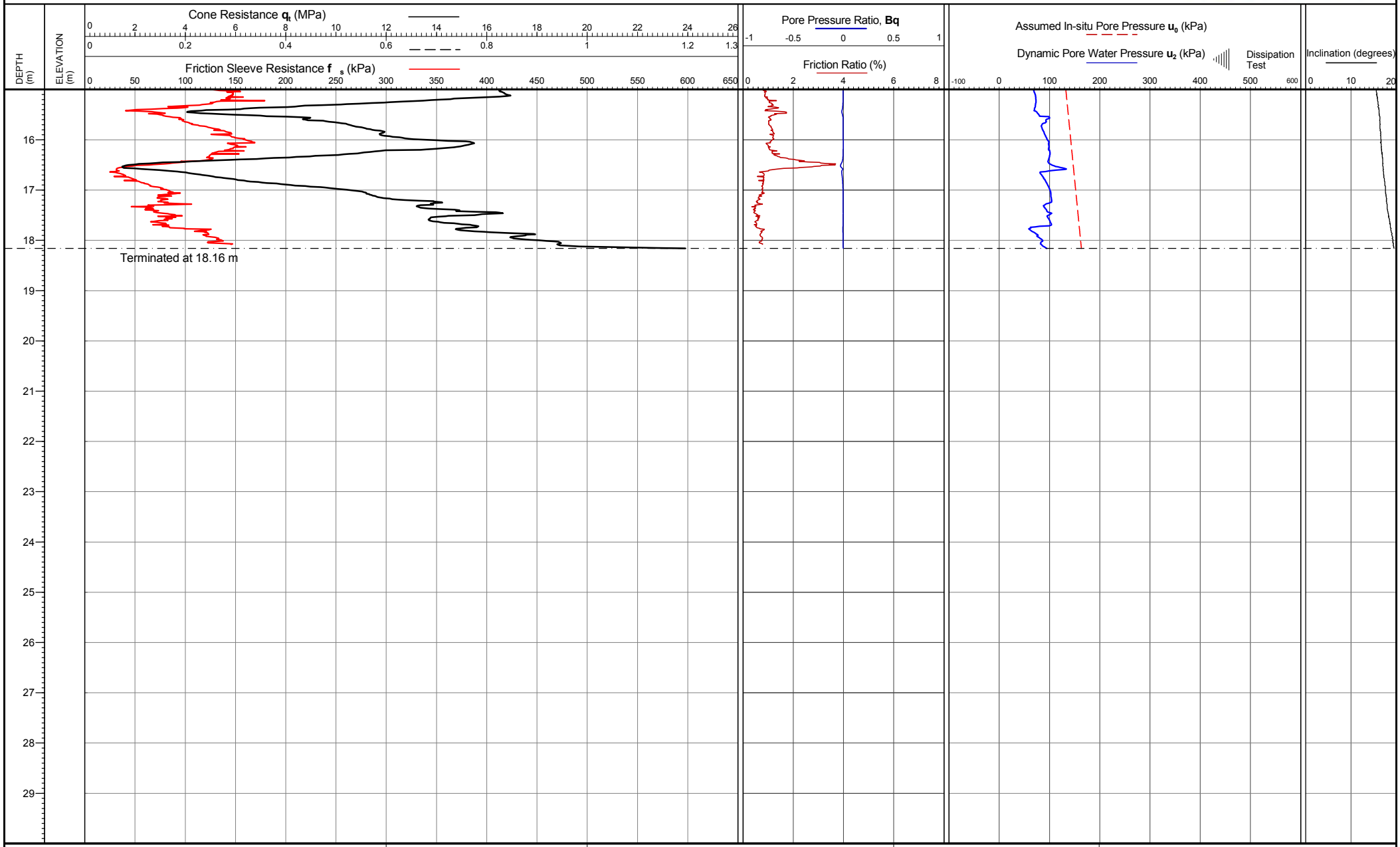
Cone area (mm2):1500	Location: Cheshire	Remarks:	Date of plot: 20-09-13	Lankelma Project Ref: P105742
Cone ID: S15-CFIP.901	Coordinates: ,			
Operator: Walter Geddes	Elevation:		Checked by: Emma Stickland	
Date of test: 18/09/2013 13:35:37	Coordinate system:	Refusal criteria: Tip load		

TEST ID: CPT14

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



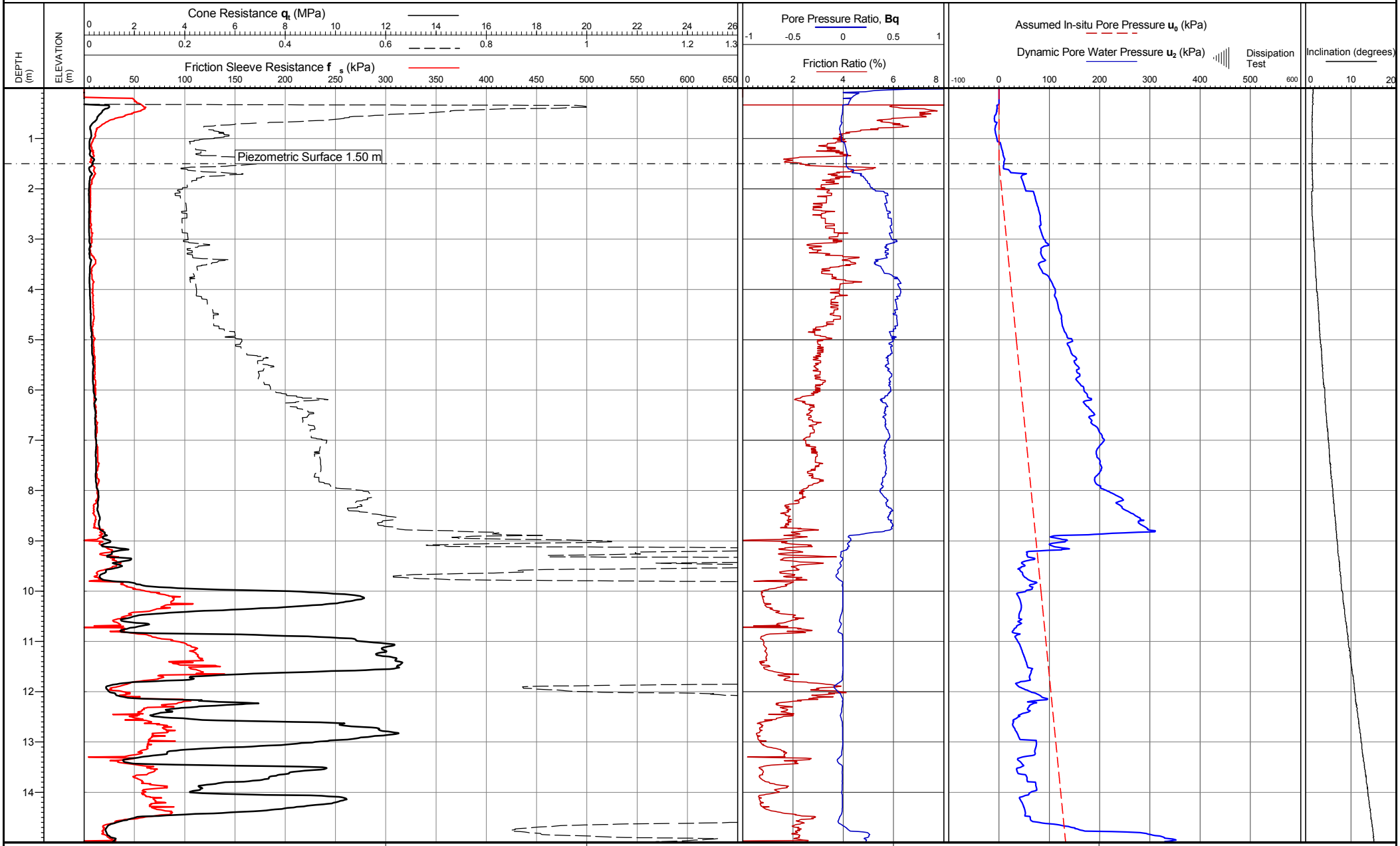
Cone area (mm2):1500	Location: Cheshire	Remarks:	Date of plot: 20-09-13	Lankelma Project Ref: P105742
Cone ID: S15-CFIP.901	Coordinates: ,			
Operator: Walter Geddes	Elevation:		Checked by: Emma Stickland	
Date of test: 18/09/2013 13:35:37	Coordinate system:	Refusal criteria: Tip load		

TEST ID: CPT14

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA

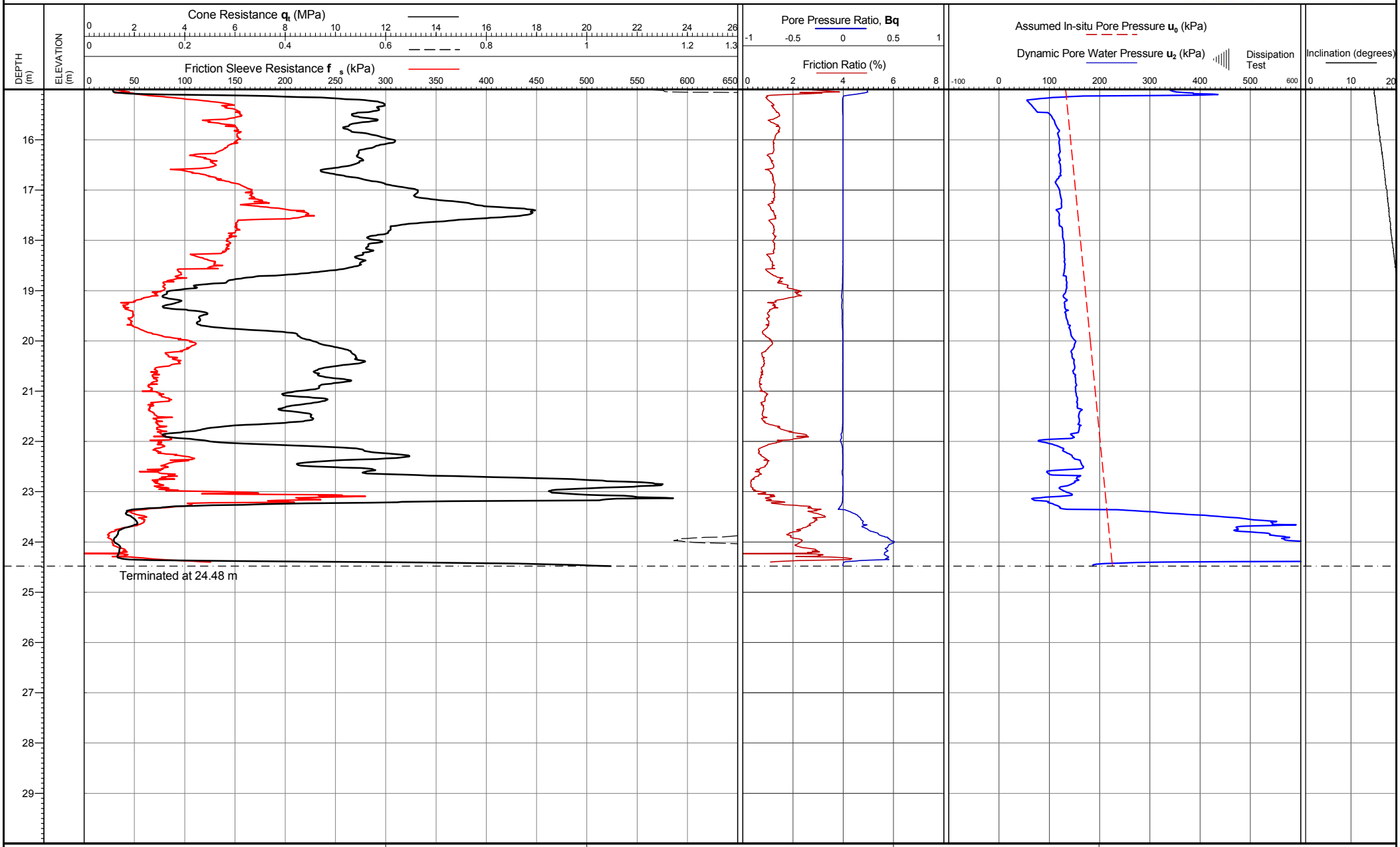


Cone area (mm2):1500	Location: Cheshire	Remarks:	Date of plot: 20-09-13	Lankelma Project Ref: P105742
Cone ID: S15-CFIP.901	Coordinates: ,			
Operator: Walter Geddes	Elevation:		Checked by: Emma Stickland	**TEST ID: CPT15**
Date of test: 18/09/2013 10:25:25	Coordinate system:	Refusal criteria: Tip load		Page 1 of 2

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



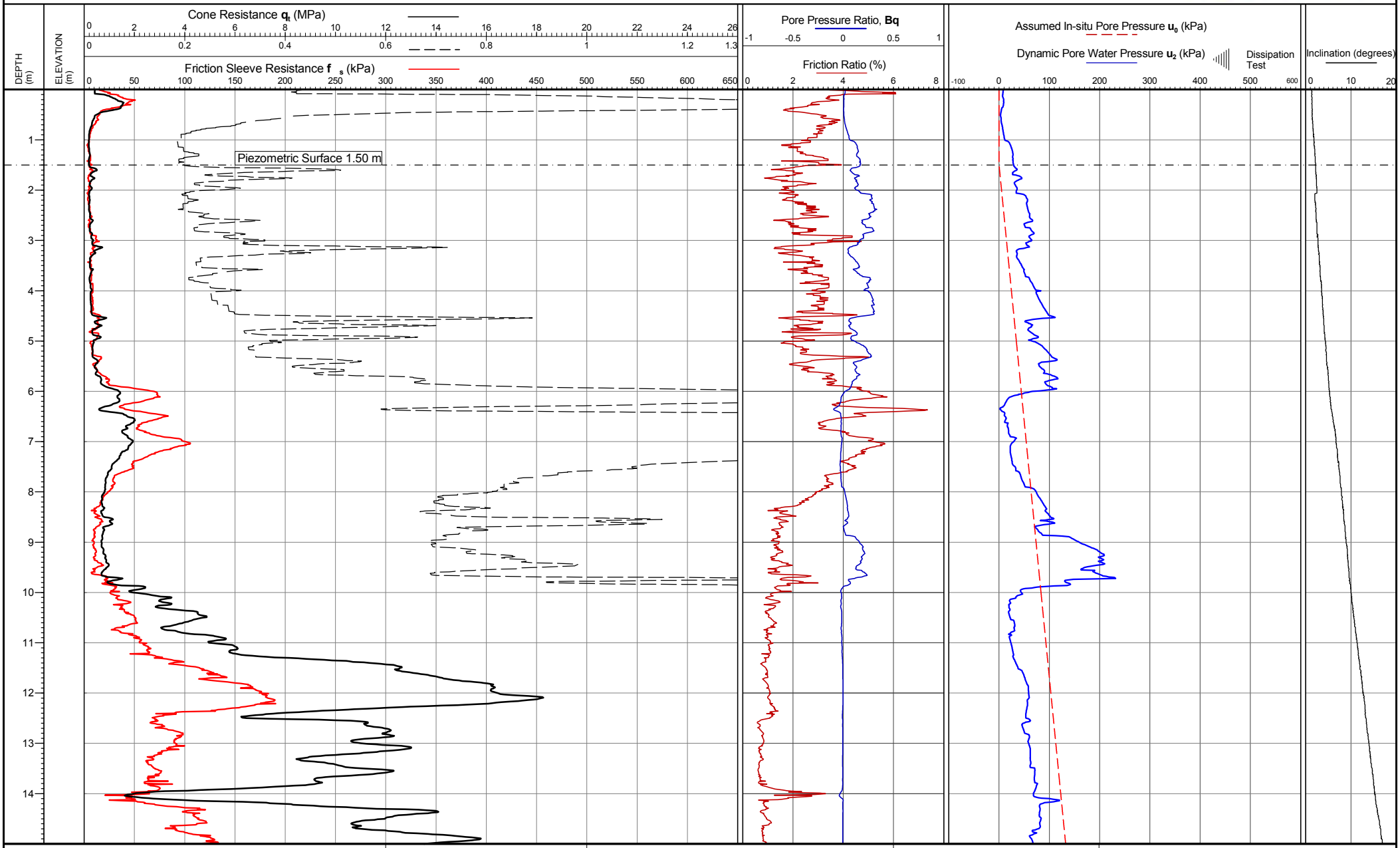
Cone area (mm2):1500	Location: Cheshire	Remarks:	Date of plot: 20-09-13	Lankelma Project Ref: P105742
Cone ID: S15-CFIP.901	Coordinates: ,			
Operator: Walter Geddes	Elevation:		Checked by: Emma Stickland	
Date of test: 18/09/2013 10:25:25	Coordinate system:	Refusal criteria: Tip load		

TEST ID: CPT15

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



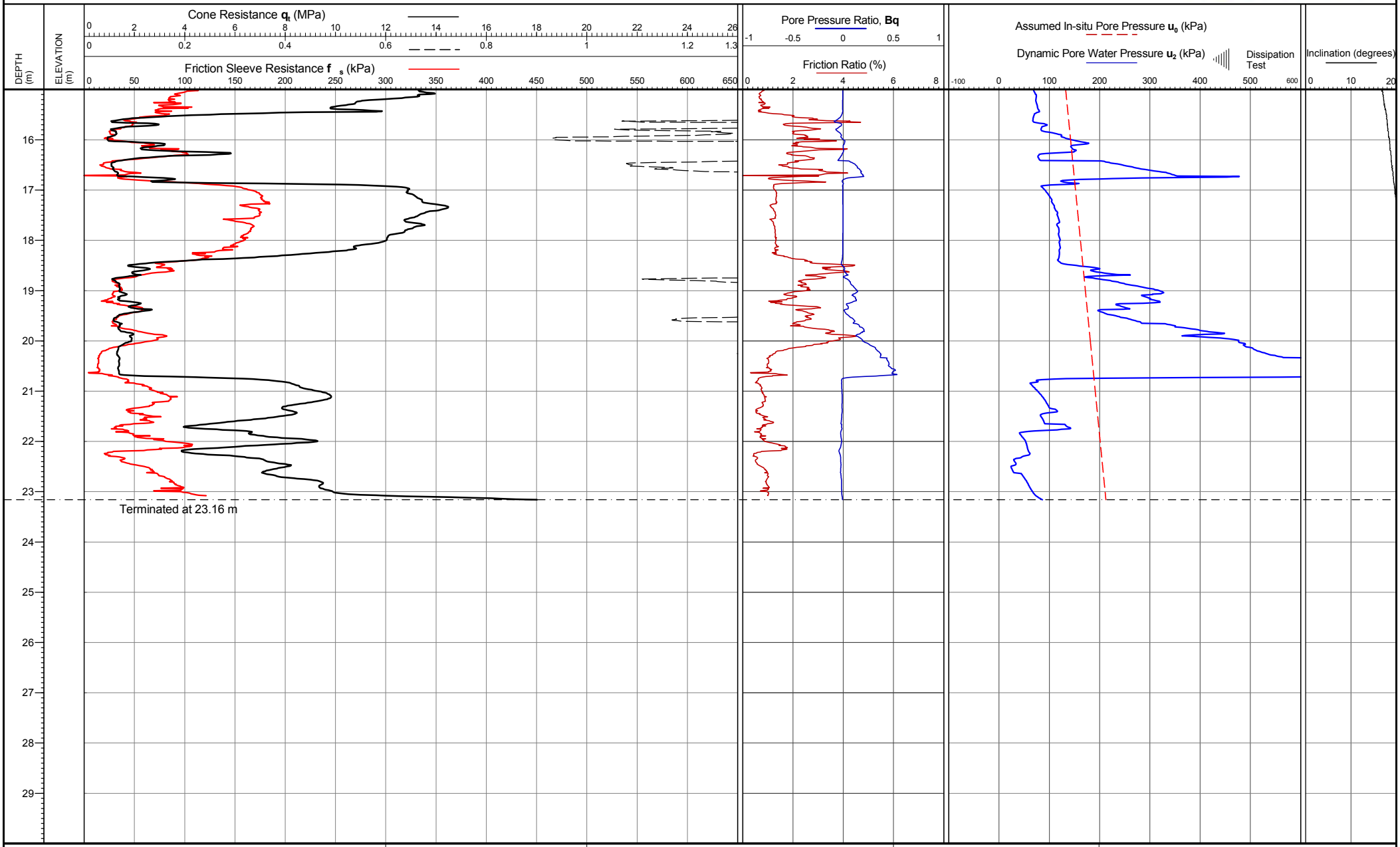
Cone area (mm2):1500	Location: Cheshire	Remarks:	Date of plot: 20-09-13	Lankelma Project Ref: P105742
Cone ID: S15-CFIP.901	Coordinates: ,			
Operator: Walter Geddes	Elevation:		Checked by: Emma Stickland	
Date of test: 18/09/2013 09:07:05	Coordinate system:	Refusal criteria: Tip load		

TEST ID: CPT16

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
Cone ID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 18/09/2013 09:07:05

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Refusal criteria: Tip load

Date of plot: 20-09-13
Lankelma Project Ref: P105742

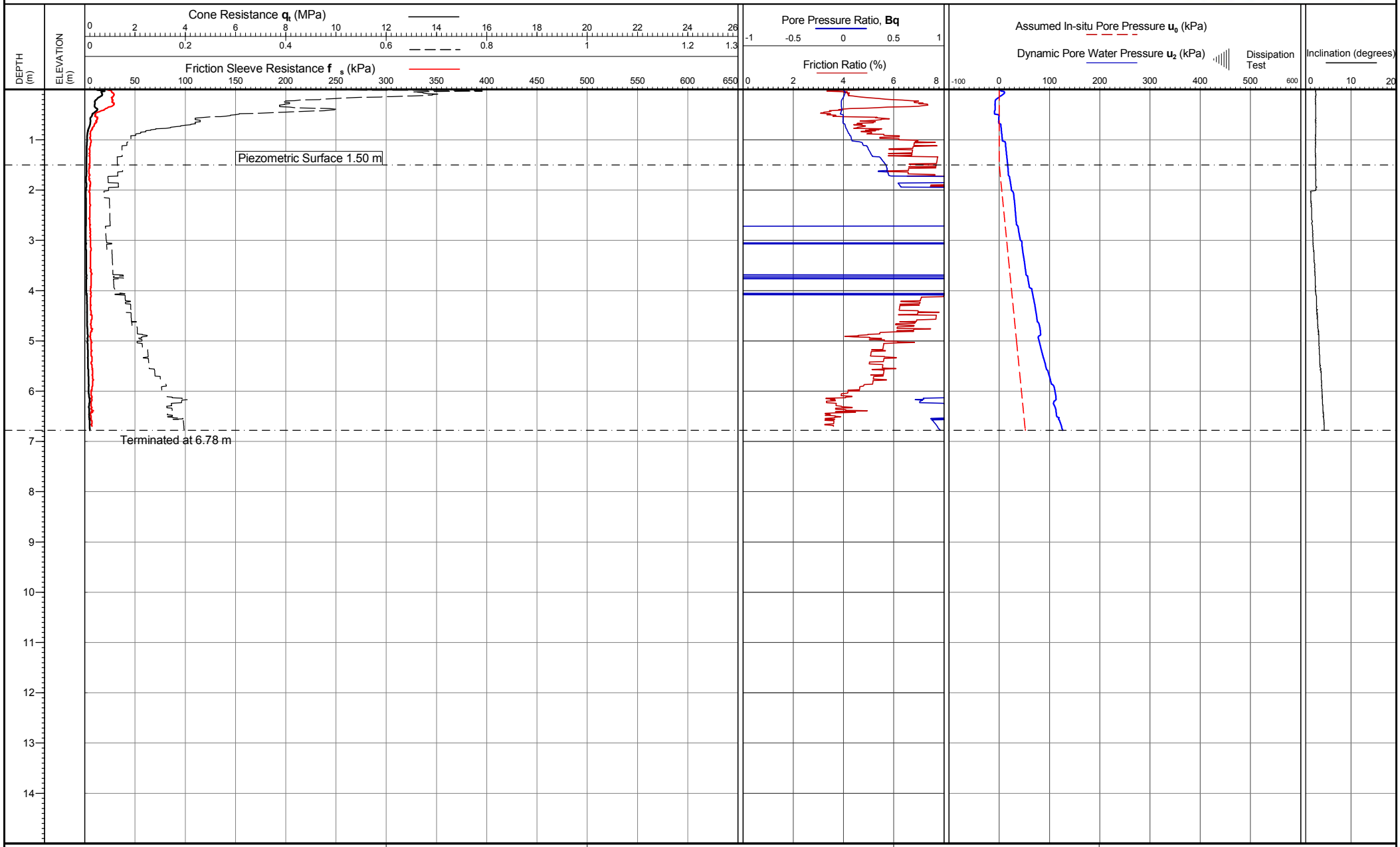
Checked by: Emma Stickland

TEST ID: CPT16

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA

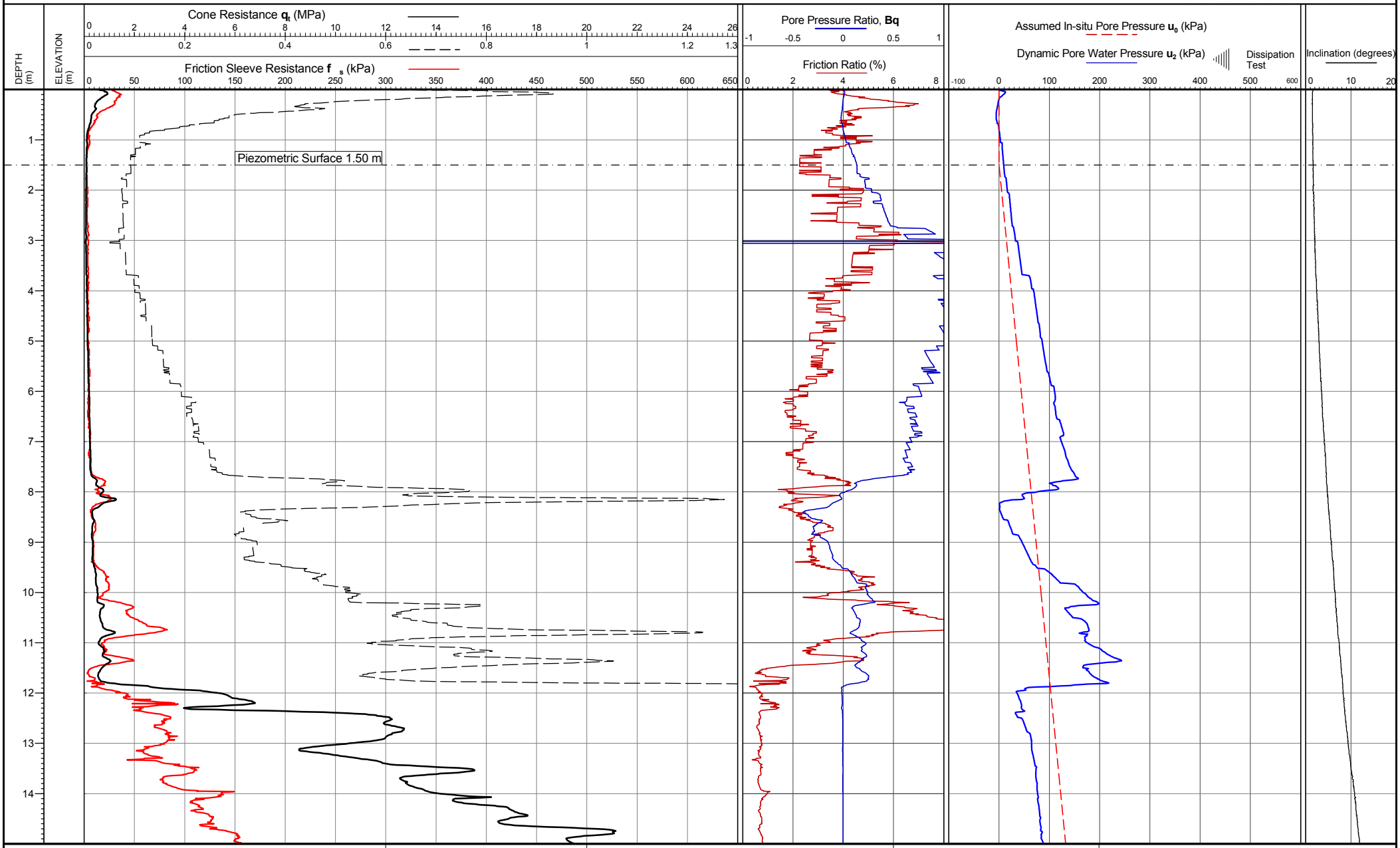


Cone area (mm2):1500	Location: Cheshire	Remarks:	Date of plot: 20-09-13	Lankelma Project Ref: P105742
Cone ID: S15-CFIP.901	Coordinates: ,			
Operator: Walter Geddes	Elevation:		Checked by: Emma Stickland	**TEST ID: CPT17**
Date of test: 18/09/2013 14:59:41	Coordinate system:	Refusal criteria: Data error		Page 1 of 1

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



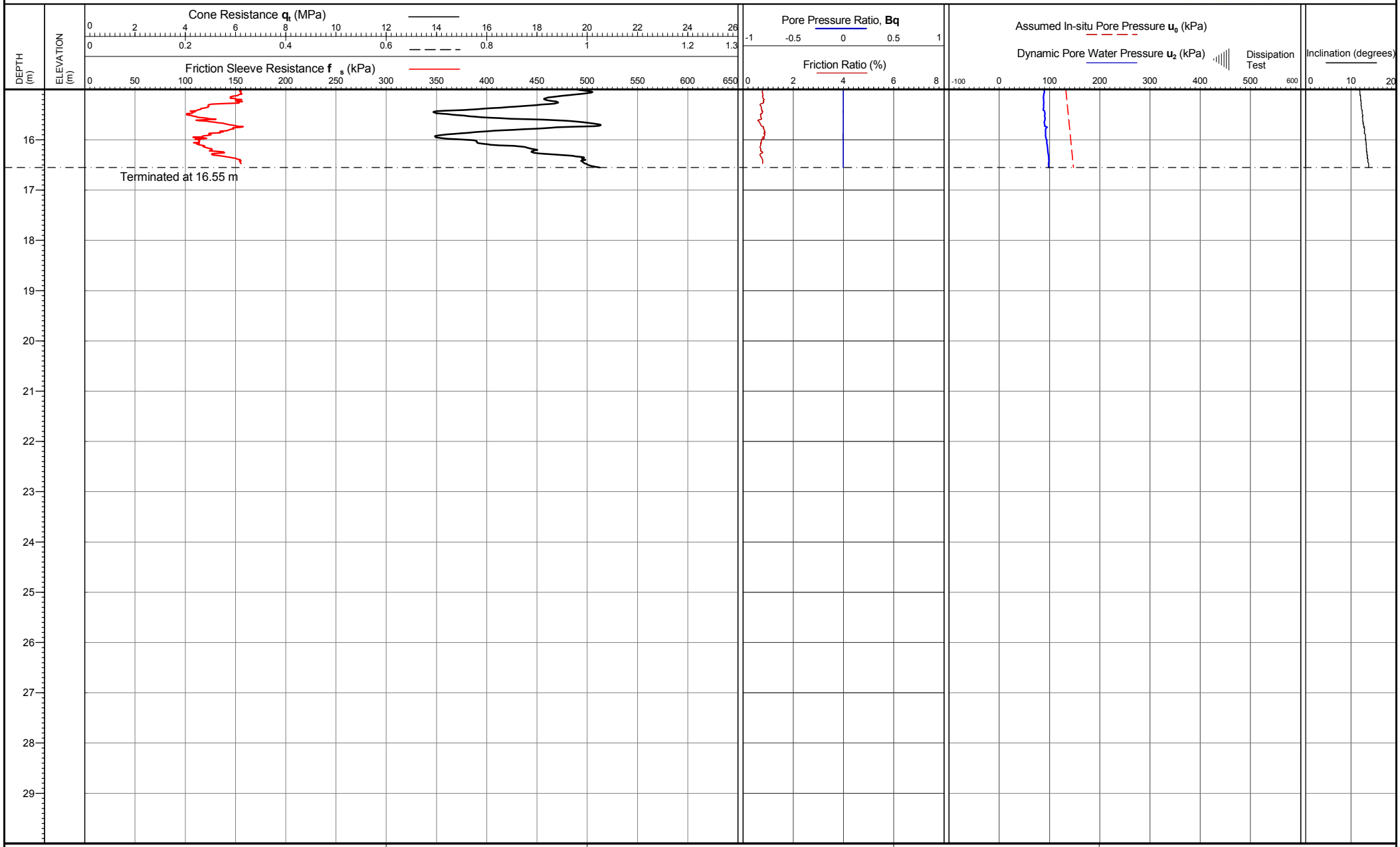
Cone area (mm2):1500	Location: Cheshire	Remarks:	Date of plot: 20-09-13	Lankelma Project Ref: P105742
Cone ID: S15-CFIP.901	Coordinates: ,			
Operator: Walter Geddes	Elevation:		Checked by: Emma Stickland	
Date of test: 18/09/2013 16:01:33	Coordinate system:	Refusal criteria: Tip load		

TEST ID: CPT17a

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA

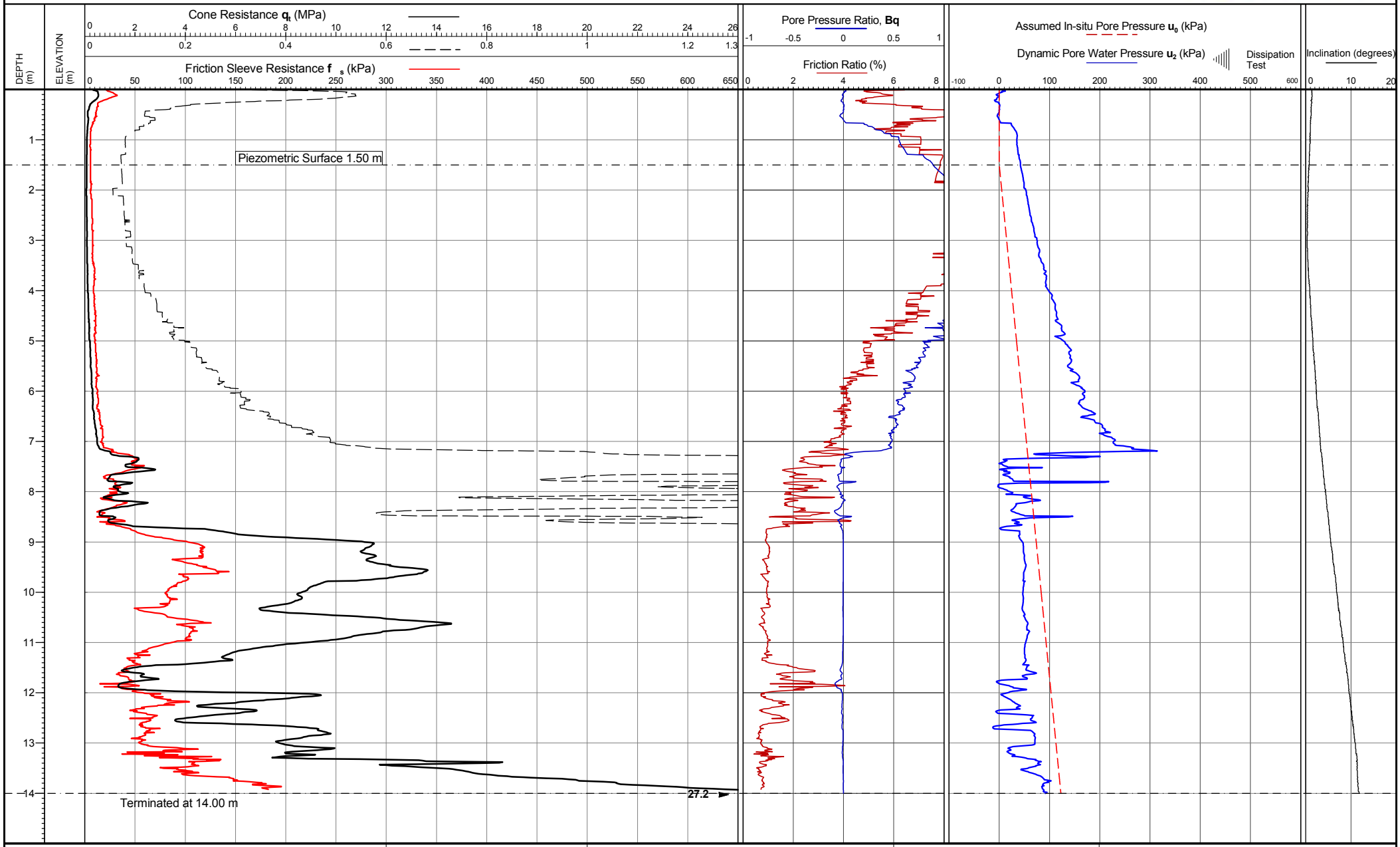


Cone area (mm2):1500	Location: Cheshire	Remarks:	Date of plot: 20-09-13	Lankelma Project Ref: P105742
Cone ID: S15-CFIP.901	Coordinates: ,			
Operator: Walter Geddes	Elevation:		Checked by: Emma Stickland	**TEST ID: CPT17a**
Date of test: 18/09/2013 16:01:33	Coordinate system:	Refusal criteria: Tip load		Page 2 of 2

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



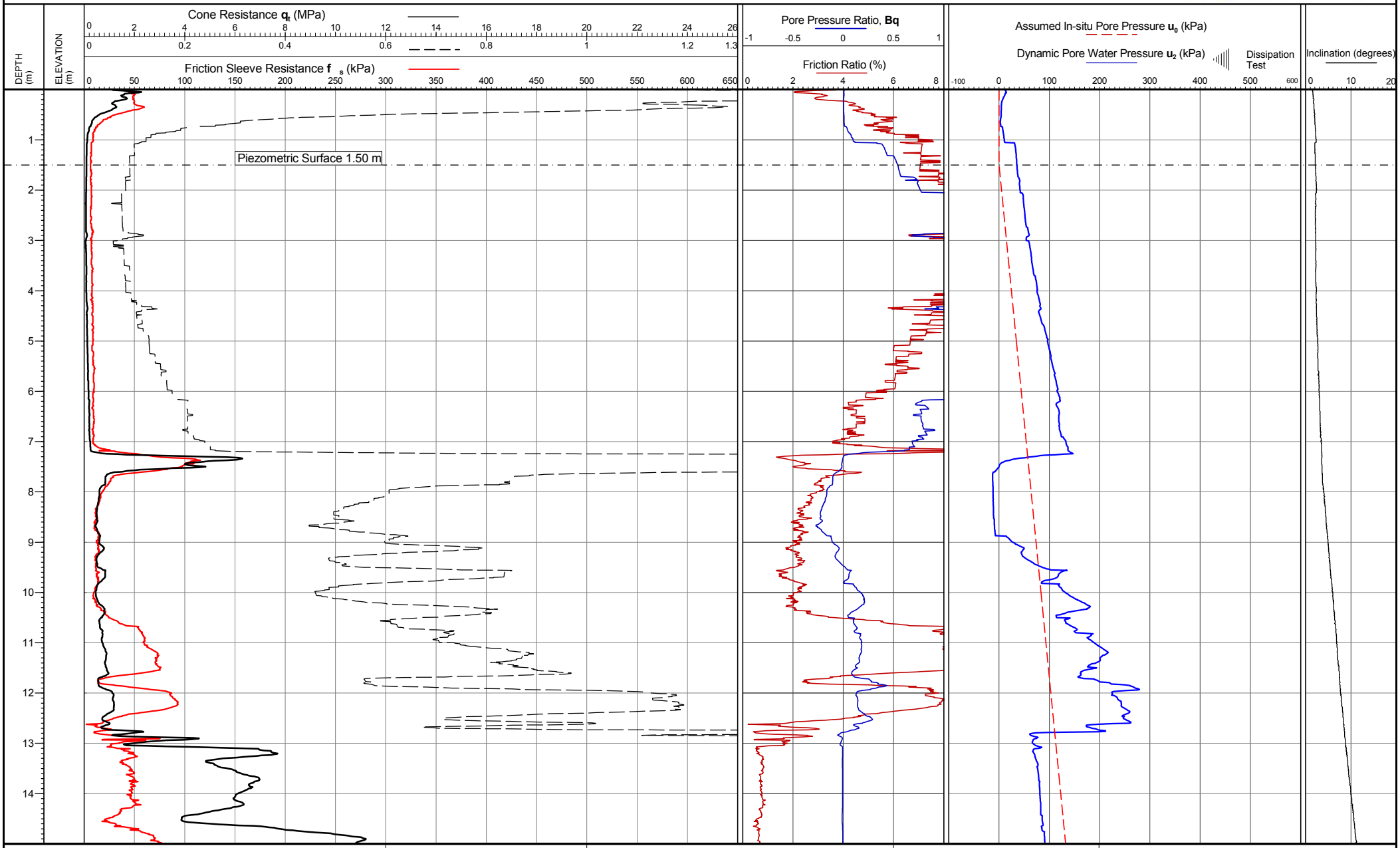
Cone area (mm2):1500	Location: Cheshire	Remarks:	Date of plot: 20-09-13	Lankelma Project Ref: P105742
Cone ID: S15-CFIP.901	Coordinates: ,			
Operator: Walter Geddes	Elevation:		Checked by: Emma Stickland	
Date of test: 19/09/2013 09:28:39	Coordinate system:	Refusal criteria: Tip load		

TEST ID: CPT18

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



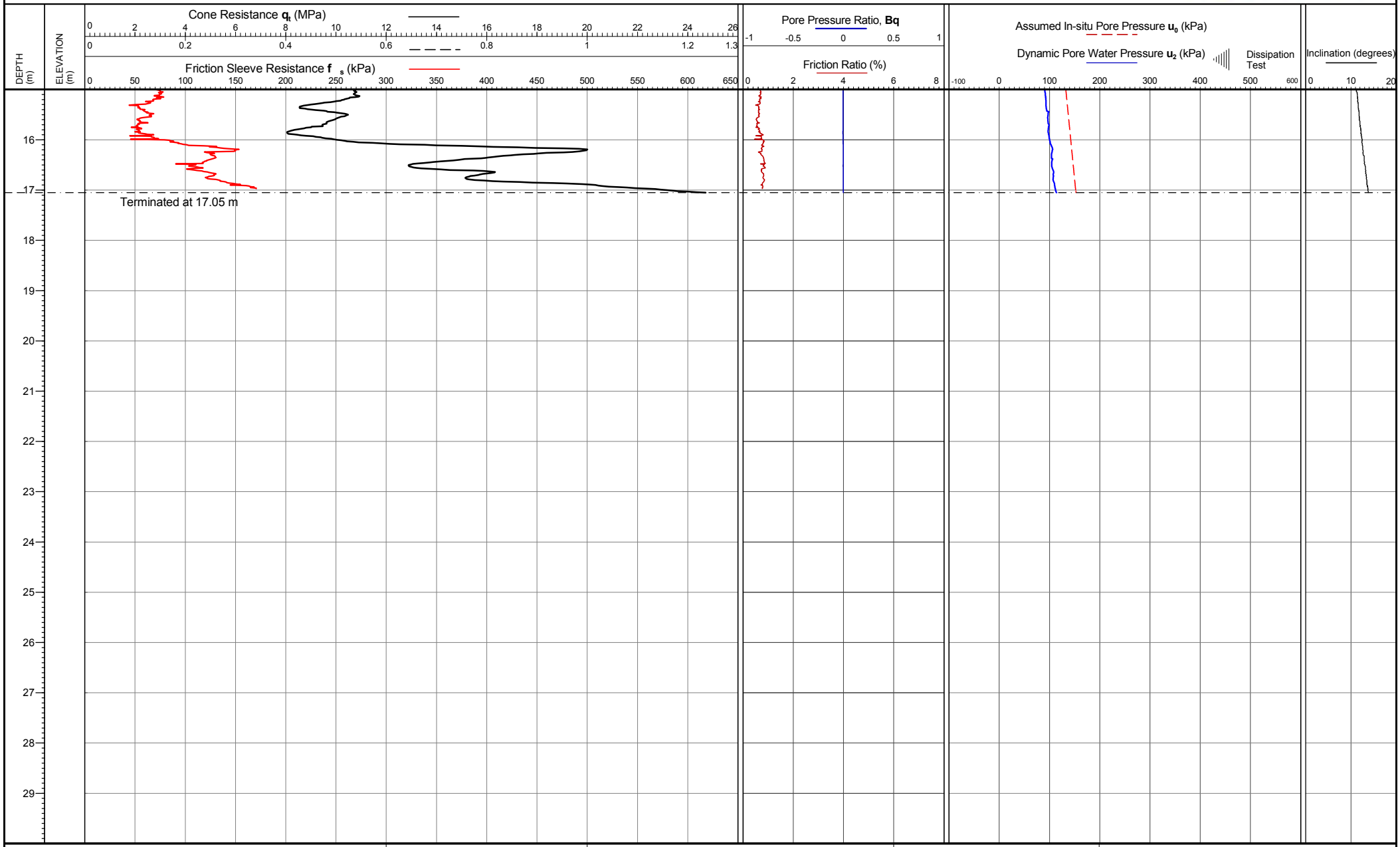
Cone area (mm2):1500	Location: Cheshire	Remarks:	Date of plot: 20-09-13	Lankelma Project Ref: P105742
Cone ID: S15-CFIP.901	Coordinates: ,			
Operator: Walter Geddes	Elevation:		Checked by: Emma Stickland	
Date of test: 19/09/2013 10:59:39	Coordinate system:	Refusal criteria: Tip load		

TEST ID: CPT19

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
Cone ID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 19/09/2013 10:59:39

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Refusal criteria: Tip load

Date of plot: 20-09-13
Lankelma Project Ref: P105742

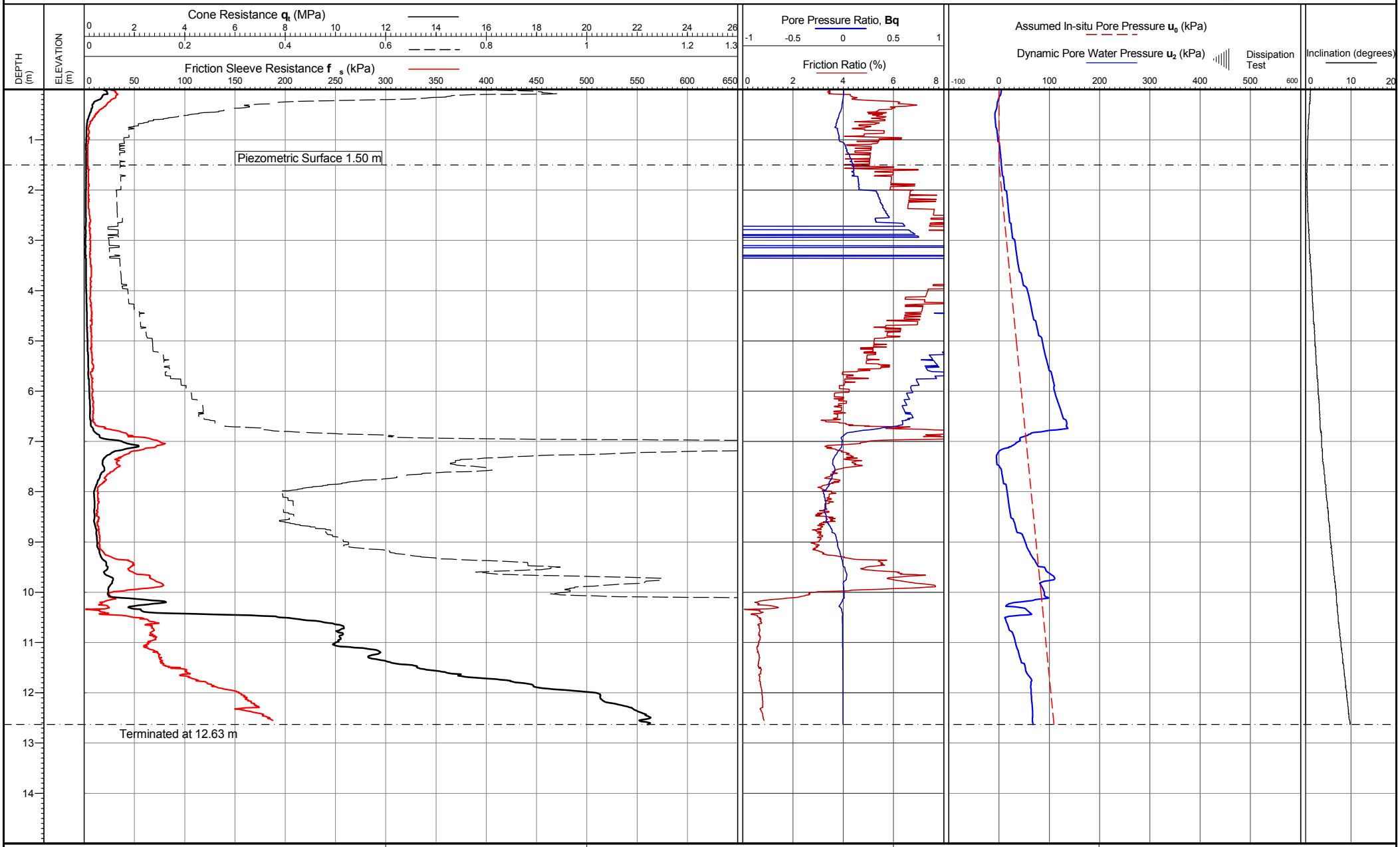
Checked by: Emma Stickland

TEST ID: CPT19

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



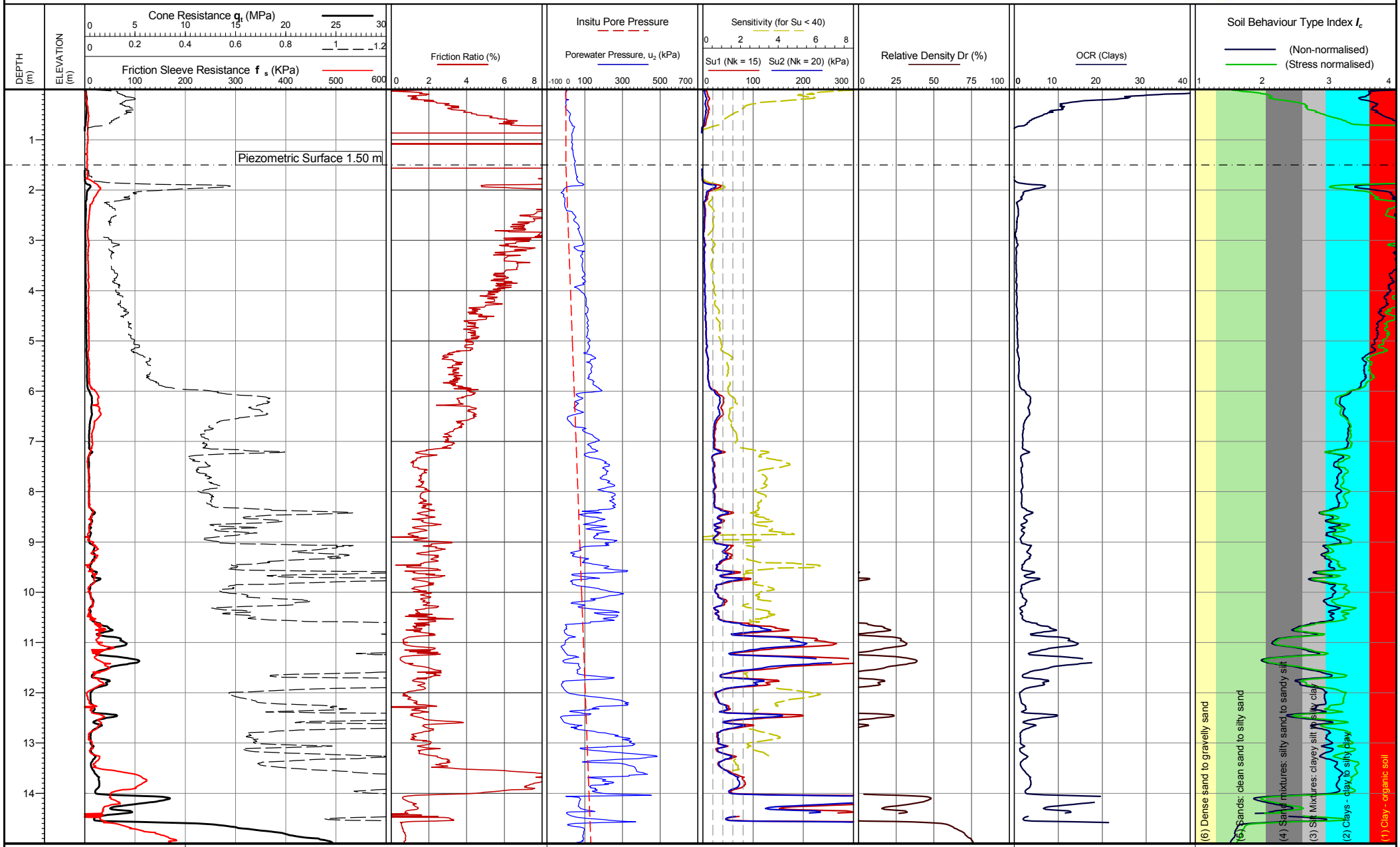
Cone area (mm2):1500	Location: Cheshire	Remarks:	Date of plot: 20-09-13	Lankelma Project Ref: P105742
Cone ID: S15-CFIP.901	Coordinates: ,			
Operator: Walter Geddes	Elevation:		Checked by: Emma Stickland	
Date of test: 18/09/2013 17:21:00	Coordinate system:	Refusal criteria: Tip load		

TEST ID: CPT20

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.908
Operator: Anthony Davis
Date of test: 12/09/2013 09:59:38

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13
Lankelma Project Ref: P105742

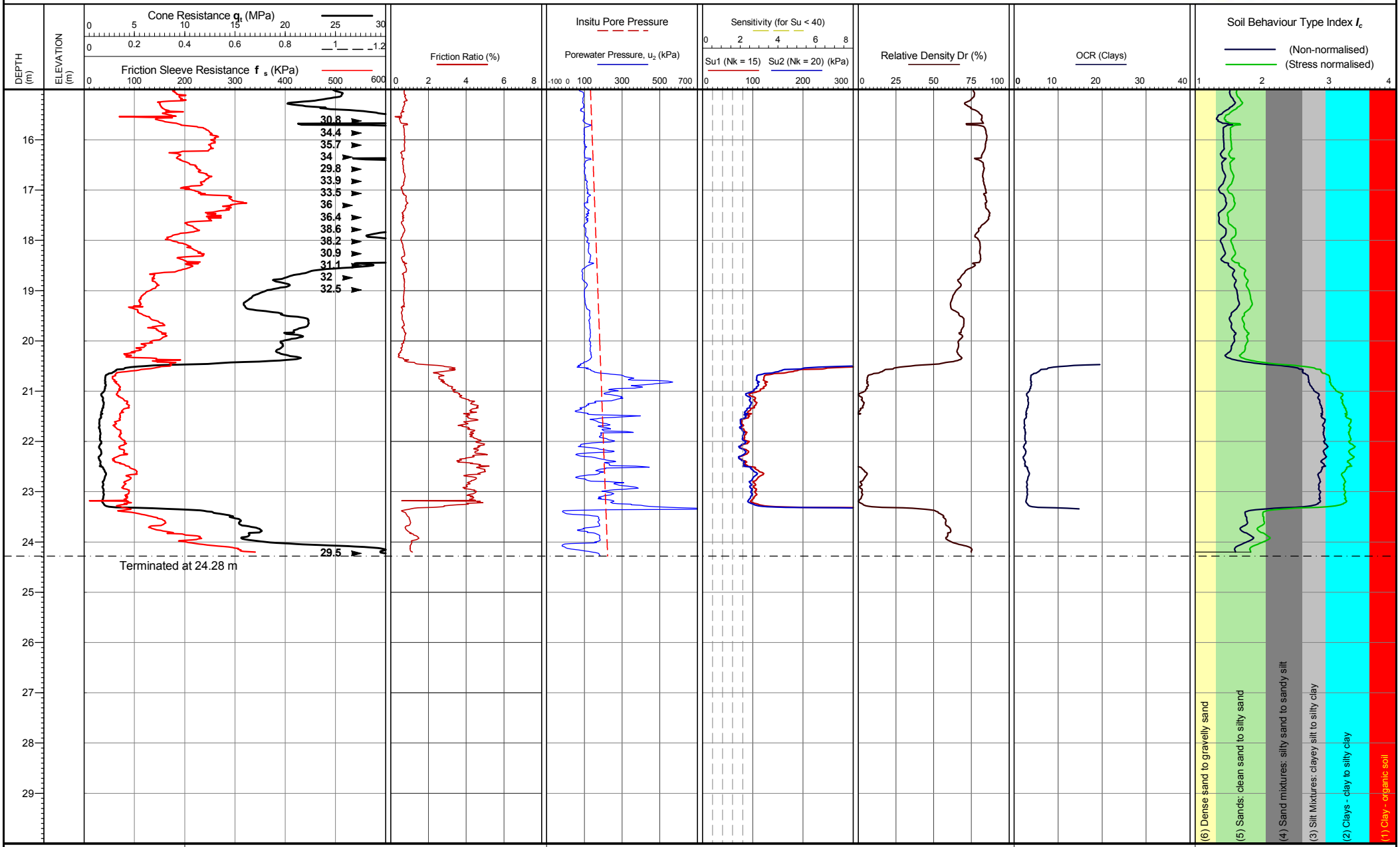
Checked by:
Emma Stickland

TEST ID: CPT01

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.908
Operator: Anthony Davis
Date of test: 12/09/2013 09:59:38

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13
Lankelma Project Ref: P105742

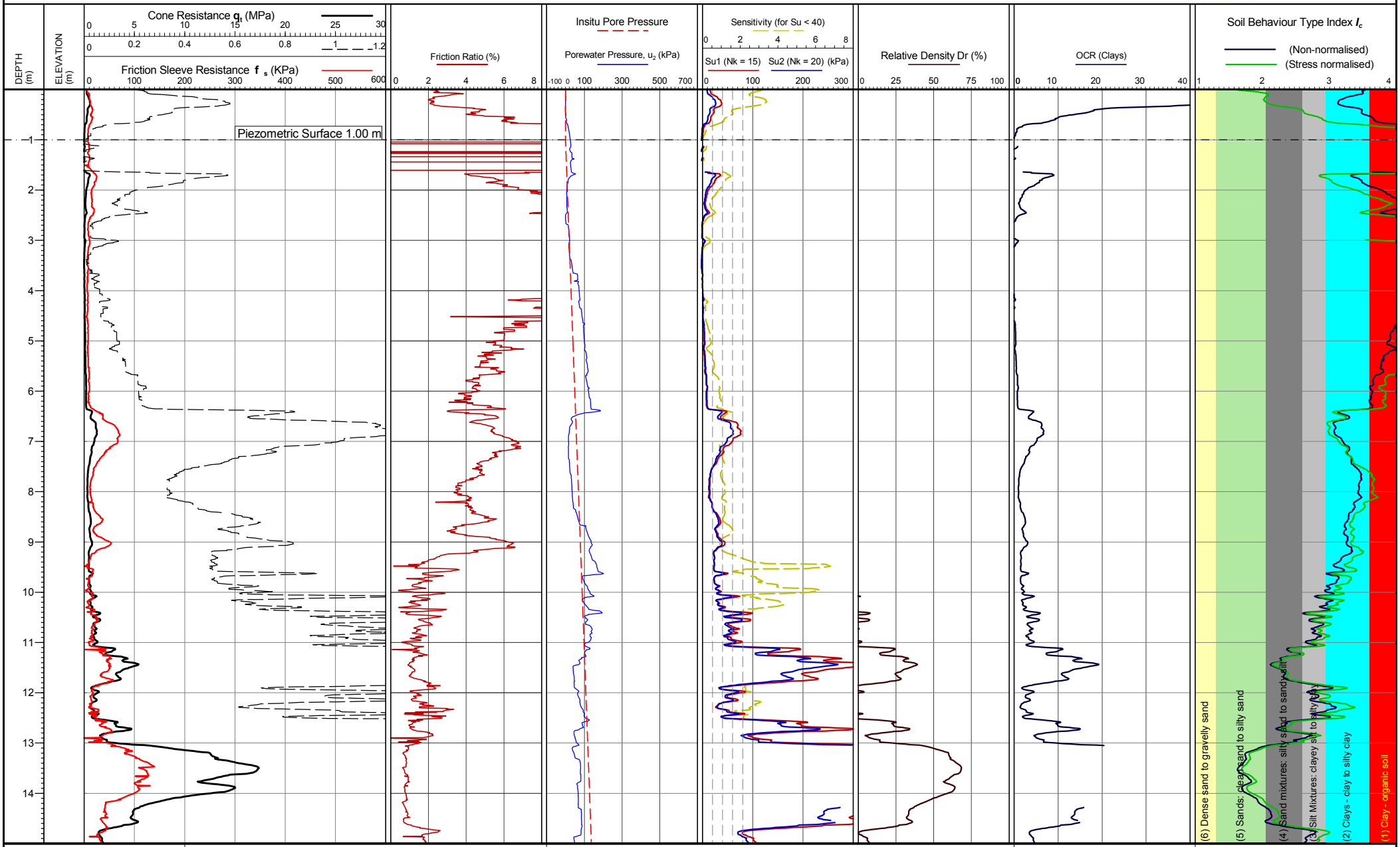
Checked by:
Emma Stickland

TEST ID: CPT01

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.908
Operator: Anthony Davis
Date of test: 12/09/2013 14:06:31

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13

Lankelma Project Ref: P105742

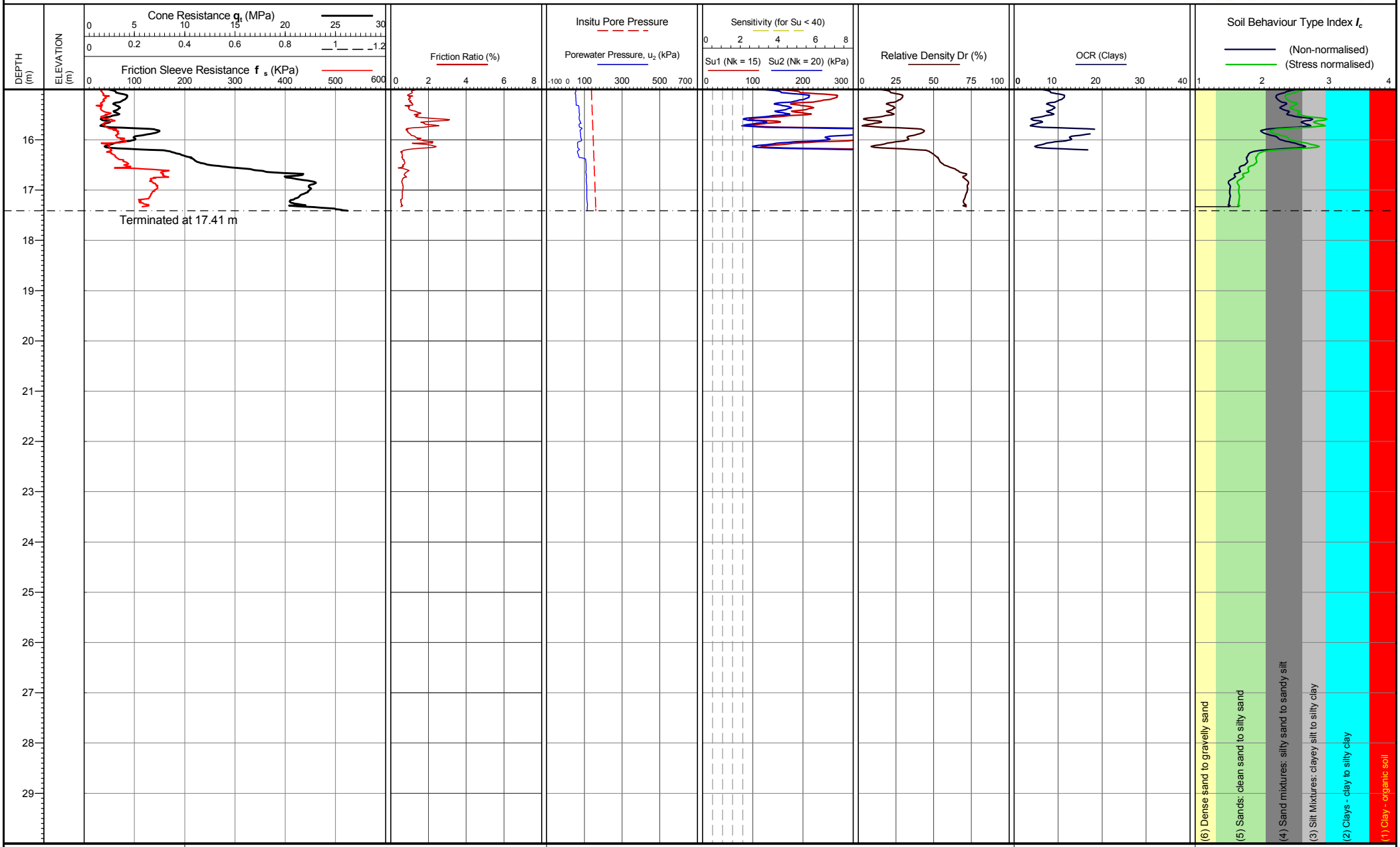
Checked by: Emma Stickland

TEST ID: CPT02

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.908
Operator: Anthony Davis
Date of test: 12/09/2013 14:06:31

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13

Lankelma Project Ref: P105742

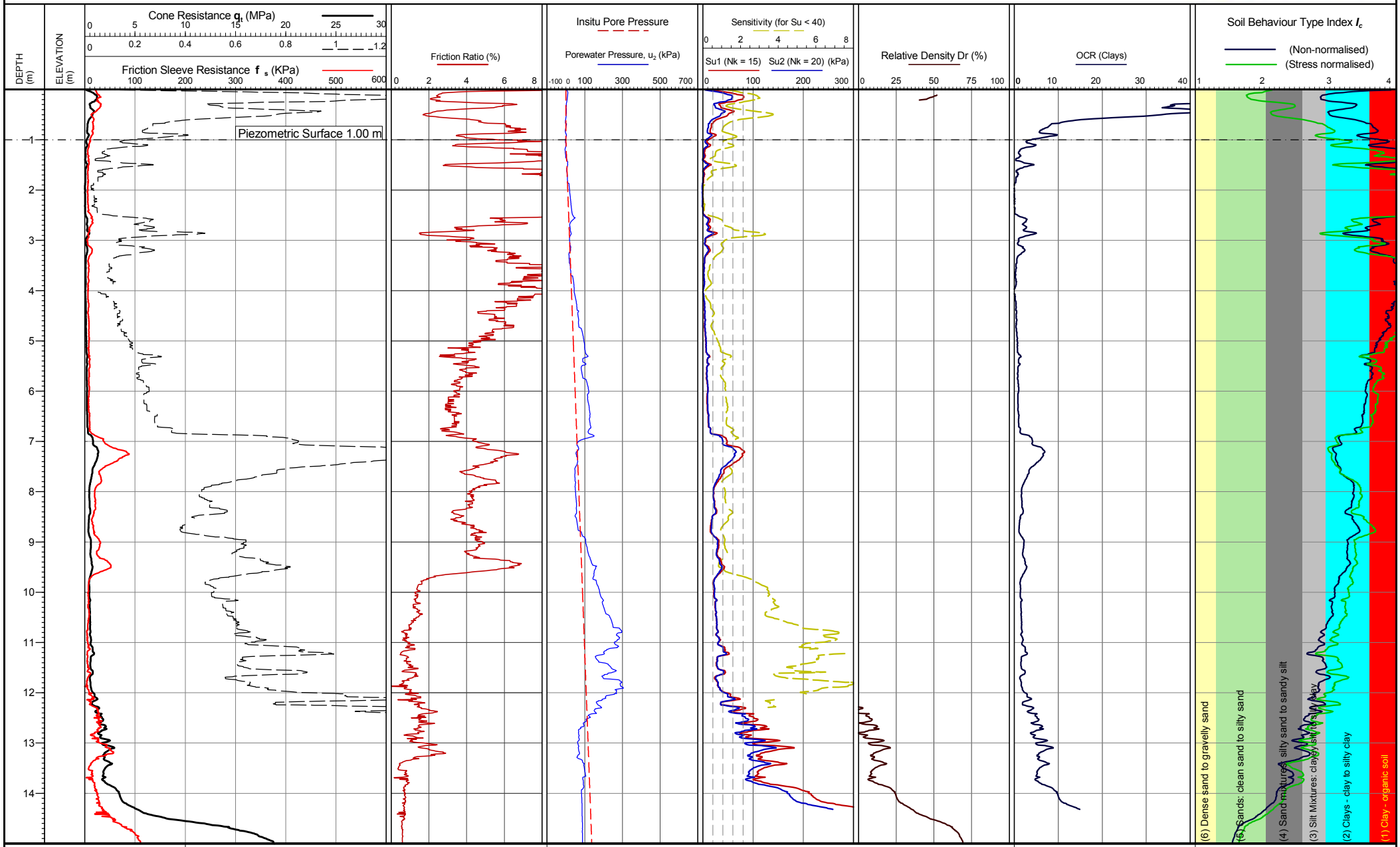
Checked by: Emma Stickland

TEST ID: CPT02

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.908
Operator: Anthony Davis
Date of test: 12/09/2013 15:26:00

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13

Lankelma Project Ref: P105742

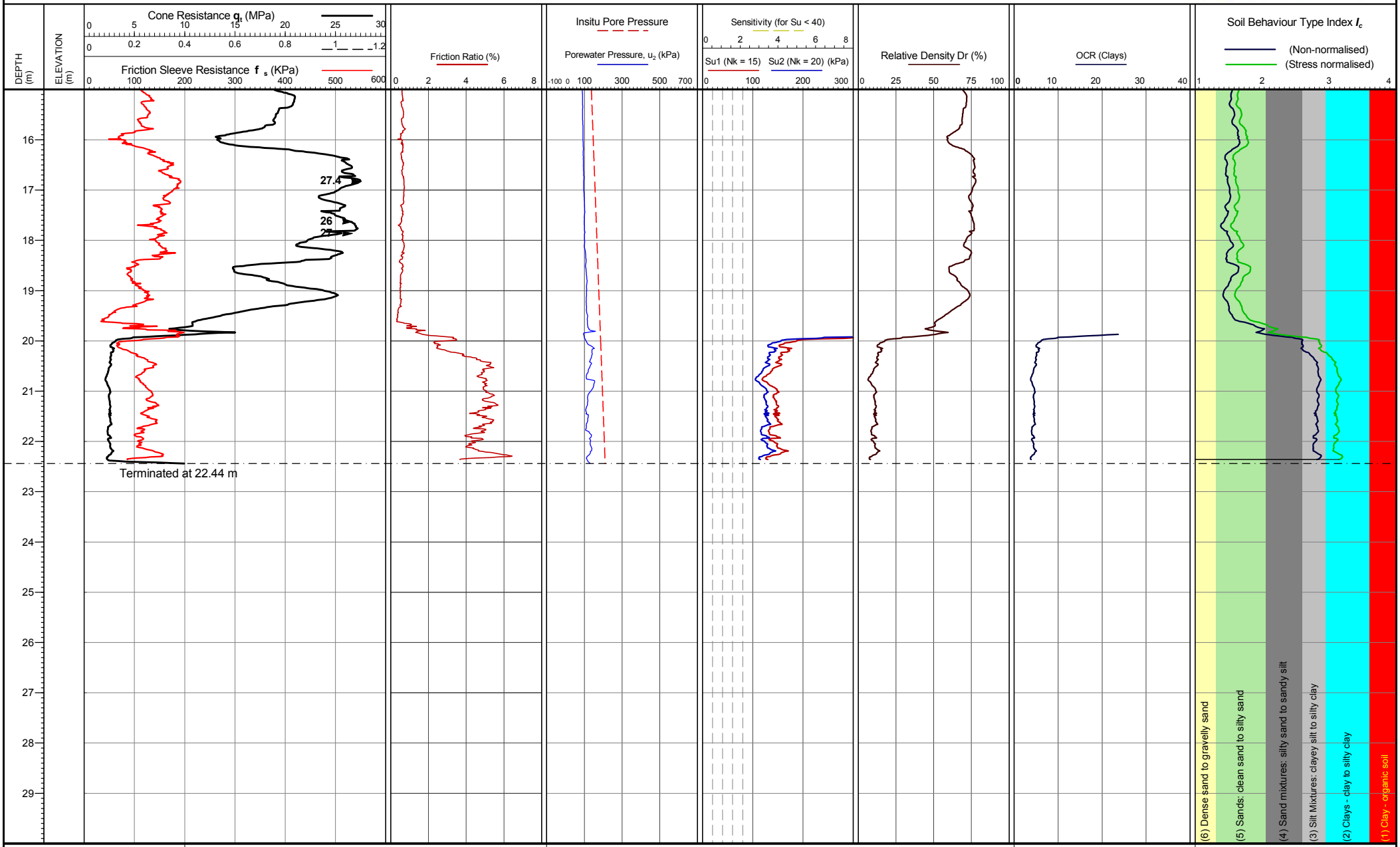
Checked by: Emma Stickland

TEST ID: CPT03

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.908
Operator: Anthony Davis
Date of test: 12/09/2013 15:26:00

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13

Lankelma Project Ref: P105742

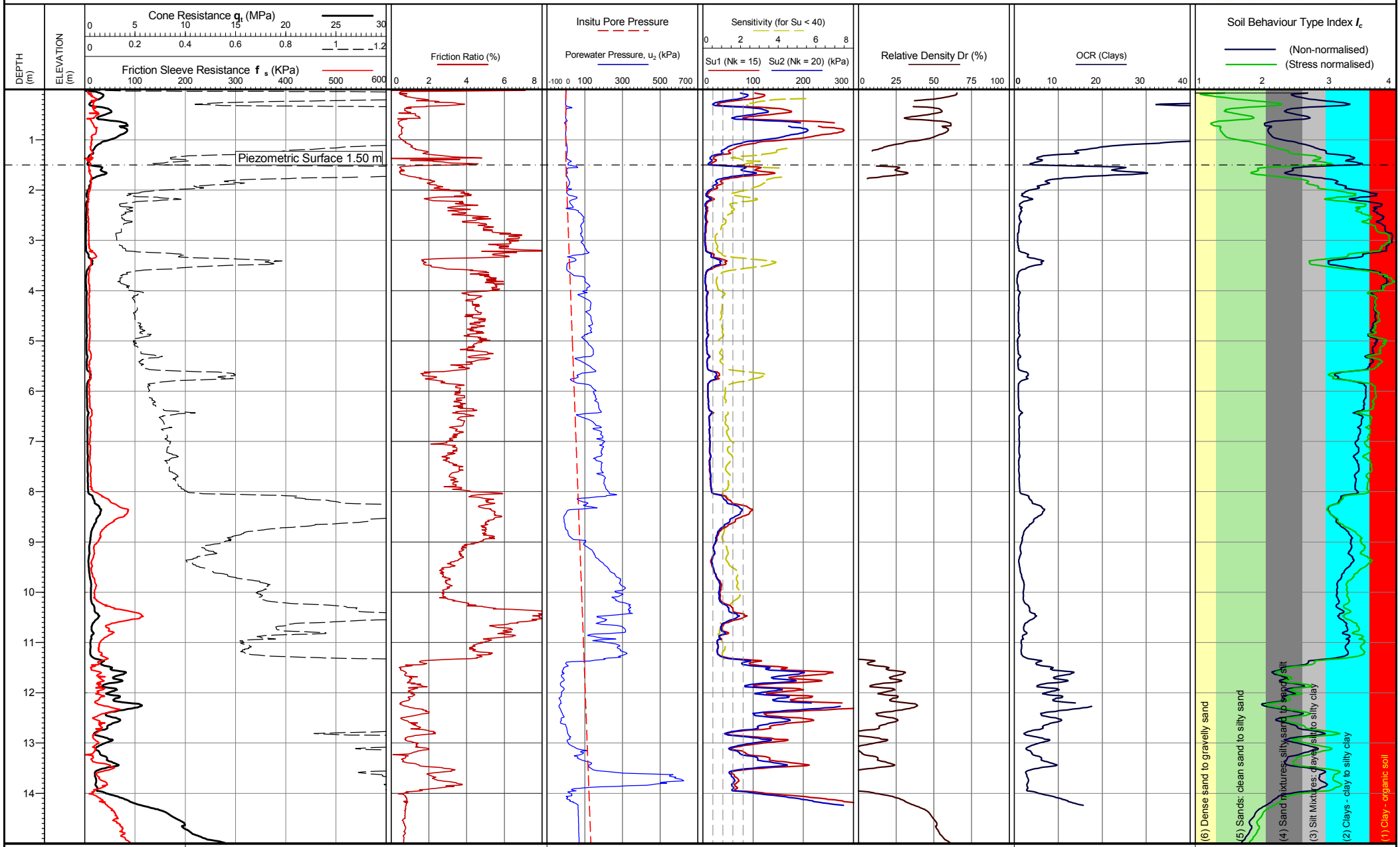
Checked by: Emma Stickland

TEST ID: CPT03

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.901
Operator: Anthony Davis
Date of test: 13/09/2013 13:03:03

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13

Lankelma Project Ref: P105742

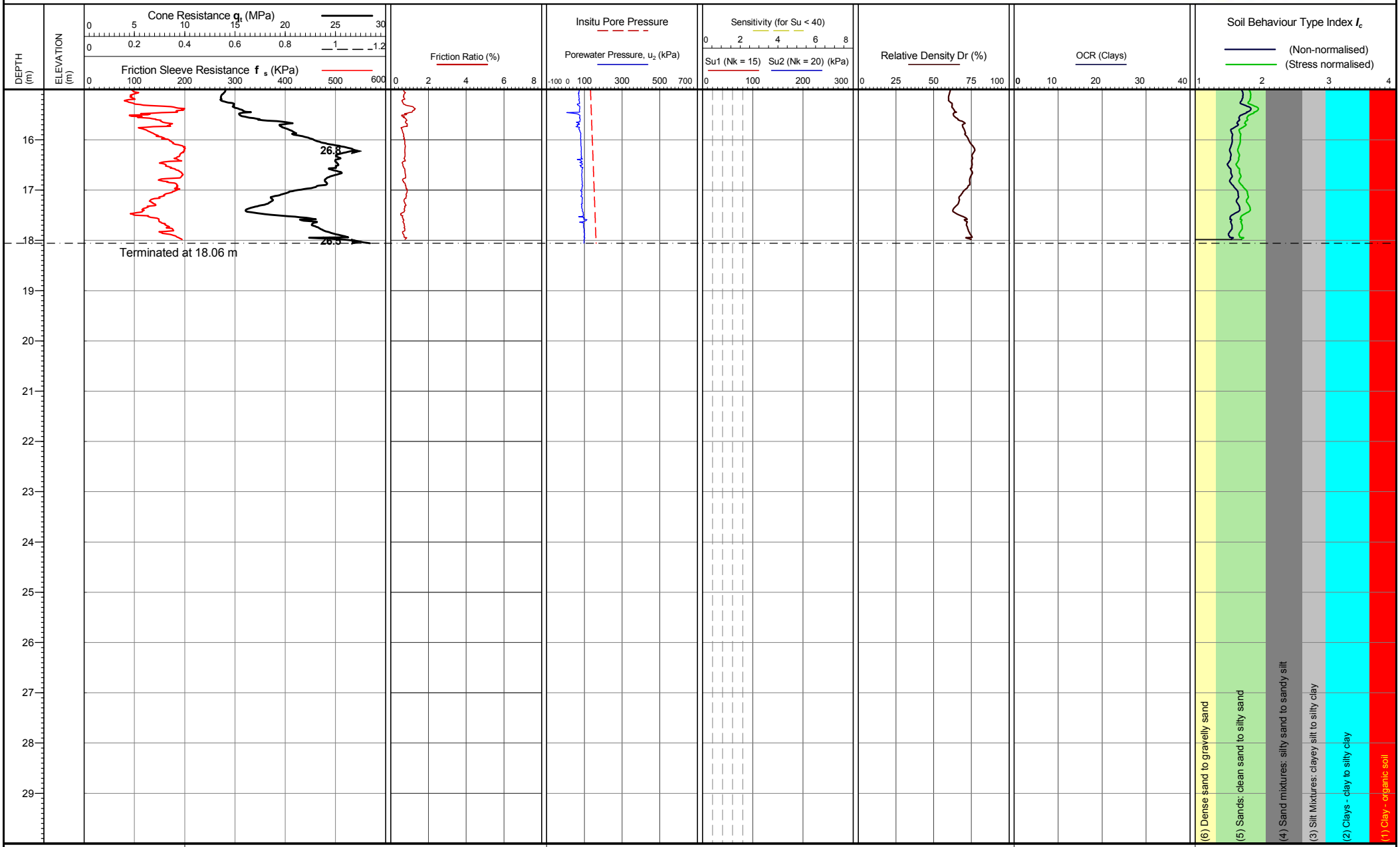
Checked by: Emma Stickland

TEST ID: CPT04

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.901
Operator: Anthony Davis
Date of test: 13/09/2013 13:03:03

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13
Lankelma Project Ref: P105742

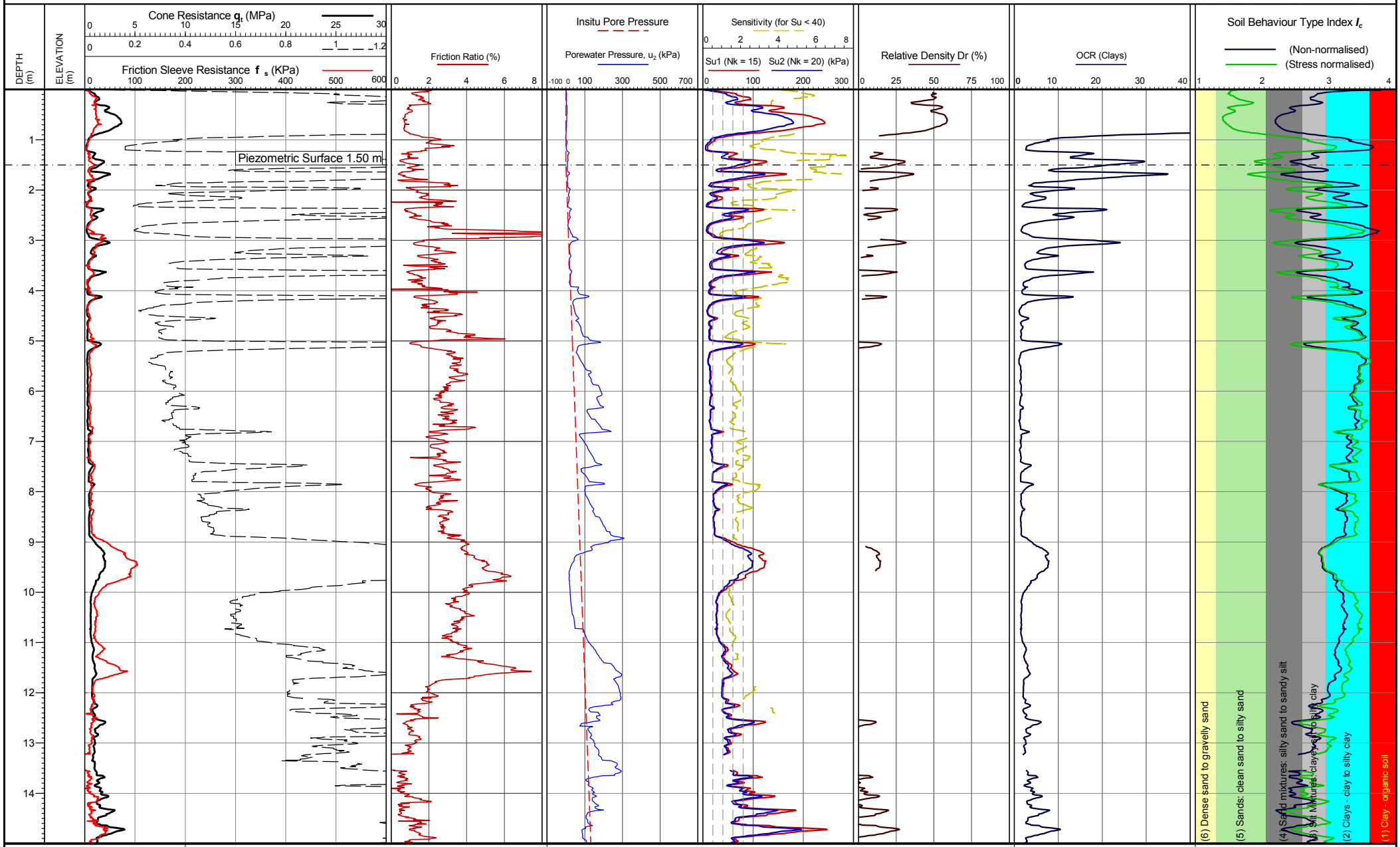
Checked by:
Emma Stickland

TEST ID: CPT04

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 16/09/2013 10:33:08

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

Dissipation Test

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13
Lankelma Project Ref: P105742

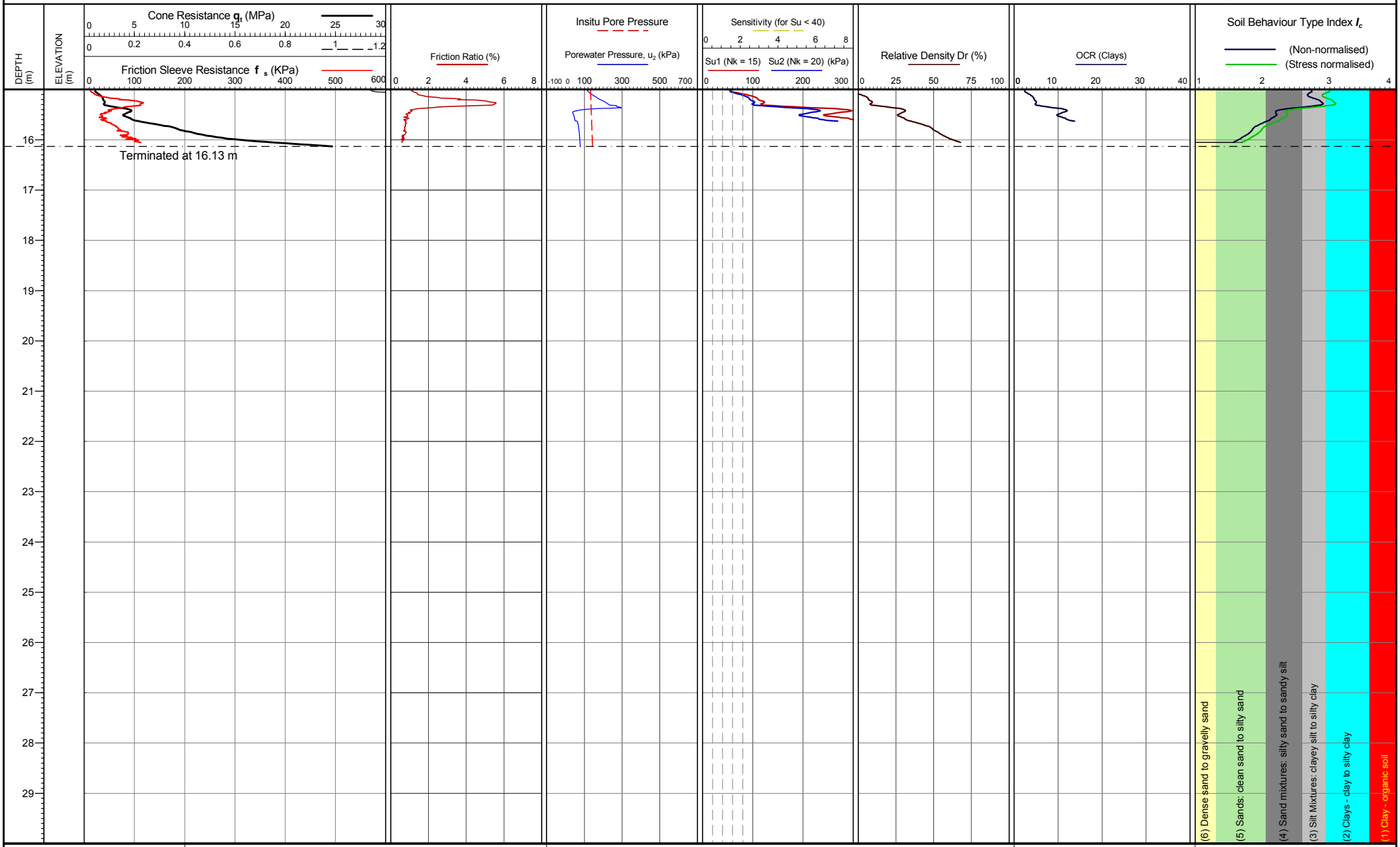
Checked by:
Emma Stickland

TEST ID: CPT05

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 16/09/2013 10:33:08

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13

Lankelma Project Ref: P105742

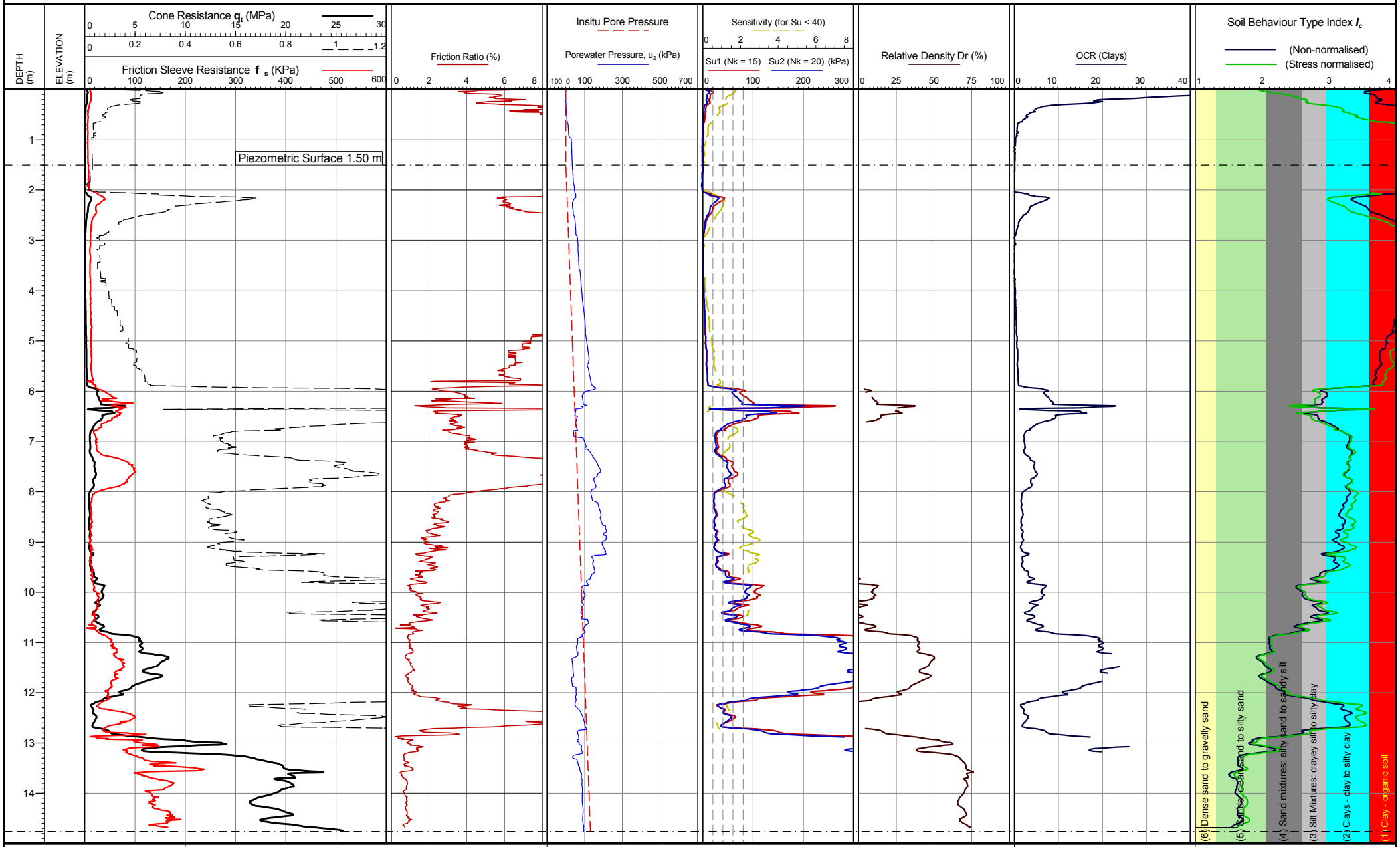
Checked by: Emma Stickland

TEST ID: CPT05

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 16/09/2013 11:54:05

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

Dissipation Test

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13
Lankelma Project Ref: P105742

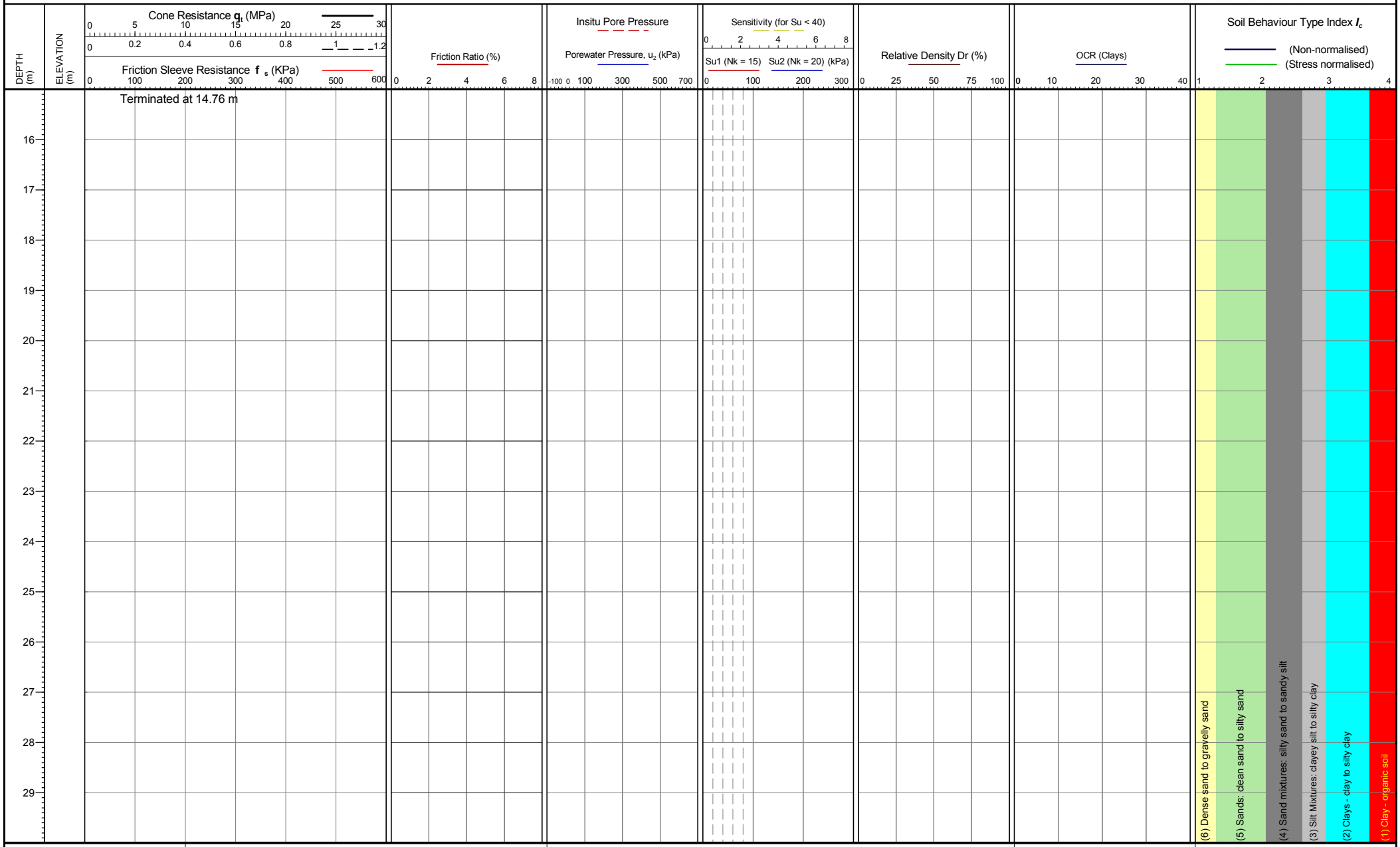
Checked by:
Emma Stickland

TEST ID: CPT06

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 16/09/2013 11:54:05

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13
Lankelma Project Ref: P105742

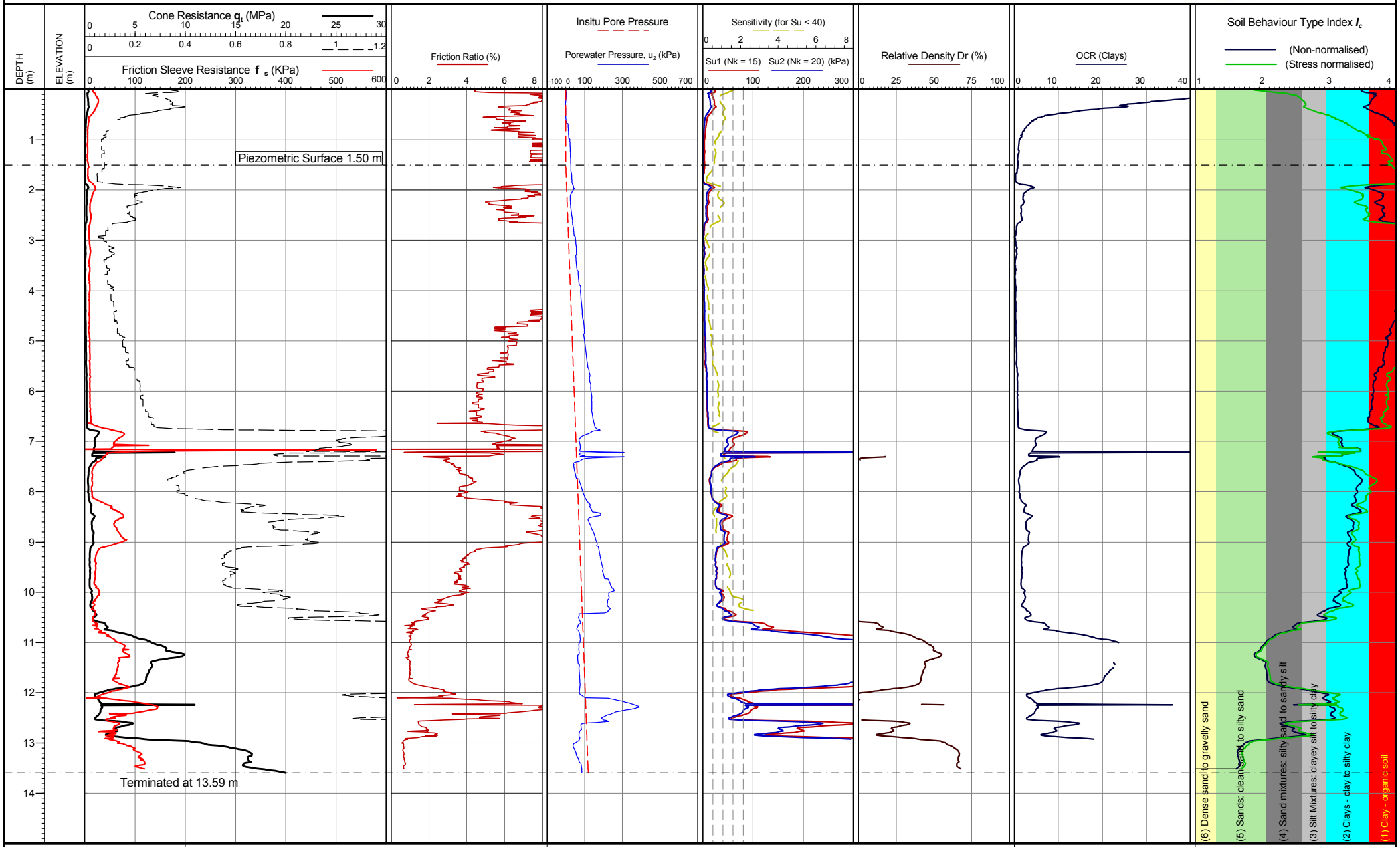
Checked by:
Emma Stickland

TEST ID: CPT06

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 16/09/2013 14:19:31

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Dissipation Test

Date of plot: 20-09-13

Lankelma Project Ref: P105742

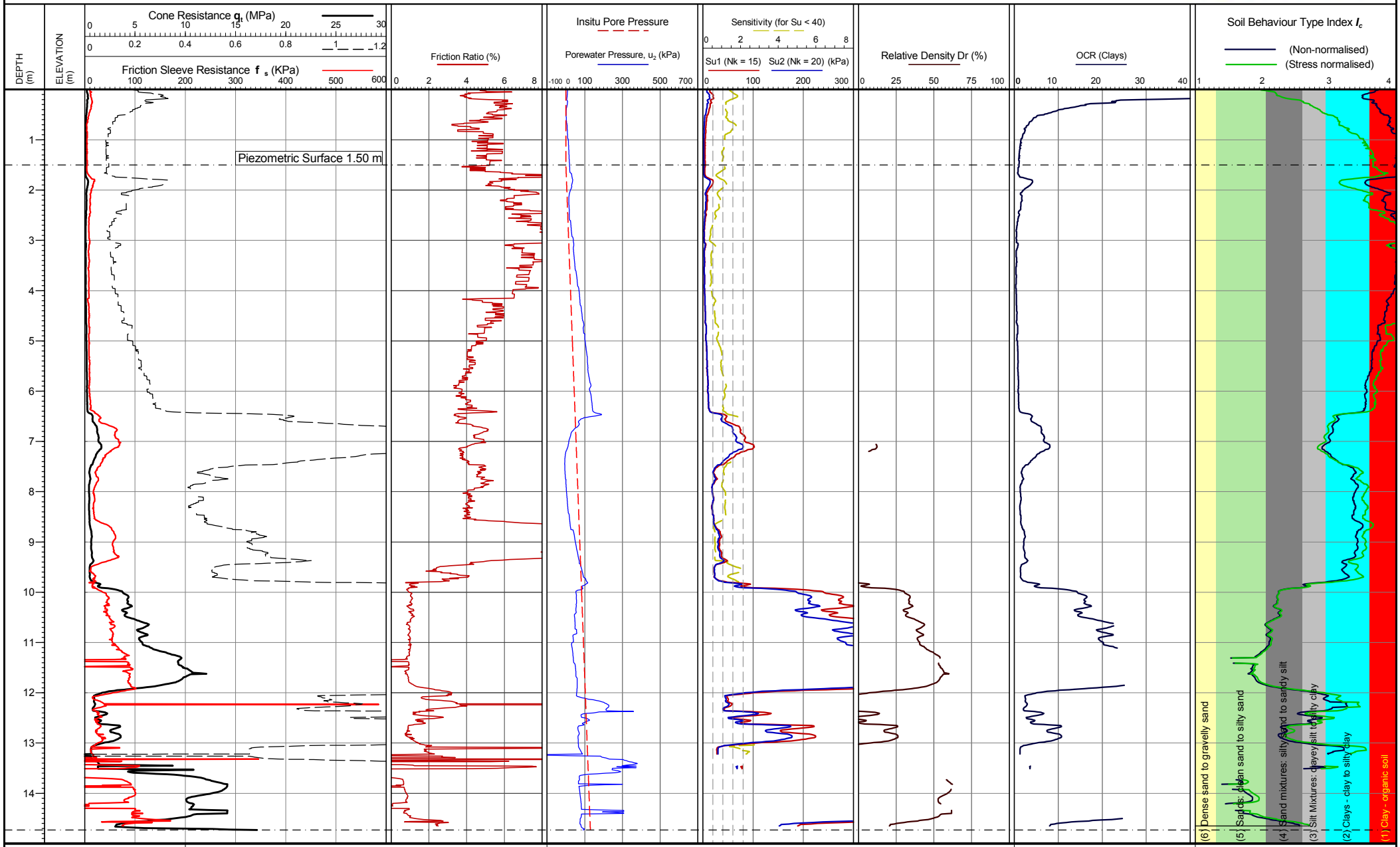
Checked by: Emma Stickland

TEST ID: CPT07

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 16/09/2013 16:01:44

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13

Lankelma Project Ref: P105742

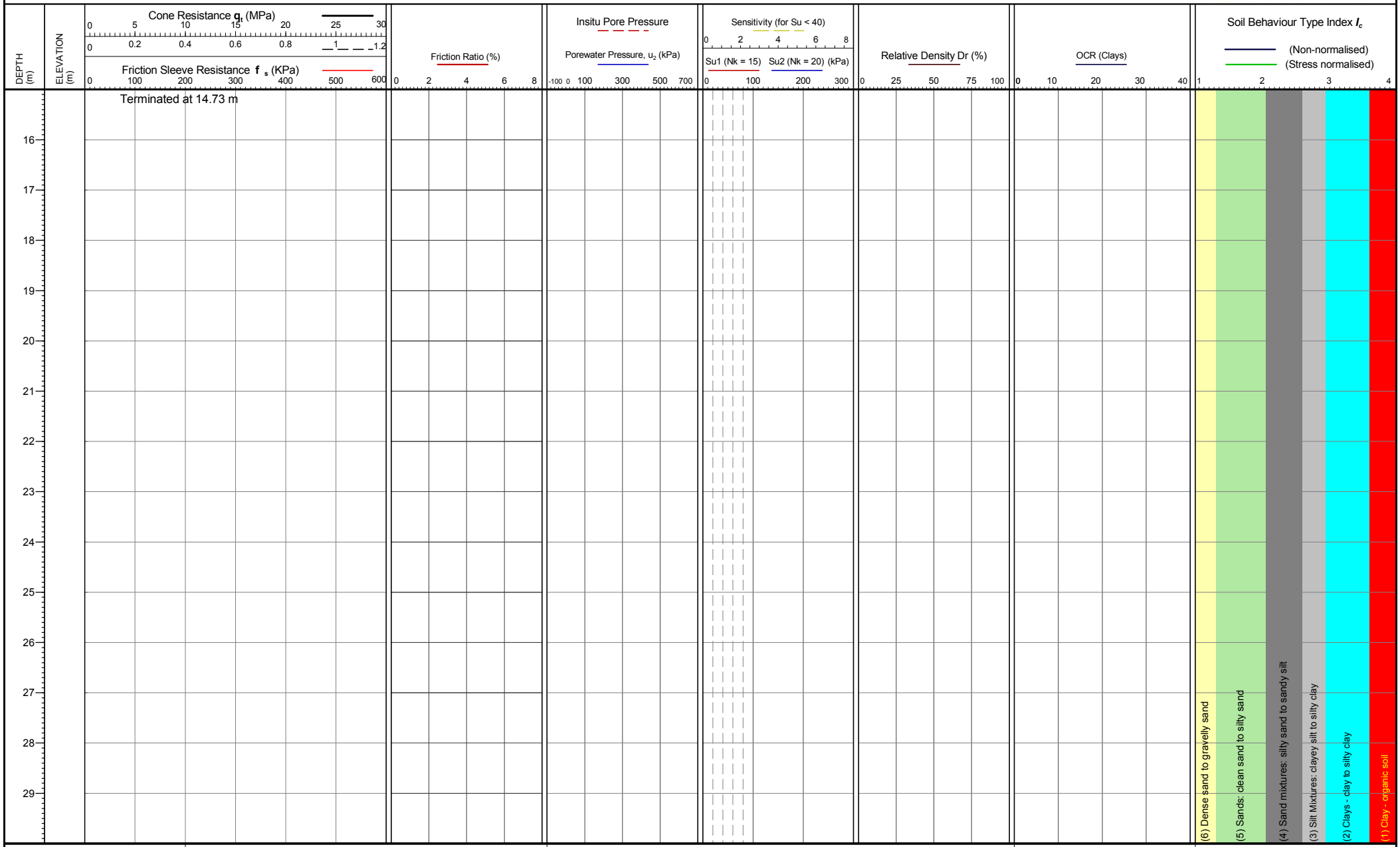
Checked by: Emma Stickland

TEST ID: CPT08

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 16/09/2013 16:01:44

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13
Lankelma Project Ref: P105742

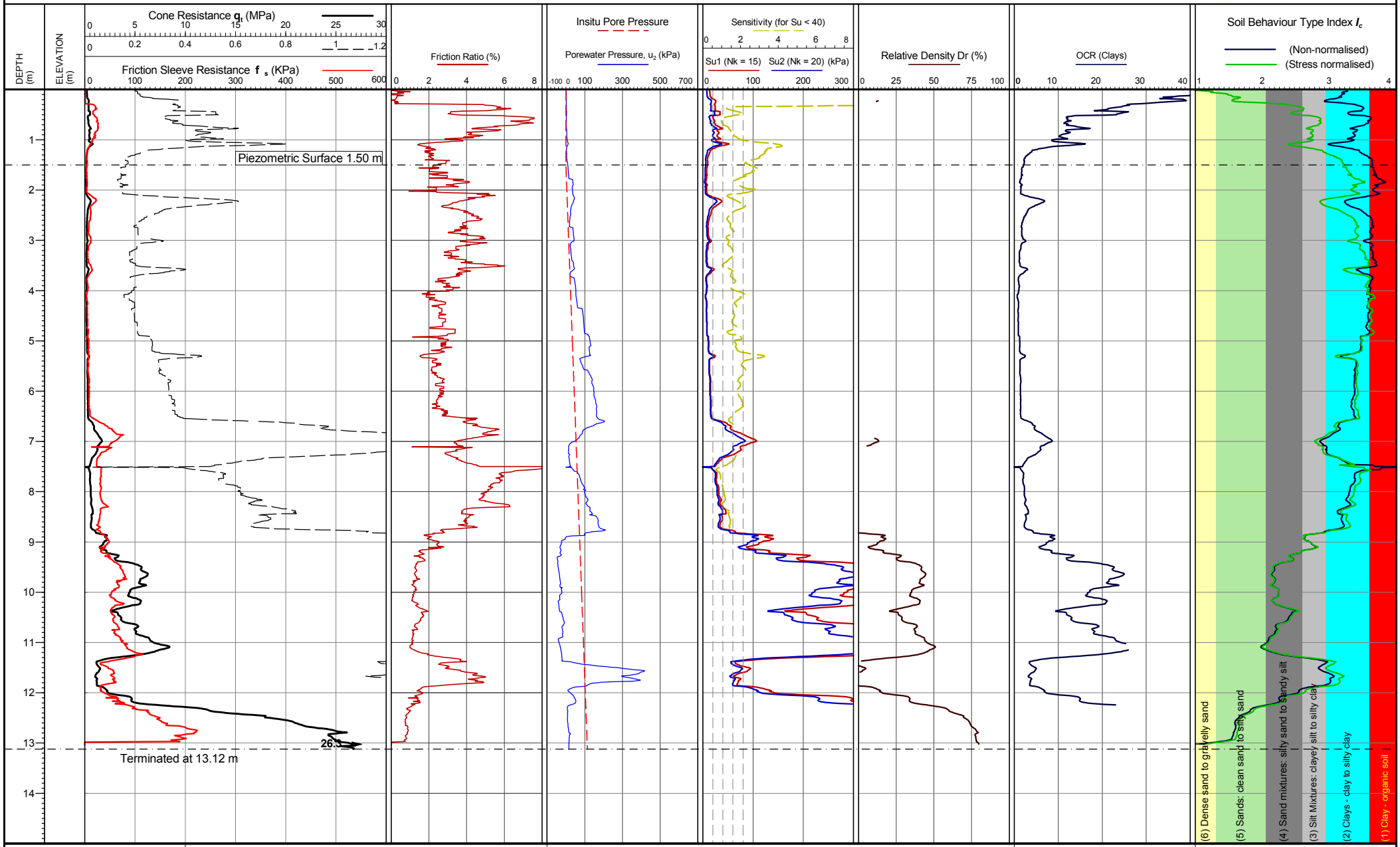
Checked by:
Emma Stickland

TEST ID: CPT08

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 17/09/2013 10:45:57

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

Dissipation Test

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13
Lankelma Project Ref: P105742

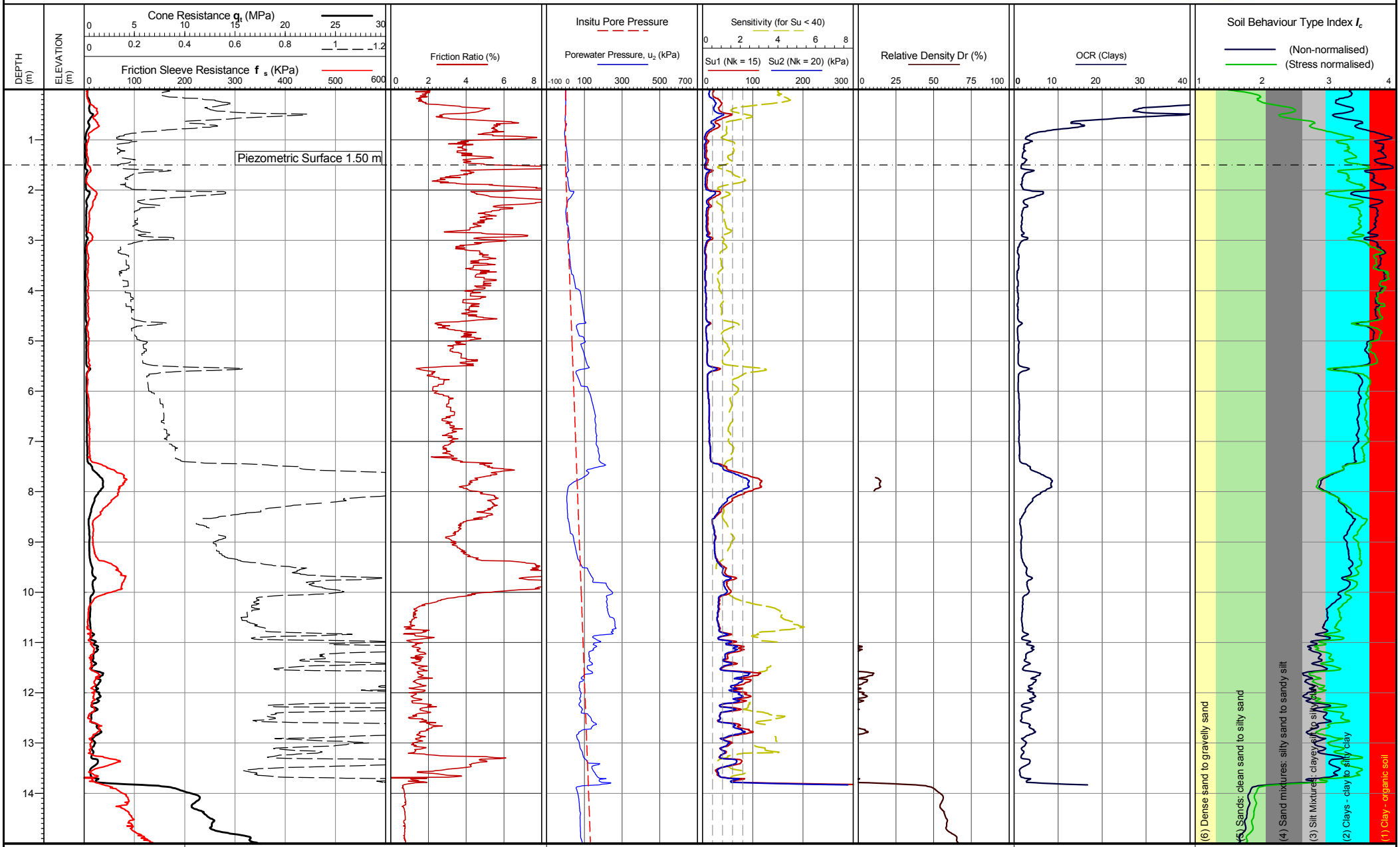
Checked by:
Emma Stickland

TEST ID: CPT09

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 17/09/2013 12:50:07

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

Dissipation Test

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13
Lankelma Project Ref: P105742

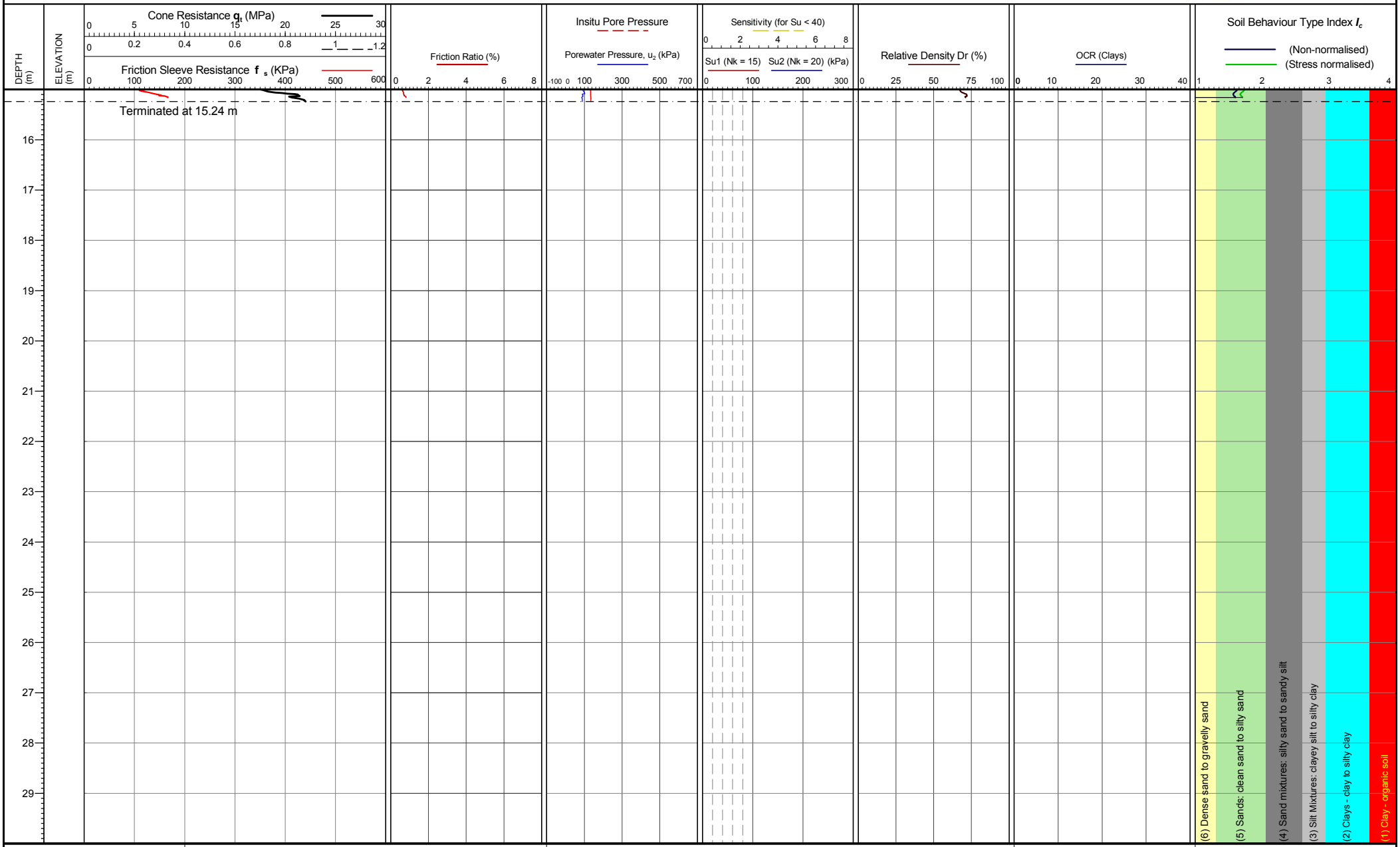
Checked by:
Emma Stickland

TEST ID: CPT10

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 17/09/2013 12:50:07

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13
Lankelma Project Ref: P105742

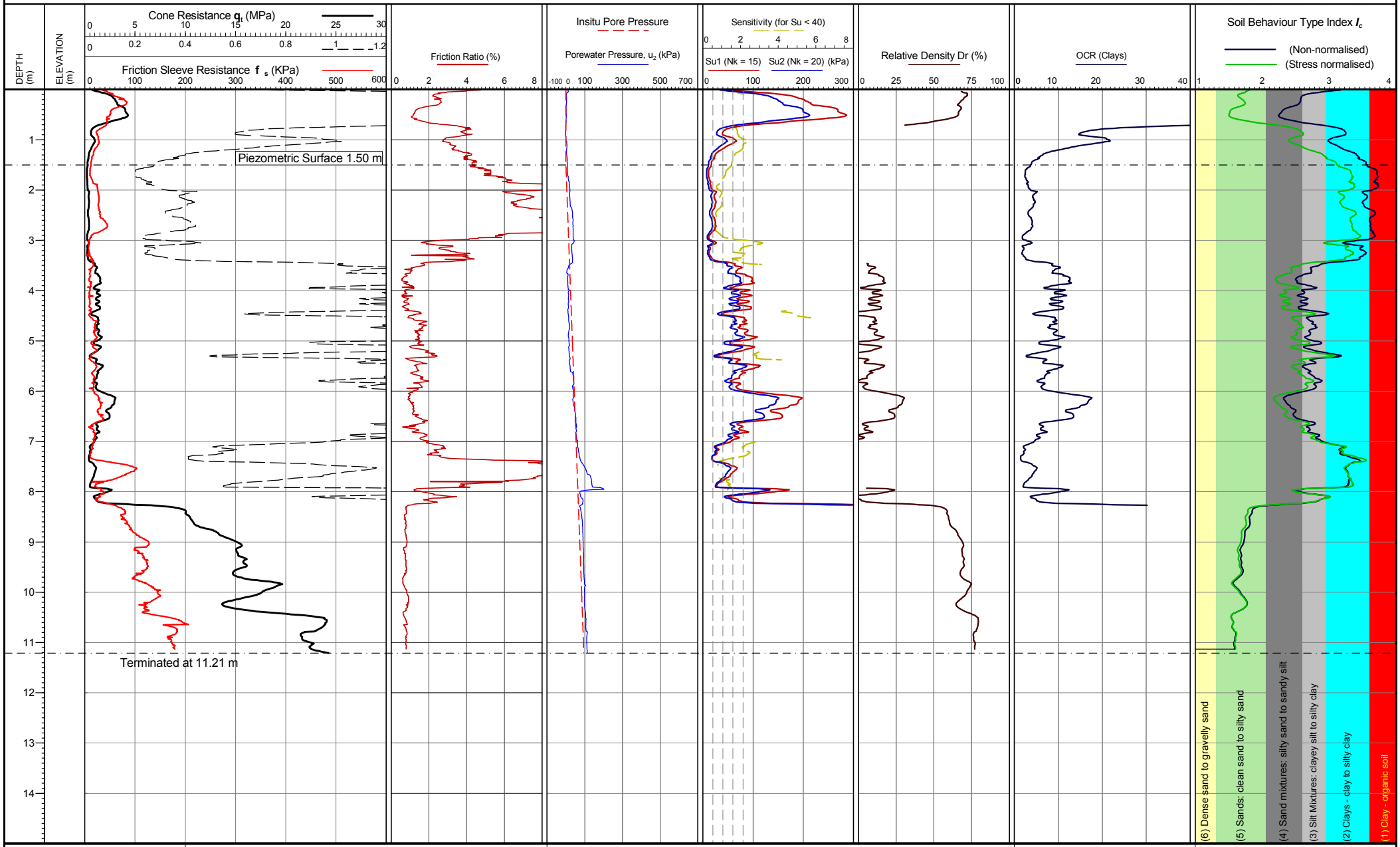
Checked by:
Emma Stickland

TEST ID: CPT10

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 19/09/2013 13:46:35

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13

Lankelma Project Ref: P105742

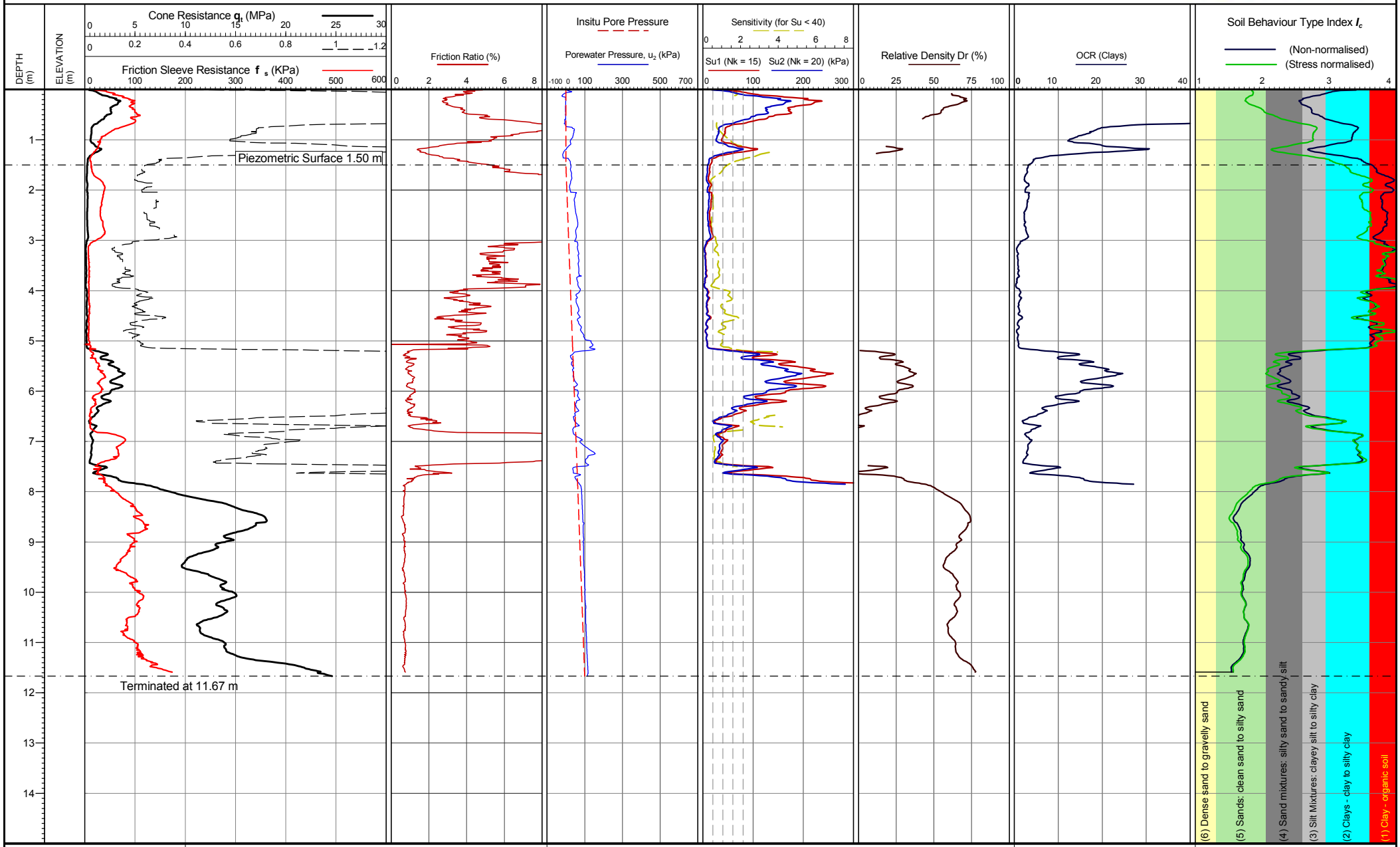
Checked by: Emma Stickland

TEST ID: CPT11

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 19/09/2013 14:52:53

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

Dissipation Test

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13
Lankelma Project Ref: P105742

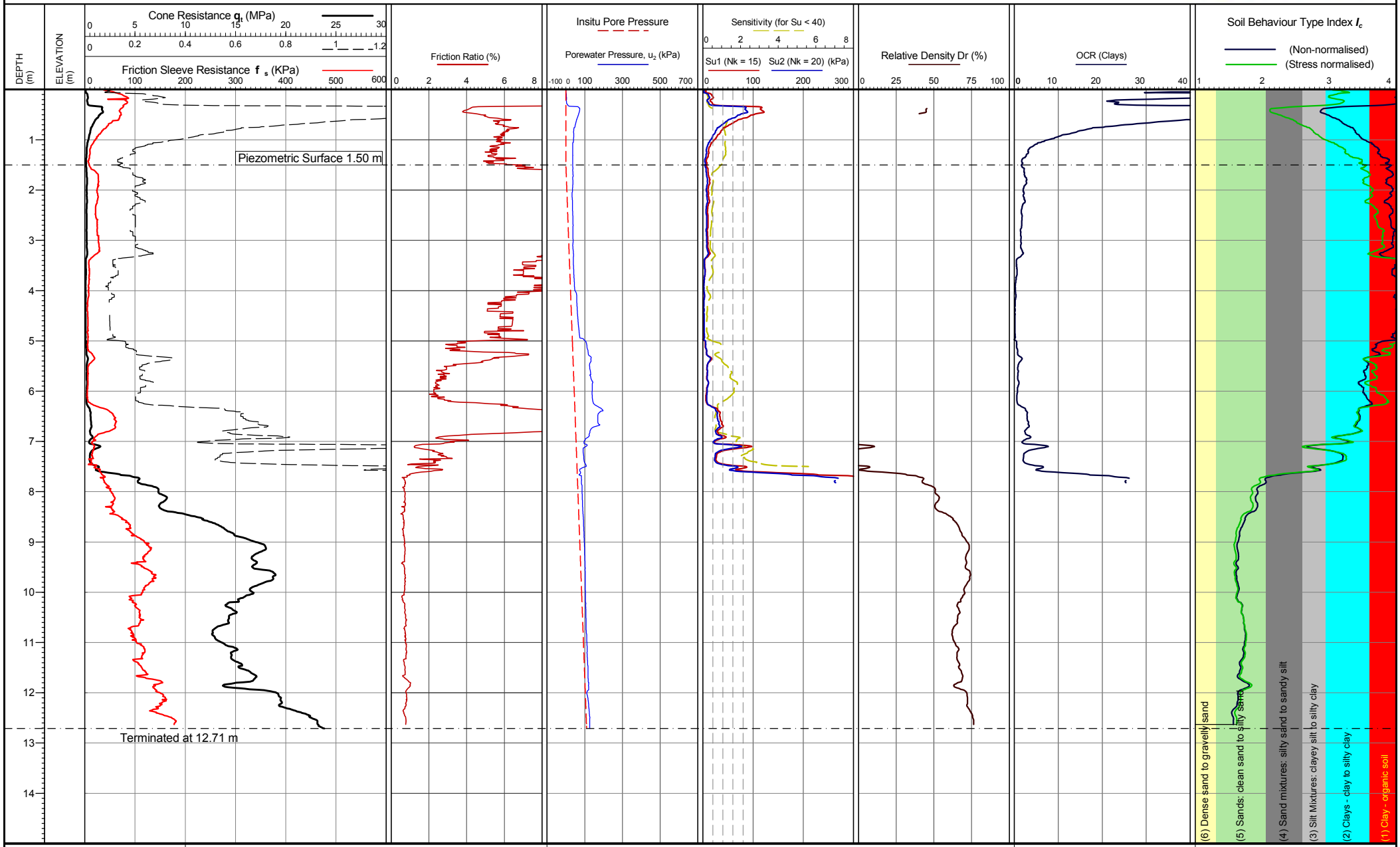
Checked by:
Emma Stickland

TEST ID: CPT12

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 19/09/2013 16:14:09

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13

Lankelma Project Ref: P105742

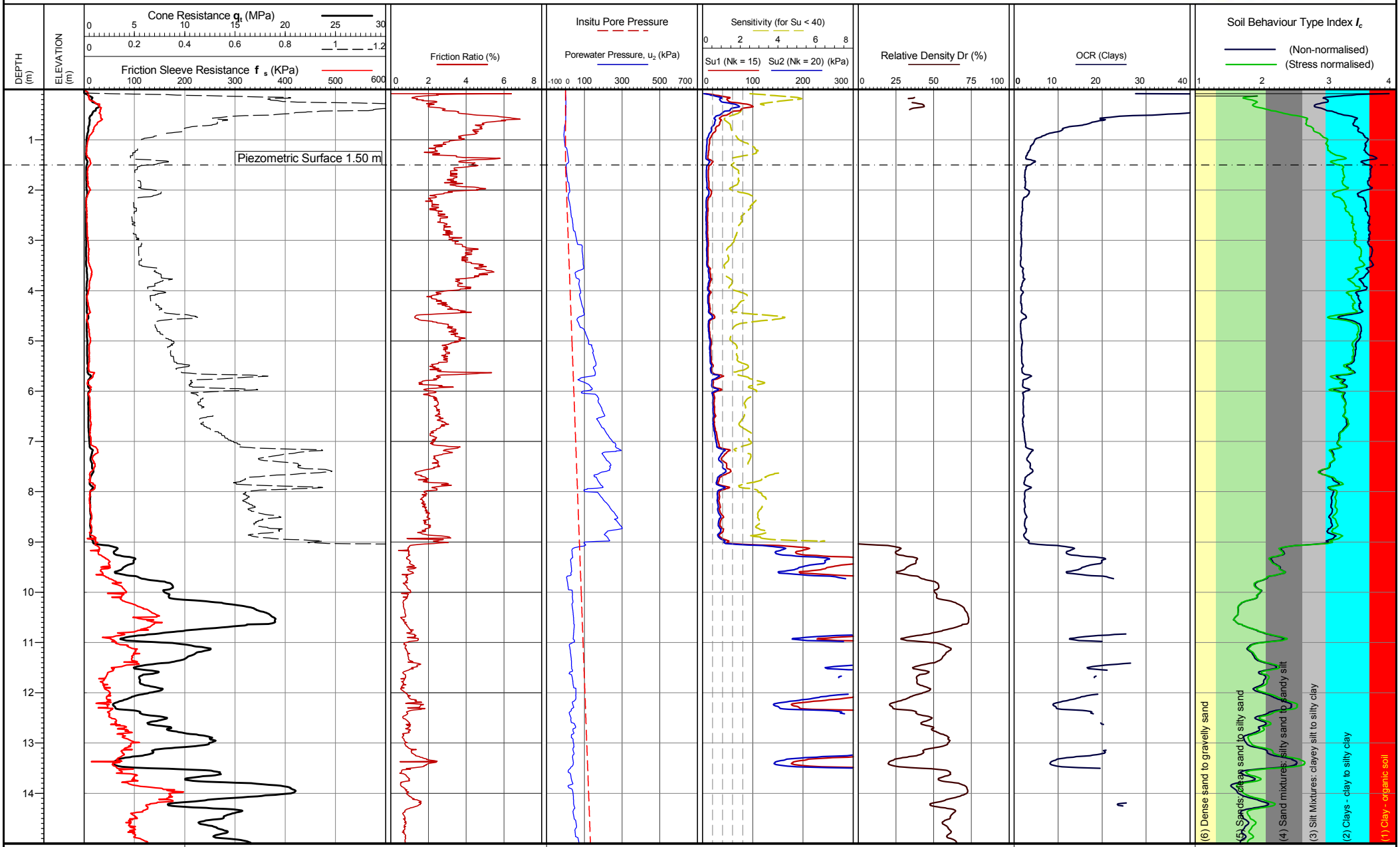
Checked by: Emma Stickland

TEST ID: CPT13

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 18/09/2013 13:35:37

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13

Lankelma Project Ref: P105742

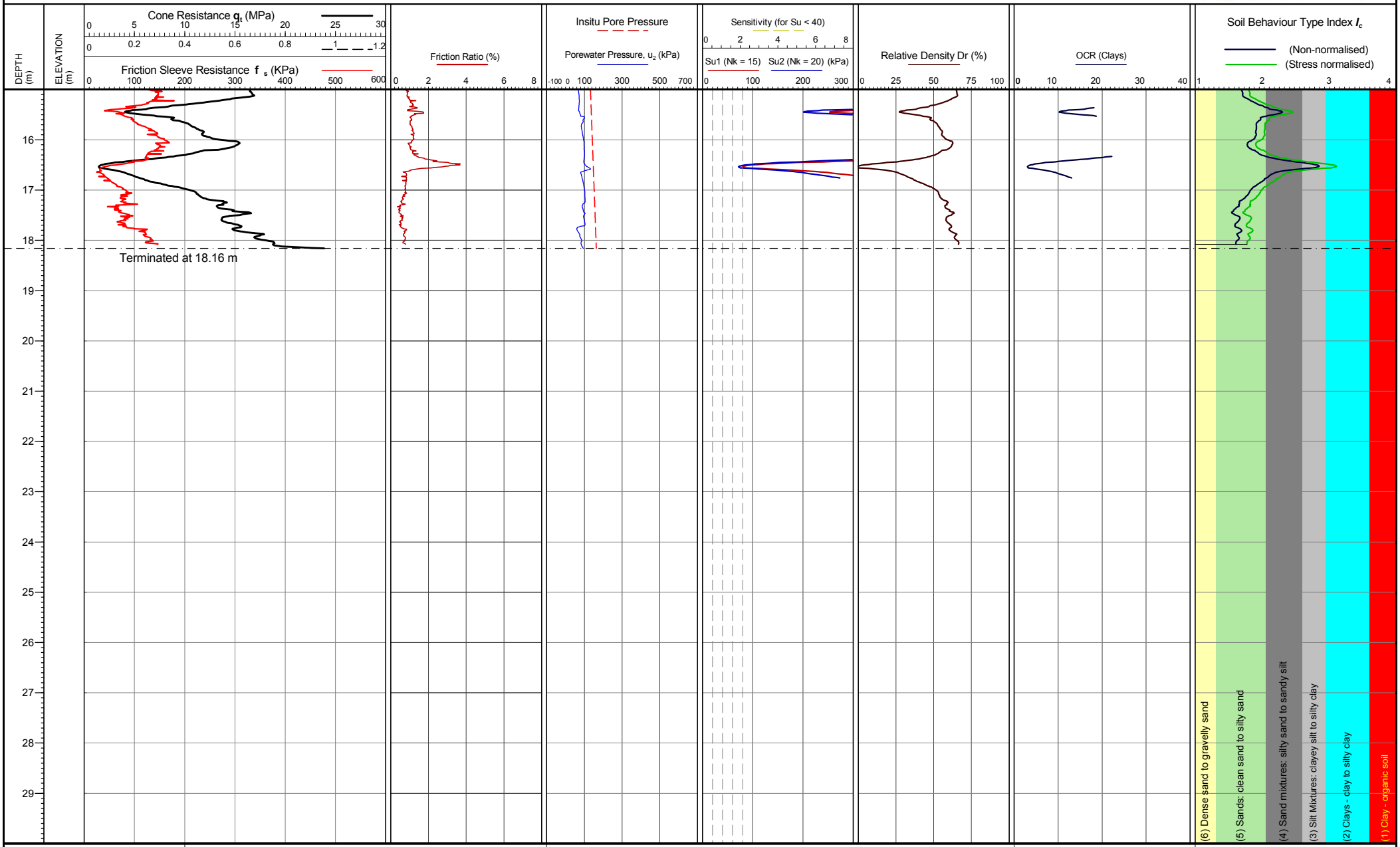
Checked by: Emma Stickland

TEST ID: CPT14

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 18/09/2013 13:35:37

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13

Lankelma Project Ref: P105742

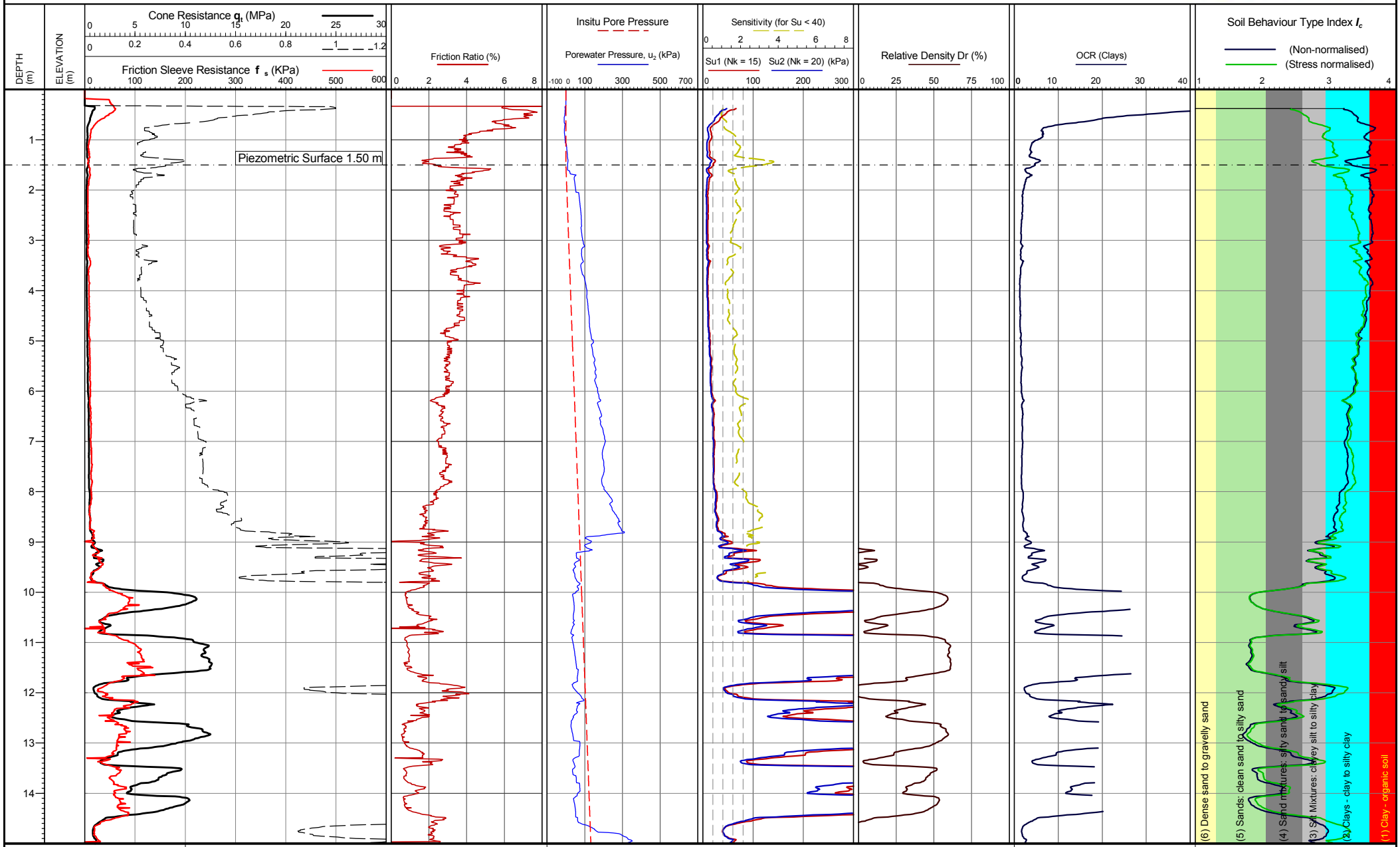
Checked by: Emma Stickland

TEST ID: CPT14

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 18/09/2013 10:25:25

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

Dissipation Test

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13
Lankelma Project Ref: P105742

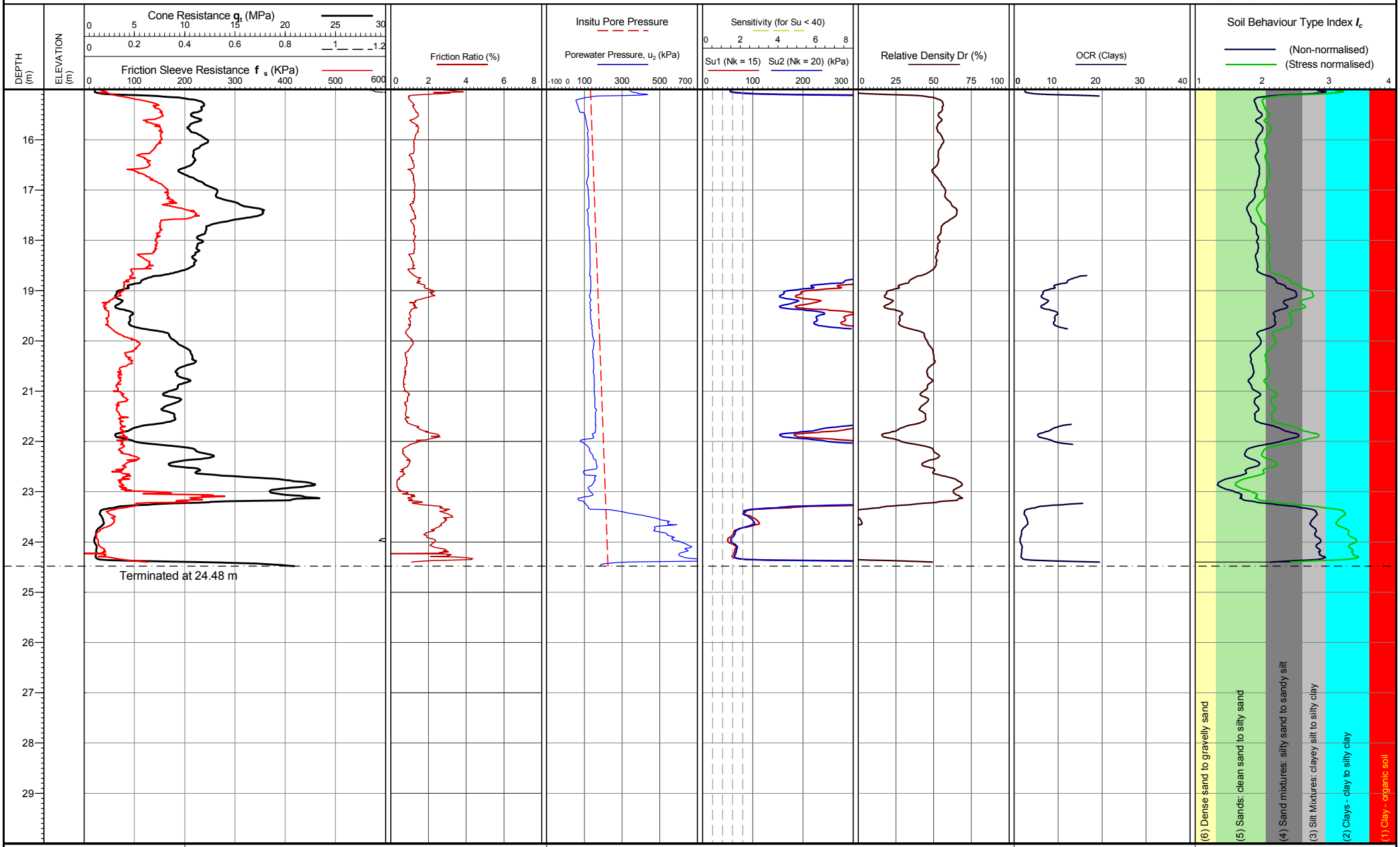
Checked by:
Emma Stickland

TEST ID: CPT15

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 18/09/2013 10:25:25

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13

Lankelma Project Ref: P105742

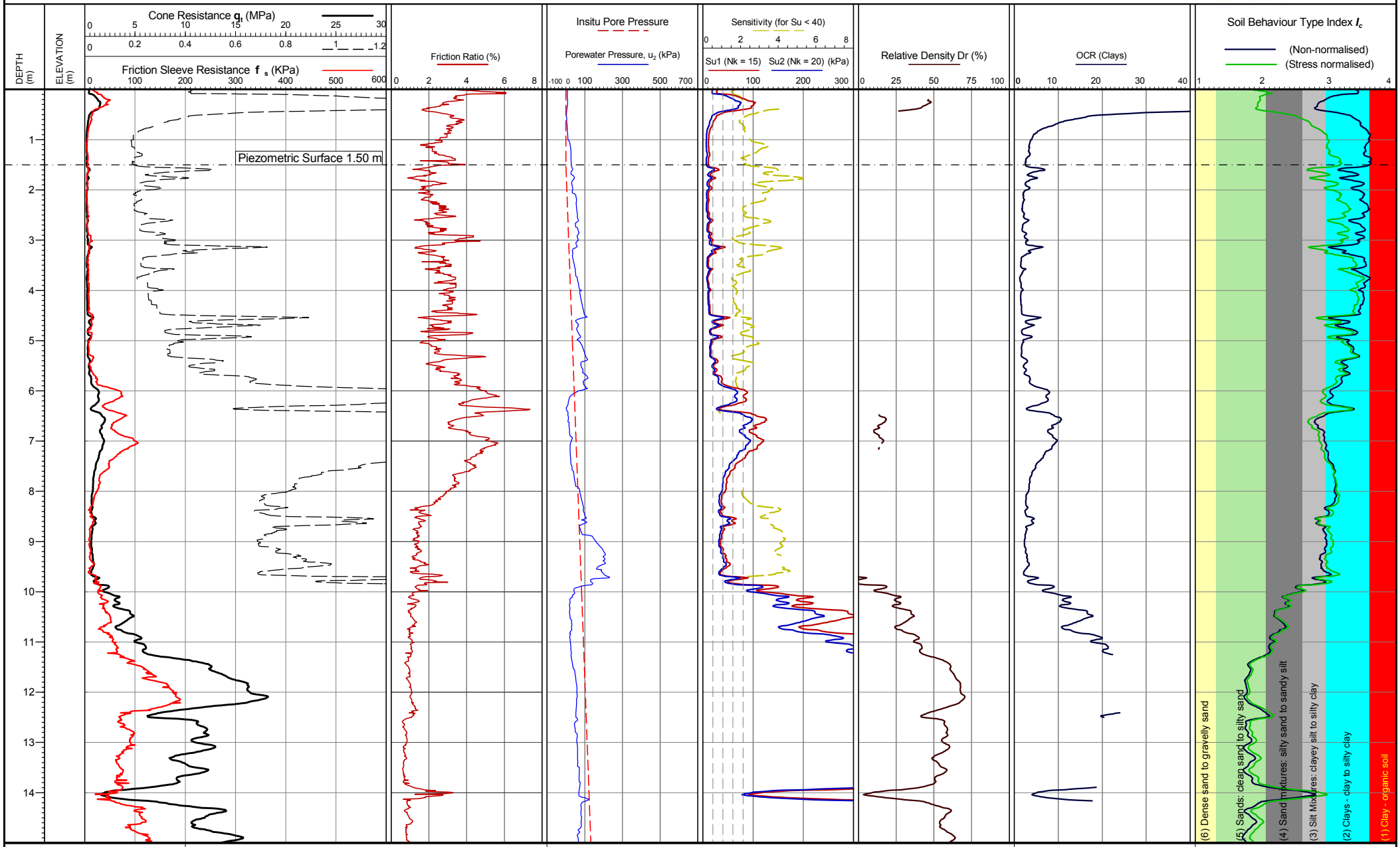
Checked by: Emma Stickland

TEST ID: CPT15

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 18/09/2013 09:07:05

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13

Lankelma Project Ref: P105742

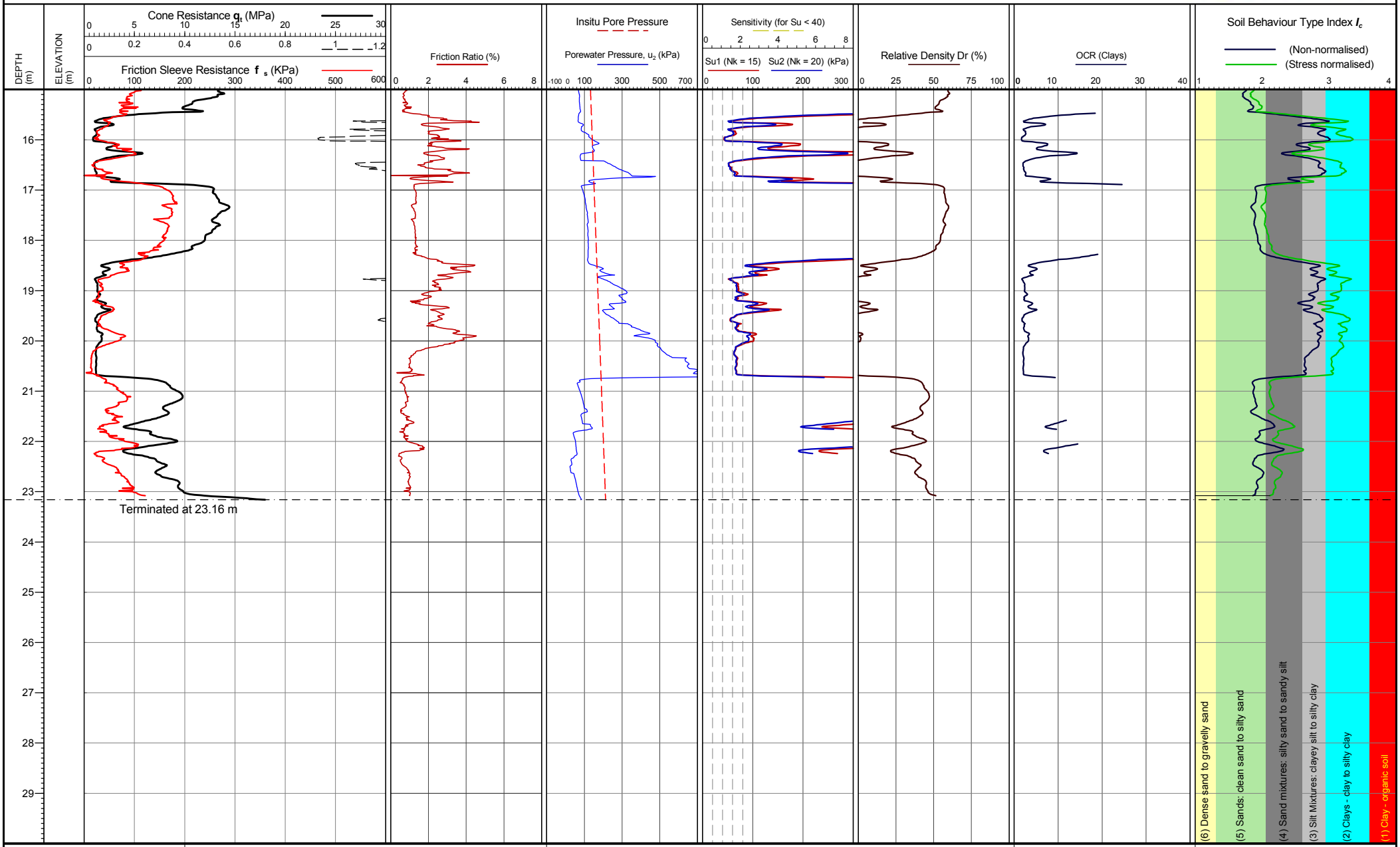
Checked by: Emma Stickland

TEST ID: CPT16

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 18/09/2013 09:07:05

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13
Lankelma Project Ref: P105742

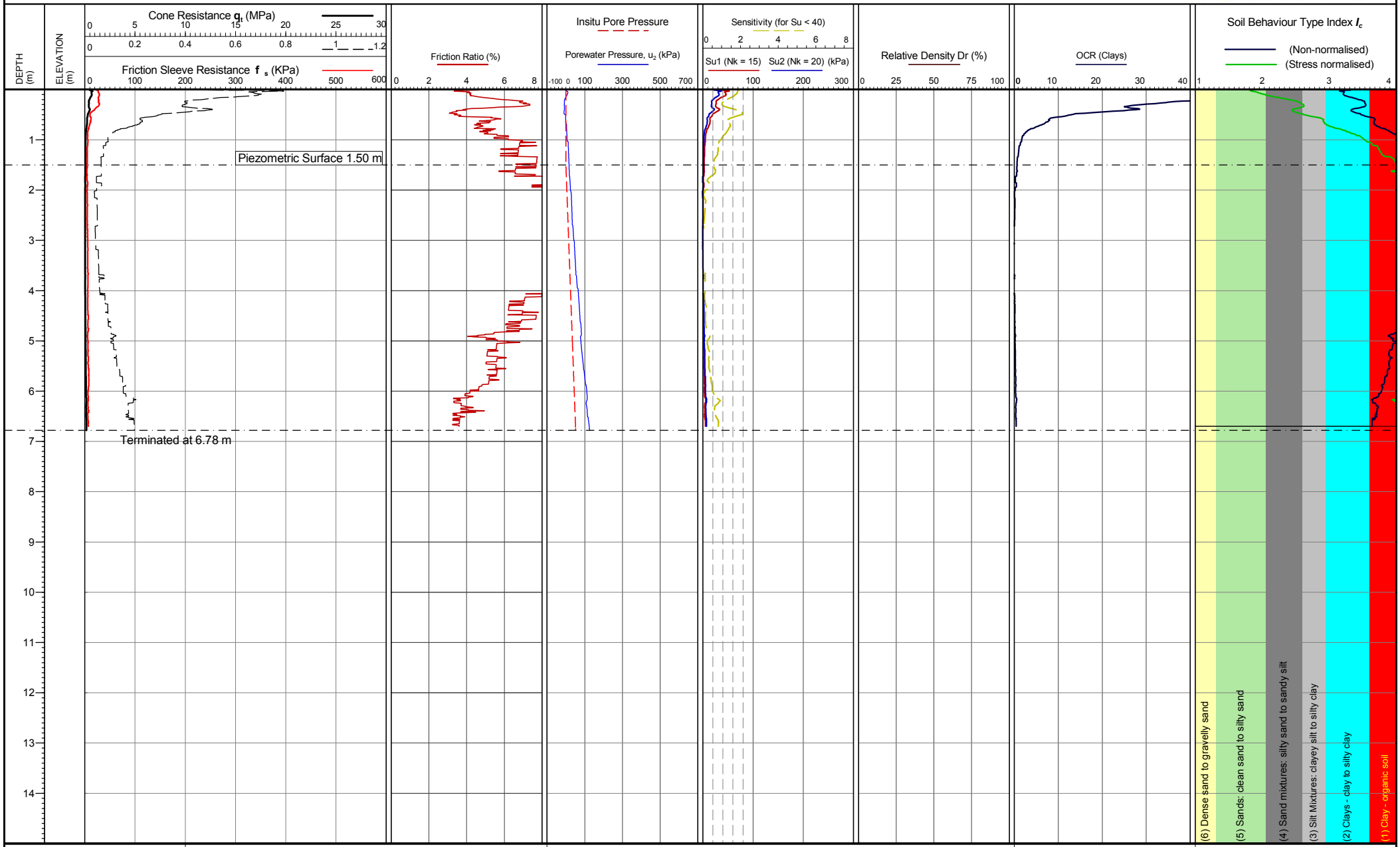
Checked by:
Emma Stickland

TEST ID: CPT16

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 18/09/2013 14:59:41

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13

Lankelma Project Ref: P105742

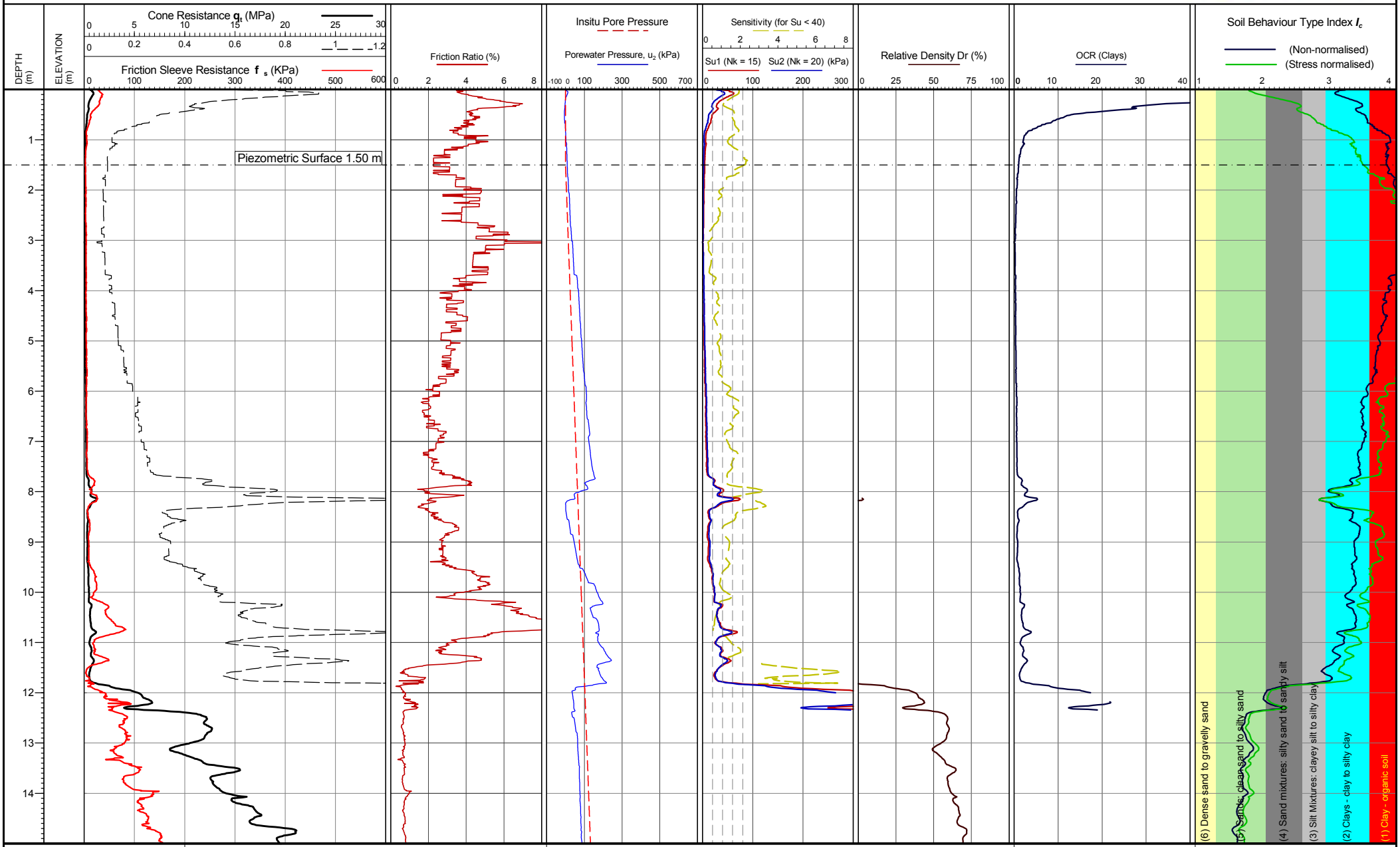
Checked by: Emma Stickland

TEST ID: CPT17

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 18/09/2013 16:01:33

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13

Lankelma Project Ref: P105742

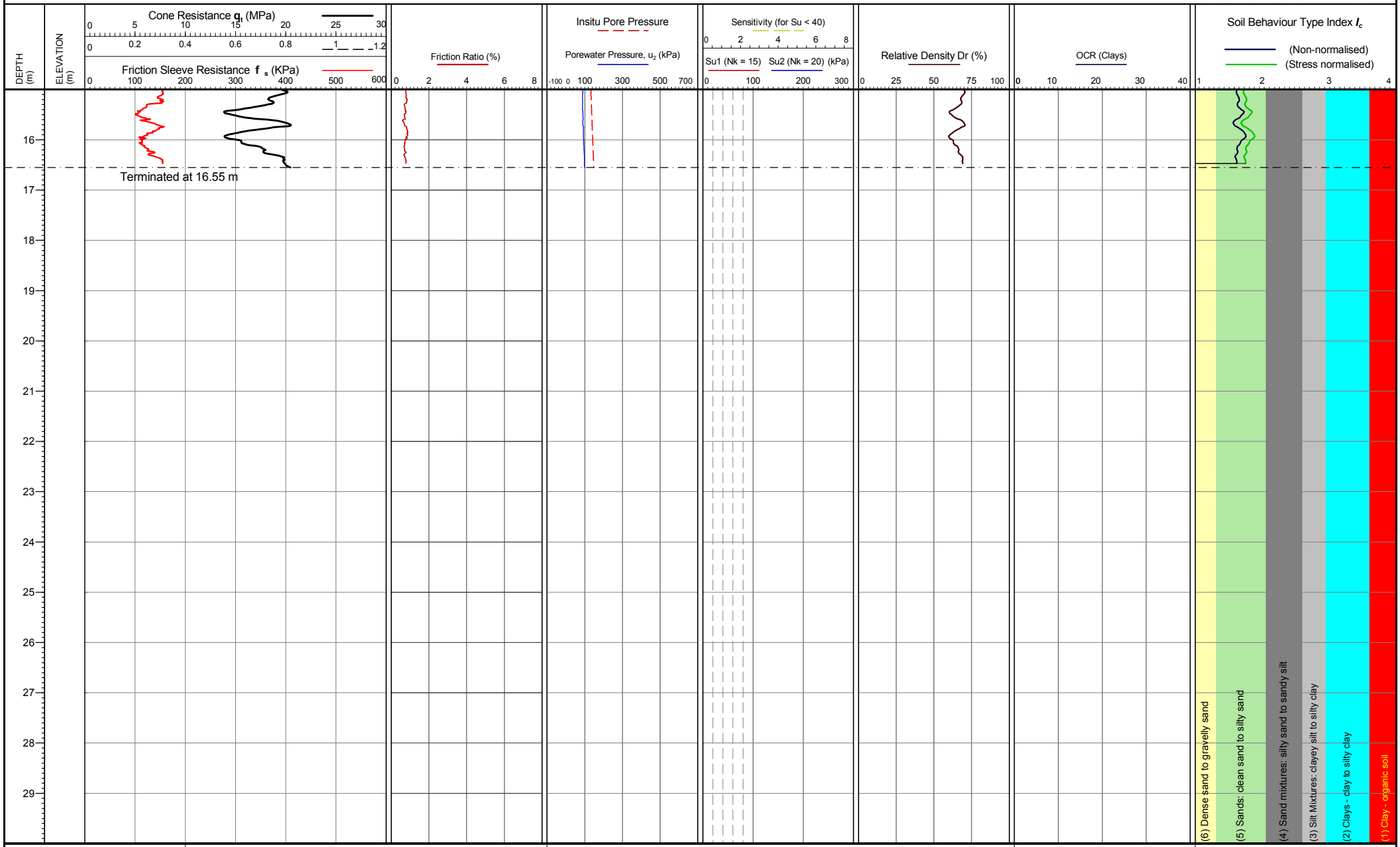
Checked by: Emma Stickland

TEST ID: CPT17a

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 18/09/2013 16:01:33

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13

Lankelma Project Ref: P105742

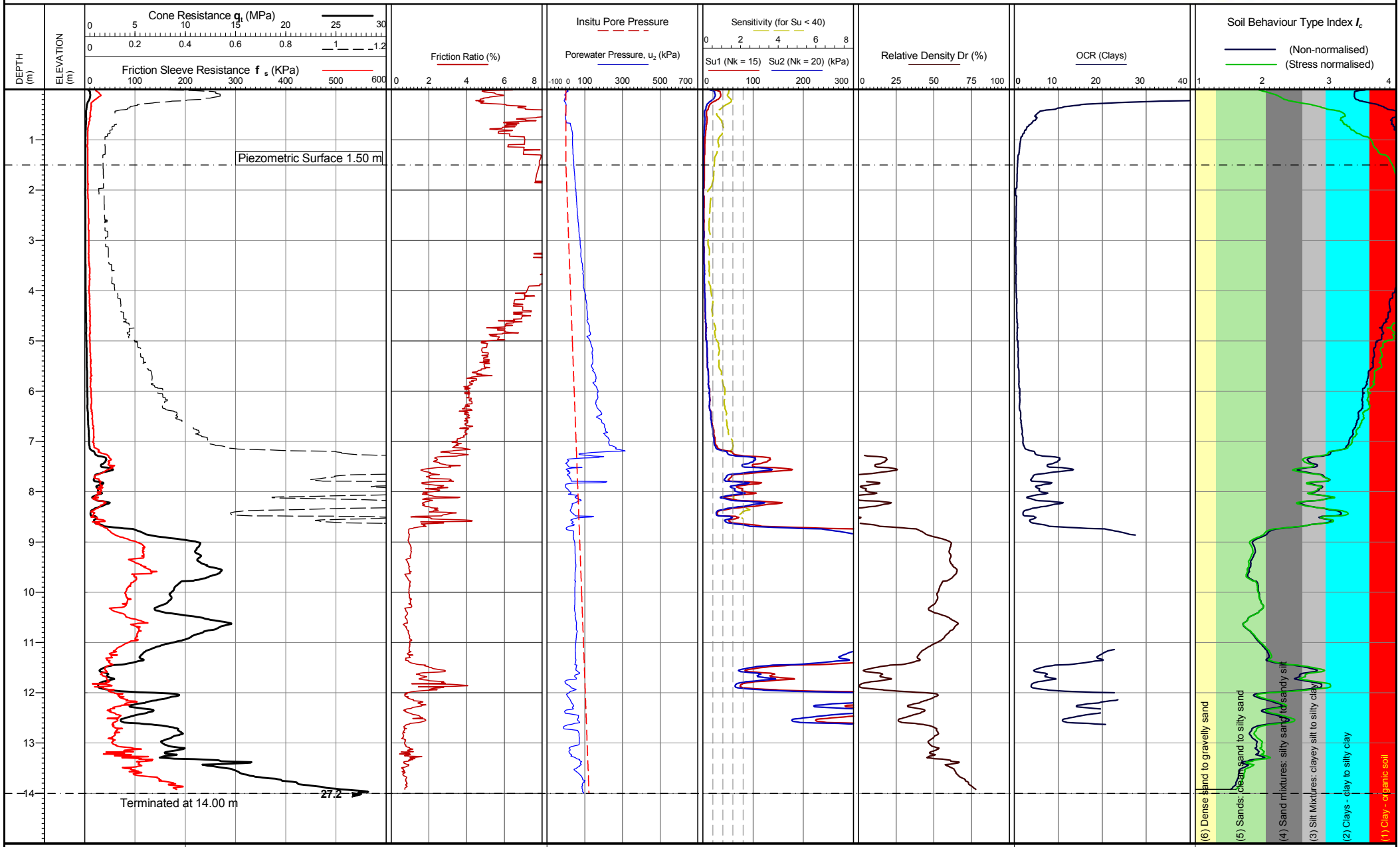
Checked by: Emma Stickland

TEST ID: CPT17a

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 19/09/2013 09:28:39

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13

Lankelma Project Ref: P105742

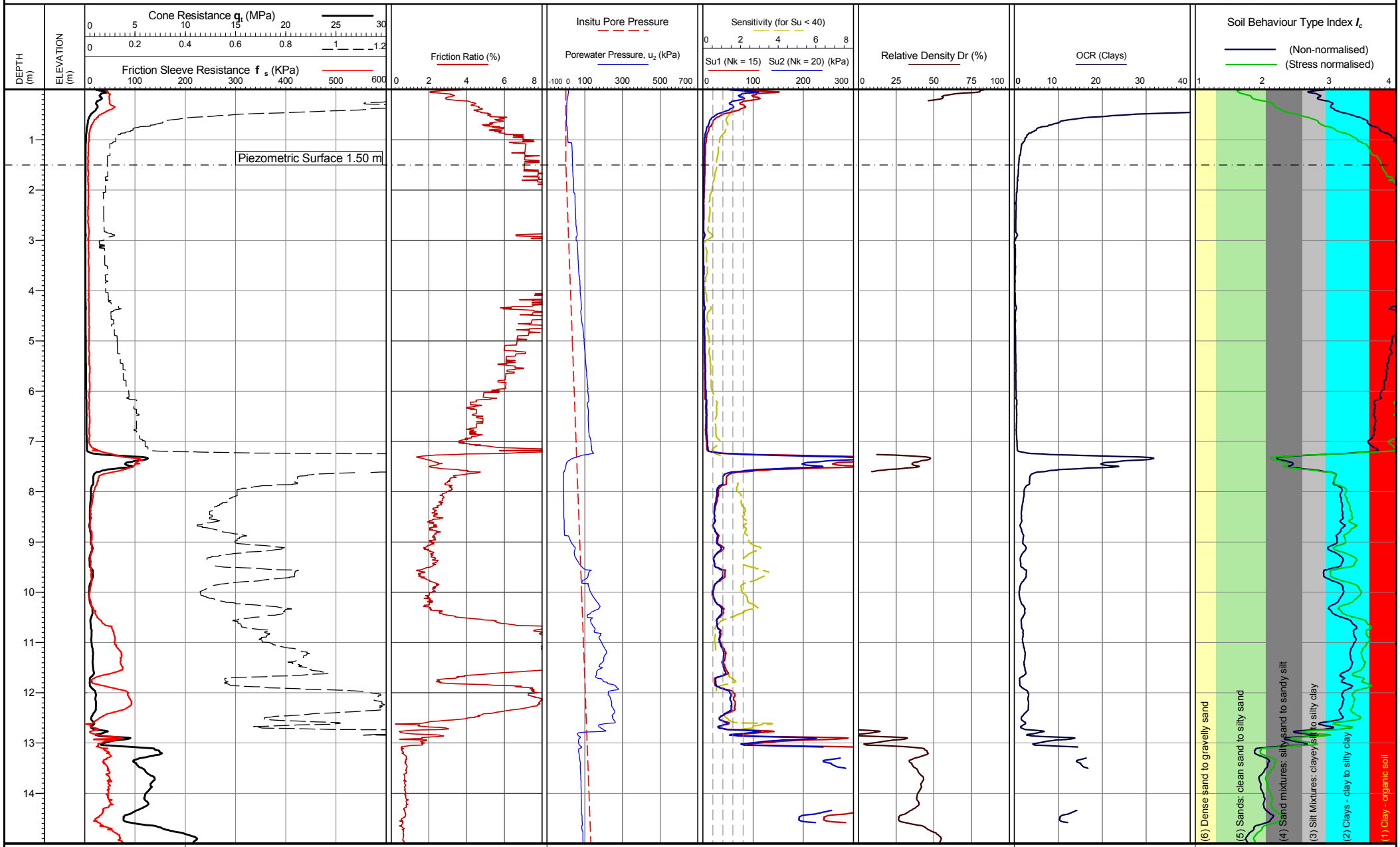
Checked by: Emma Stickland

TEST ID: CPT18

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 19/09/2013 10:59:39

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13
Lankelma Project Ref: P105742

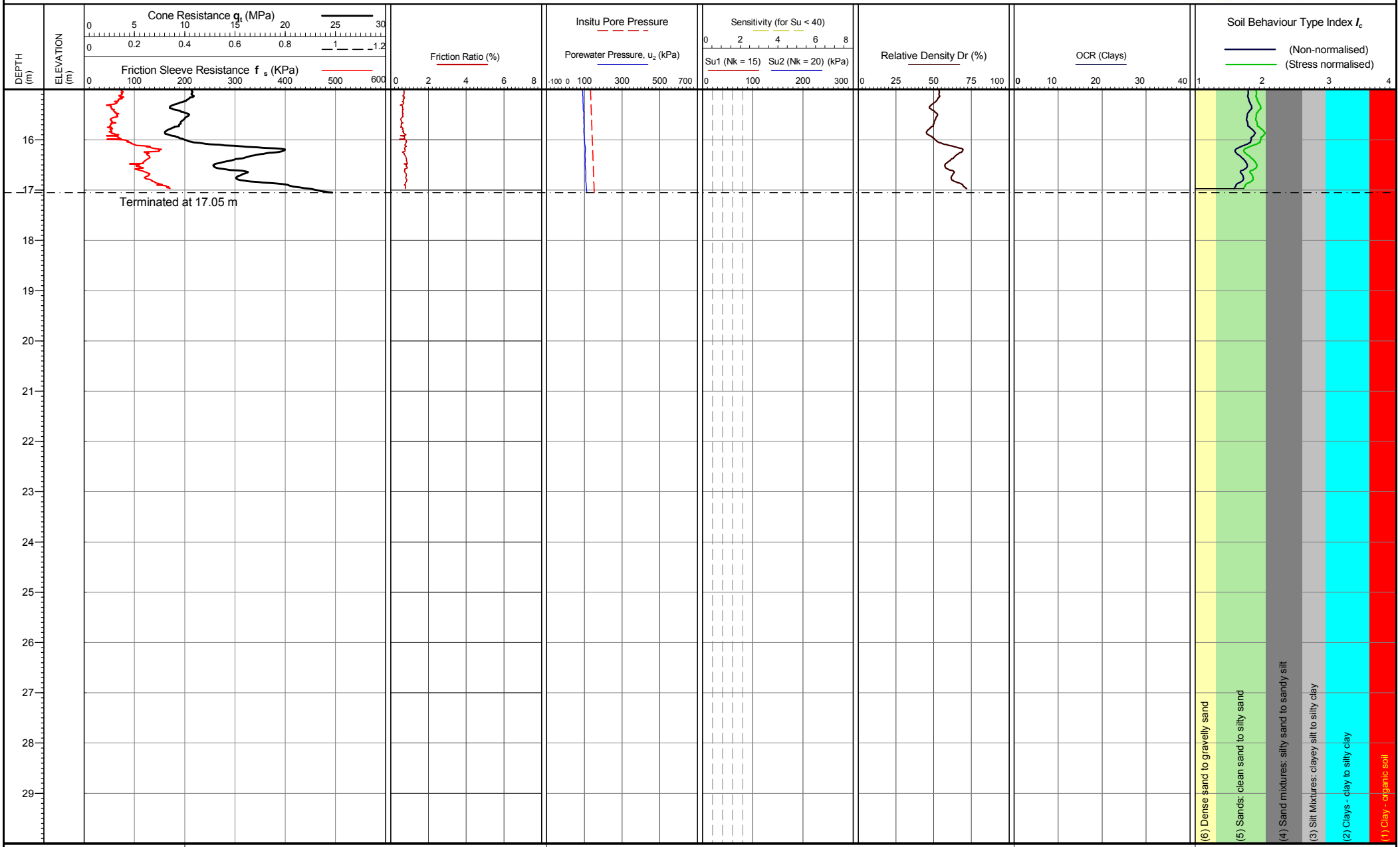
Checked by:
Emma Stickland

TEST ID: CPT19

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 19/09/2013 10:59:39

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Dissipation Test

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13
Lankelma Project Ref: P105742

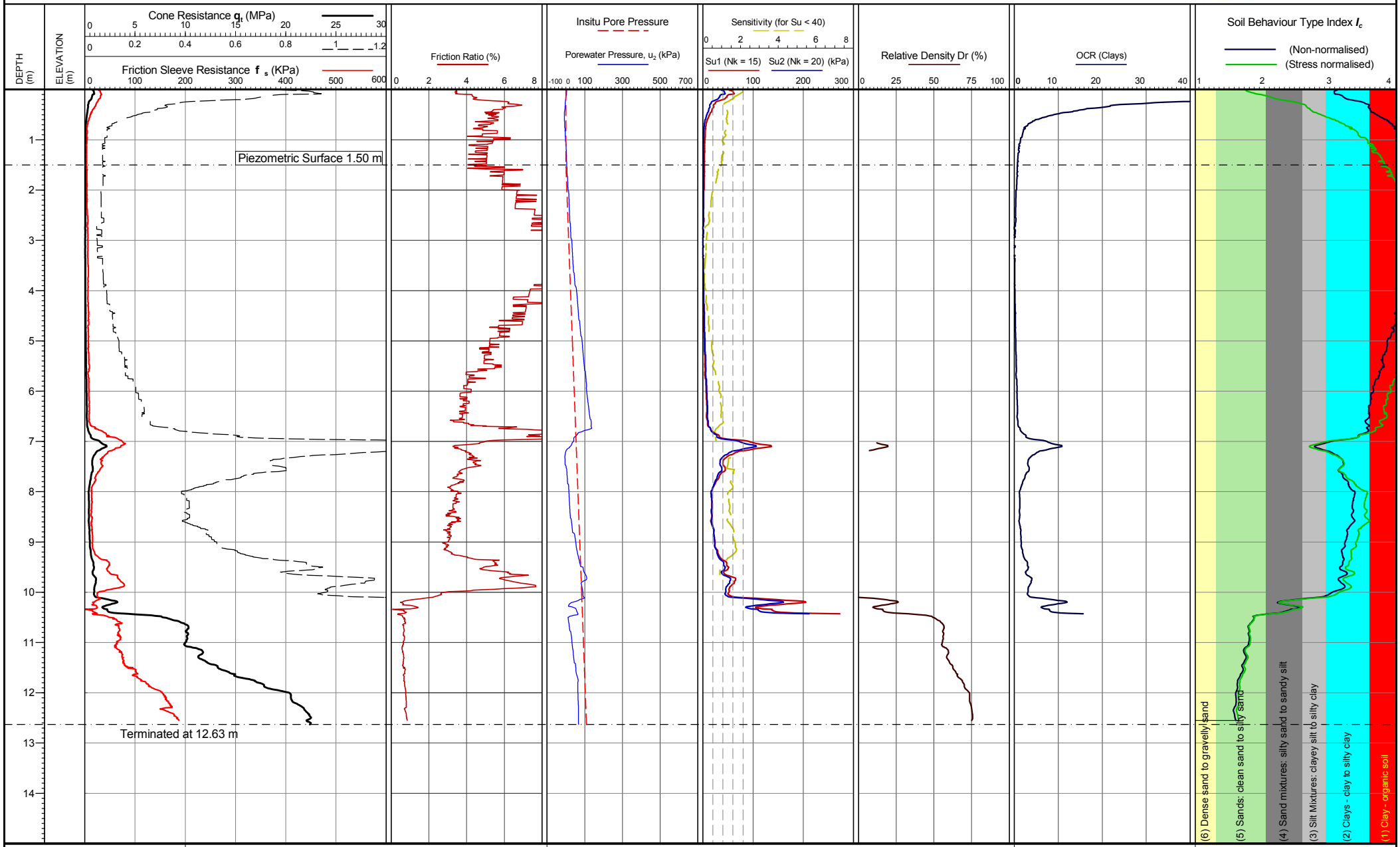
Checked by:
Emma Stickland

TEST ID: CPT19

Client: VAN ELLE

Project: FRODSHAM WINDFARM

LANKELMA



Cone area (mm2):1500
ConeID: S15-CFIP.901
Operator: Walter Geddes
Date of test: 18/09/2013 17:21:00

Location: Cheshire
Coordinates: ,
Elevation:
Coordinate system:

Remarks:

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.05-2.95. See report section 'Drained and Undrained Behaviour' for discussion.

Dissipation Test

See report section 'Interperative Data' for methods and discussion of parameter evaluation.

Date of plot: 20-09-13
Lankelma Project Ref: P105742

Checked by: Emma Stickland

TEST ID: CPT20

Appendix 1: (v) Site Location Plans

Reproduced from Ordnance Survey digital map data (c) Crown copyright 2006. All rights reserved.
Licence number 0100031673

Drawing Title

FRODSHAM WINDFARM

SITE LOCATION PLAN

FIGURE 1

Scale at A3 : NTS

Drw DY	App	Rev
Chk GT	Date	Date

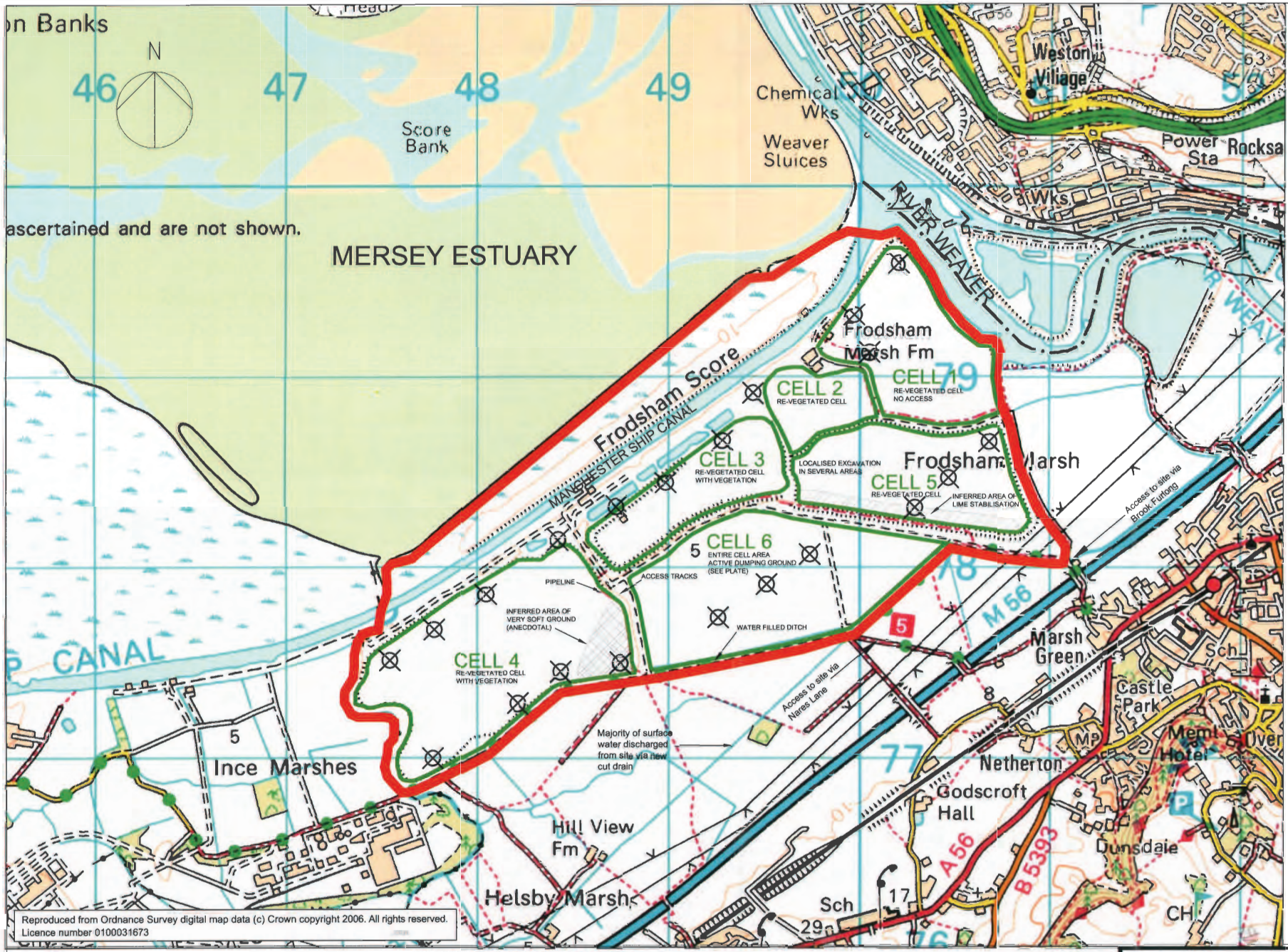
Scott Wilson

www.scottwilson.com

Plot Date :

AutoCAD File Name :

DB3



NOTES

KEY

- SITE BOUNDARY
- CELL
- 5 CELL NUMBERS (AND DEPOSIT DUMP)
- PROPOSED TURBINE LOCATION (APPROXIMATE)
- LIME STABILSATION AREA
- VERY SOFT GROUND
- PIPELINE

Drawing Title

FRODSHAM WINDFARM

SITE FEATURES PLAN

FIGURE 2

Scale at A3 : 1:20000		
Drw DY	App	Rev
Chk GT	Date	Date

Scott Wilson

www.scottwilson.com

Plot Date :

AutoCAD File Name :

DB3

DO NOT SCALE FROM THIS DRAWING | A1

NOTES

1. FOR SITE ACCESS ROUTES, REFER TO DRAWING D117743/002 - 004

2. CABLE ROUTES CURRENTLY ARE INDICATED BEYOND MAIN SITE AREA. ON-SITE CABLES CURRENTLY ANTICIPATED TO FOLLOW SITE ROADS AND NOT SHOWN FOR CLARITY.

3. TURNING HEADS AND ROAD BELLMOUTHS NOT SHOWN.

4. REPRODUCED FROM ORDNANCE SURVEY DIGITAL MAP DATA (C) CROWN COPYRIGHT 2009. ALL RIGHTS RESERVED. LICENCE NUMBER 1000183033

KEY

- NEW ACCESS TRACK
- EXISTING ACCESS TRACK TO BE UPGRADED
- TURBINE LOCATION AND OVERSAIL (45M BLADES)
- CRANE PAD
- INDICATIVE SUBSTATION LOCATION
- PROPOSED EXPORT CABLE ROUTE
- POSSIBLE CABLE ROUTE
- INDICATIVE SITE COMPOUND
- PROPOSED DEVELOPMENT (WITH PLANNING CONSENT)
- SITE BOUNDARY
- RESTRICTED BYWAYS
- EXISTING FOOPATH

PROPOSED PRELIMINARY SITE INVESTIGATION (2013)

- CPT 1 CONE PENETRATION TEST (20 No TOTAL)
- SA1 SHELL AND AUGER (OR EQUIVALENT) (5 No TOTAL)
- WS1 WINDOWLESS SAMPLING HOLE/DYNAMIC PROBE (20 No TOTAL)

SITE LAYOUT PRODUCED BY SCOTT WILSON. DRAWING No. D117743/ES/001 REV G DATED 18/07/11

PROPOSED SITE INVESTIGATION LOCATIONS AND CO-ORDINATES

REF.	EASTINGS	NORTHINGS
CPT 1	347434.00	377279.00
CPT 2	347585.00	377504.00
CPT 3	347840.00	377647.00
CPT 4	348080.00	377804.00
CPT 5	348312.00	377964.00
CPT 6	347598.00	376950.00
CPT 7	347864.00	377110.00
CPT 8	348101.00	377288.00
CPT 9	348364.00	377490.00
CPT 10	348652.00	377645.00
CPT 11	348057.00	376779.00
CPT 12	348525.00	377158.00
CPT 13	348868.00	377157.00
CPT 14	350203.00	379638.00
CPT 15	350478.00	379279.00
CPT 16	350243.00	379060.00
CPT 17	350425.00	378519.00
CPT 18	350702.00	378685.00
CPT 19	350387.36	378225.06
CPT 20	350832.00	378302.00
WS 1	347772.30	376874.62
WS 2	347608.10	377150.98
WS 3	347340.94	377288.80
WS 4	347503.44	377610.71
WS 5	347896.80	377850.29
WS 6	348323.55	378087.45
WS 7	348121.03	377107.11
WS 8	348457.08	377349.42
WS 9	348829.36	377652.91
WS 10	348679.40	377974.38
WS 11	349028.25	378154.08
WS 12	349351.08	378308.02
WS 13	349806.05	378272.51
WS 14	350162.54	378210.03
WS 15	350449.25	378159.87
WS 16	350828.10	378554.65
WS 17	350425.82	378758.93
WS 18	350107.13	378794.95
WS 19	349764.46	378623.84
WS 20	350045.11	379069.24
SA 1	347845.20	377385.99
SA 2	348348.48	377732.07
SA 3	348741.66	377234.46
SA 4	350566.51	378346.03
SA 5	350215.54	379331.40
MET MAST	350203.00	379638.00

OS DATA PROVIDED BY CLIENT

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D
P0	Preliminary Issue	26/07/13	SJB		

CLIENT

Peel Wind Farms (Frodsham) Ltd

PROJECT

Preliminary Site Investigation at 2013
Frodsham Wind Farm

DRAWING TITLE

Indicative Site Investigation Locations

DRG No.	SCALE	DATE
ST13418-002	1:10,000	26/07/13
DRAWN BY: SJB	CHECKED BY	APPROVED BY

STOKE-ON-TRENT (HEAD OFFICE) TEL 0845 111 7777 | CARDIFF TEL 029 2072 9191
NEWCASTLE UPON TYNE TEL 0191 232 0943 | LEIGH TEL 01942 260101
WEST BROMWICH TEL 0121 580 0909 | SHEFFIELD TEL 0114 245 6244
LONDON TEL 020 7287 2872 | EDINBURGH TEL 0131 555 3311
LIVERPOOL TEL 0151 494 5431
wardell armstrong your earth our world

Preliminary

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Appendix 2: Geotechnical Testing Results

PSL
Professional Soils Laboratory

LABORATORY REPORT

UKAS TESTING
4043

Contract Number: PSL13/4038

Client's Reference: Report Date: 31 October 2013

Client Name: Van Elle
Kirkby Lane
Pinxton
Nottinghamshire

NG16 6JA

For the attention of: Andy Johnston

Contract Title: Frodsham

Date Received: 18/10/2013
Date Commenced: 18/10/2013
Date Completed: 31/10/2013

Notes: Observations and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

[redacted]

(Director) (Director) (Laboratory Manager)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Depth m	Description of Sample
SA1	B	4	0.50	Dark brown slightly gravelly very sandy very silty CLAY.
SA1	B	24	8.00	Dark brown slightly sandy very silty CLAY with occasional organic material.
SA1	B	42	16.50	Brown slightly gravelly slightly silty SAND.
SA1	D	50	21.70	Brown slightly gravelly very sandy silty CLAY.
SA1	U	59	26.20	Stiff brown slightly gravelly silty CLAY.
SA2	B	3	0.50	Brown slightly gravelly very sandy very silty CLAY with occasional organic material.
SA2	B	8	2.10	Dark brown slightly gravelly very sandy very silty organic CLAY.
SA2	U	17	8.50	Soft light brown mottled orange and grey silty CLAY.
SA2	D	18	9.00	Grey silty CLAY.
SA2	B	26	12.60	Grey sandy very silty CLAY.
SA2	B	35	17.00	Brown slightly gravelly slightly silty SAND.
SA2	B	38	17.90	Brown very gravelly slightly silty SAND.
WS2	D	5	2.10	Brown mottled grey sandy very silty CLAY.
WS2	D	7	3.40	Black PEAT.
WS2	D	10		Brown mottled grey slightly sandy very silty CLAY.
WS4	D	5		Brown slightly sandy very silty CLAY.
WS7	D	3	1.70	Brown slightly sandy very silty CLAY.
WS7	D	7	3.50	BLACK clayey PEAT.
WS8	D	5	2.20	Brown mottled grey sandy very silty CLAY.

PSL
Professional Soils Laboratory

[redacted]

FRODSHAM.

Contract No: PSL13/4038

Client Ref:

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Depth m	Description of Sample
WS9	D	4	1.50	Brown sandy very silty CLAYwith occasional organic material.
WS11	D	4	1.75	Brown very silty organic CLAY.
WS12	D	7	3.80	Dark grey very silty organic CLAY.
WS14	D	6	1.50	Brown sandy very silty CLAY with occasional organic material..
WS15	D	2	0.40	Brown sandy very silty CLAY with occasional organic material..
WS15	D	7	4.50	Grey slightly sandy very silty CLAY.
WS17	D	6	2.60	Brown very silty organic CLAY.
WS19	D	8	3.50	Brown sandy very silty CLAY with occasional organic material..
WS20	D	3	0.80	Brown sandy very silty organic CLAY.
WS20	D	6	3.10	Dark grey sandy very silty organic CLAY.

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FRODSHAM.

Contract No: PSL13/4038

Client Ref:

SUMMARY OF SOIL CLASSIFICATION TESTS

(B.S. 1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Depth m	Moisture Content % Clause 3.2	Bulk Density Mg/m^3 Clause 7.2	Dry Density Mg/m^3 Clause 7.2	Particle Density Mg/m^3 Clause 8.	Liquid Limit % Clause 4.3/4.4	Plastic Limit % Clause 5.	Plasticity Index % Clause 5.4	% Passing .425mm	Remarks
SA1	B	4	0.50	107				139	55	84	83	Extremely high plasticity CE.
SA1	U	17	8.00	44				68	30	38	100	High plasticity CH.
SA1	D	50	21.70	19				39	18	21	95	Intermediate plasticity CI.
SA2	B	3	0.50	55				64	32	32	93	High plasticity CH.
SA2	B	8	2.10	78				104	42	62	84	Extremely high plasticity CE.
SA2	D	18	9.00	40				72	30	42	100	Very high plasticity CV.
SA2	B	26	12.60	32				36	19	17	100	Intermediate plasticity CI.
WS2	D	5	2.10	45				48	26	22	100	Intermediate plasticity CI.
WS2	D	7	3.40	282				341	192	149	100	Extremely high plasticity ME.
WS2	D	10		38				50	23	27	100	High plasticity CH.
WS4	D	5		33				58	26	32	100	High plasticity CH.
WS7	D	3	1.70	36				55	28	27	100	High plasticity CH.
WS7	D	7	3.50	276				322	181	141	100	Extremely high plasticity ME.
WS8	D	5	2.20	32				45	24	21	100	Intermediate plasticity CI.
WS9	D	4	1.50	51				68	30	38	100	High plasticity CH.
WS11	D	4	1.75	83				106	41	65	100	Extremely high plasticity CE.
WS12	D	7	3.80	75				110	44	66	100	Extremely high plasticity CE.
WS14	D	6	1.50	54				70	31	39	100	Very high plasticity CV.
WS15	D	2	0.40	55				70	31	39	100	Very high plasticity CV.

SYMBOLS : NP : Non Plastic

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[redacted]

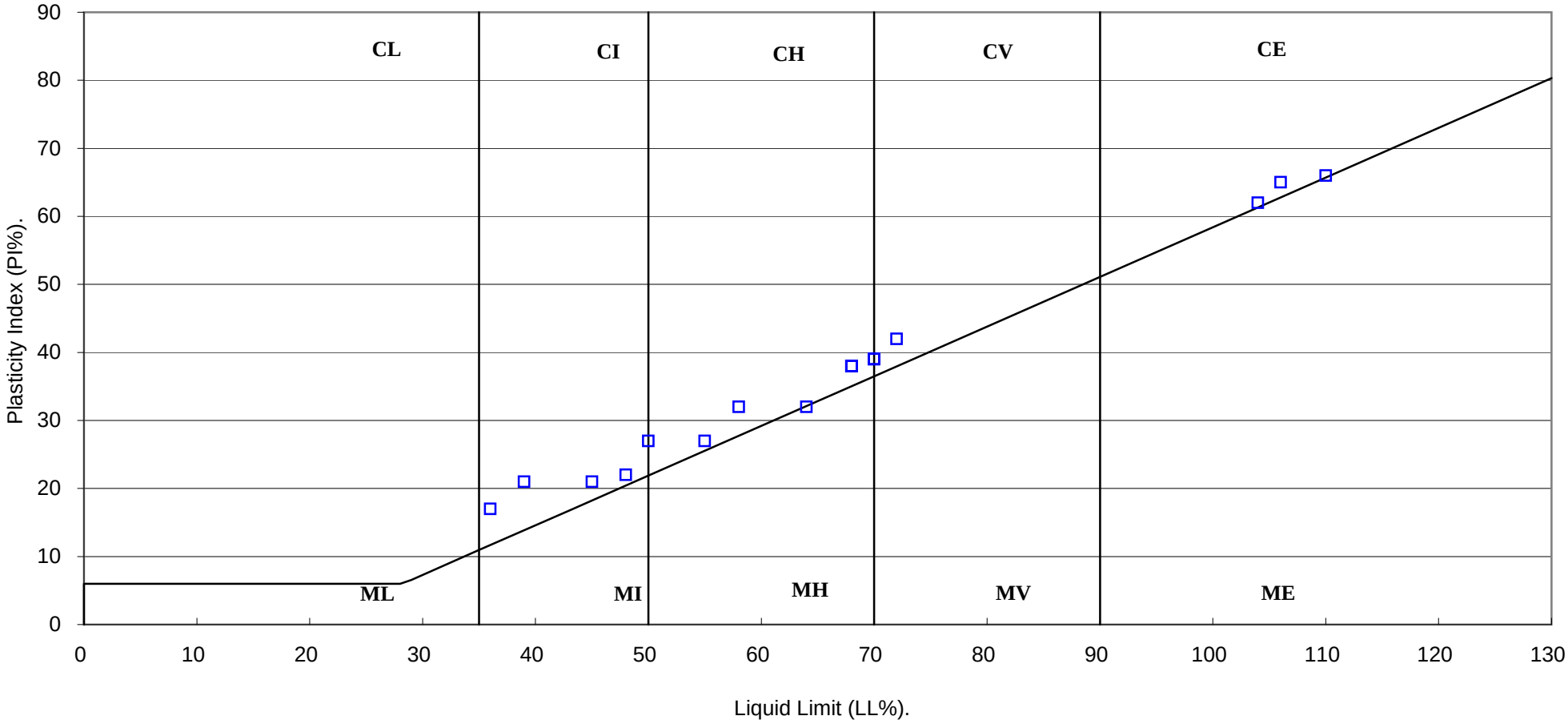
FRODSHAM.

Contract No: **PSL13/4038**

Client Ref:

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

(B.S.5930 : 1999)



[redacted]

Professional Soils Laboratory

FRODSHAM.

Contract No: PSL13/4038

Client Ref:

SUMMARY OF SOIL CLASSIFICATION TESTS

(B.S. 1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Depth m	Moisture Content % Clause 3.2	Bulk Density Mg/m^3 Clause 7.2	Dry Density Mg/m^3 Clause 7.2	Particle Density Mg/m^3 Clause 8.	Liquid Limit % Clause 4.3/4.4	Plastic Limit % Clause 5.	Plasticity Index % Clause 5.4	% Passing .425mm	Remarks
WS15	D	7	4.50	25				57	22	35	100	High plasticity CH.
WS17	D	6	2.60	83				110	42	68	100	Extremely high plasticity CE.
WS19	D	8	3.50	43				71	33	38	100	Very high plasticity CV.
WS20	D	3	0.80	62				95	40	55	100	Extremely high plasticity CE.
WS20	D	6	3.10	35				86	37	49	100	Very high plasticity CV.

SYMBOLS : NP : Non Plastic

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[redacted]

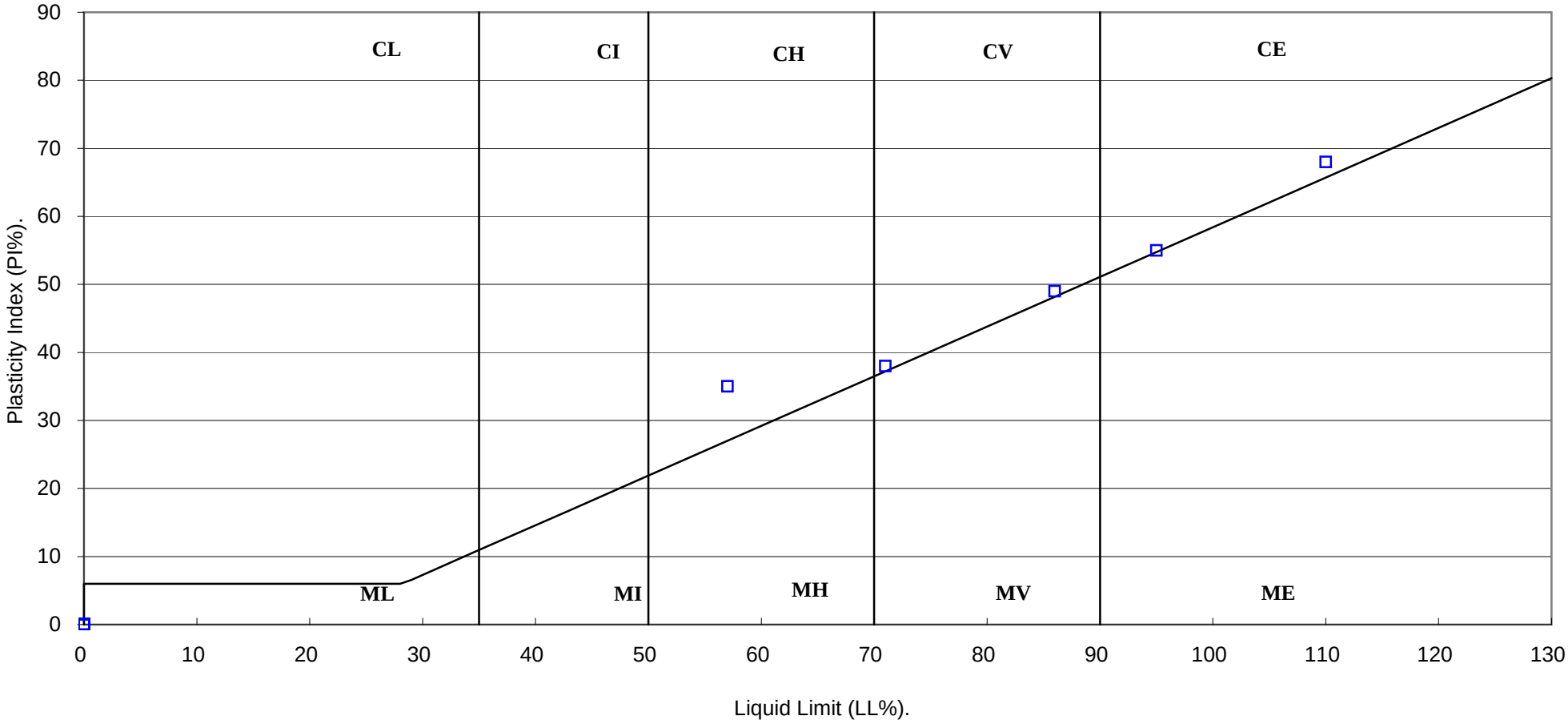
FRODSHAM.

Contract No: **PSL13/4038**

Client Ref:

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

(B.S.5930 : 1999)



[redacted]

Professional Soils Laboratory

FRODSHAM.

Client Ref:

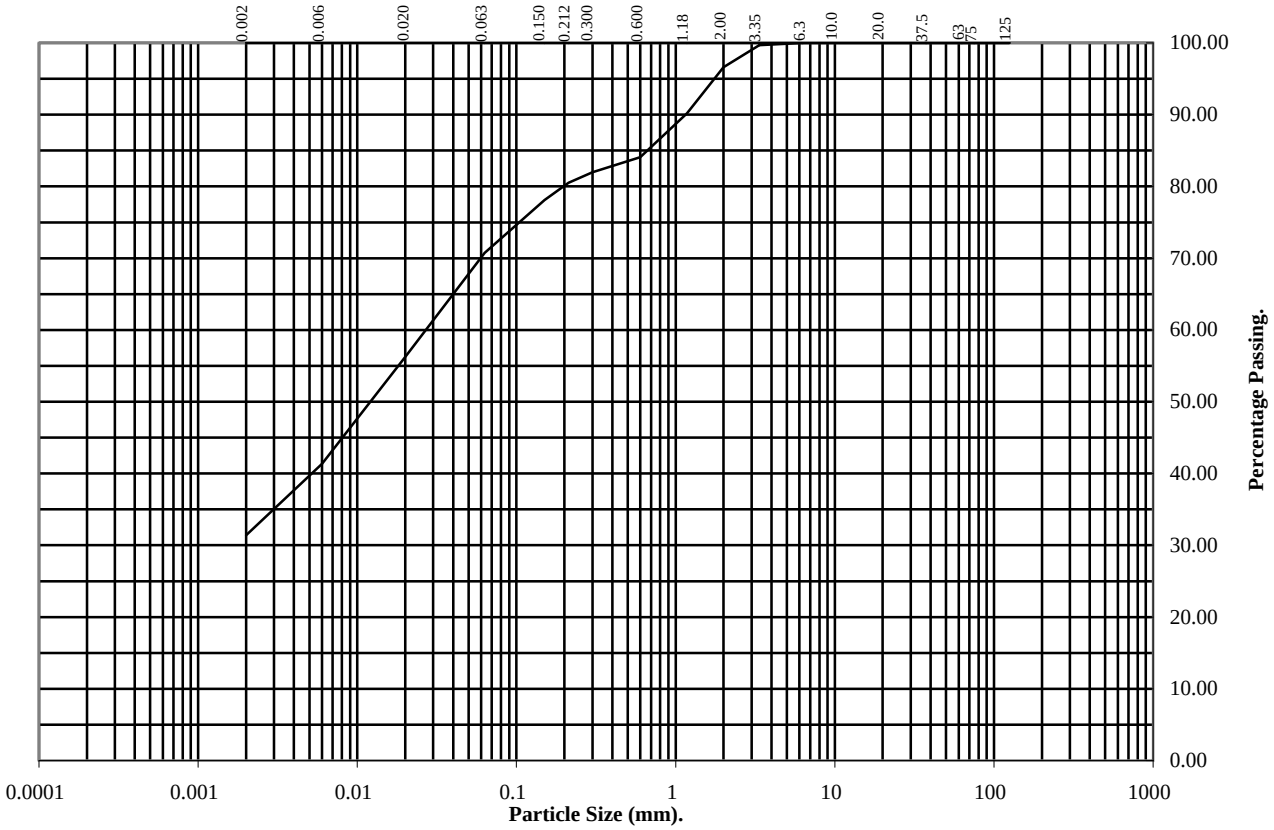
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **SA1** **Depth (m):** **0.50**

Sample Number: **4** **Sample Type:** **B**



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	97
1.18	90
0.6	84
0.3	82
0.212	81
0.15	78
0.063	71

Particle Diameter	Percentage Passing
0.02	56
0.006	41
0.002	31

Soil Fraction	Total Percentage
Cobbles	0
Gravel	3
Sand	26
Silt	40
Clay	31

Remarks:

See summary of soils descriptions.

Checked By	Date	Approved By	Date

PSL Professional Soils Laboratory	**FRODSHAM.**	**Contract No.: PSL13/4038**

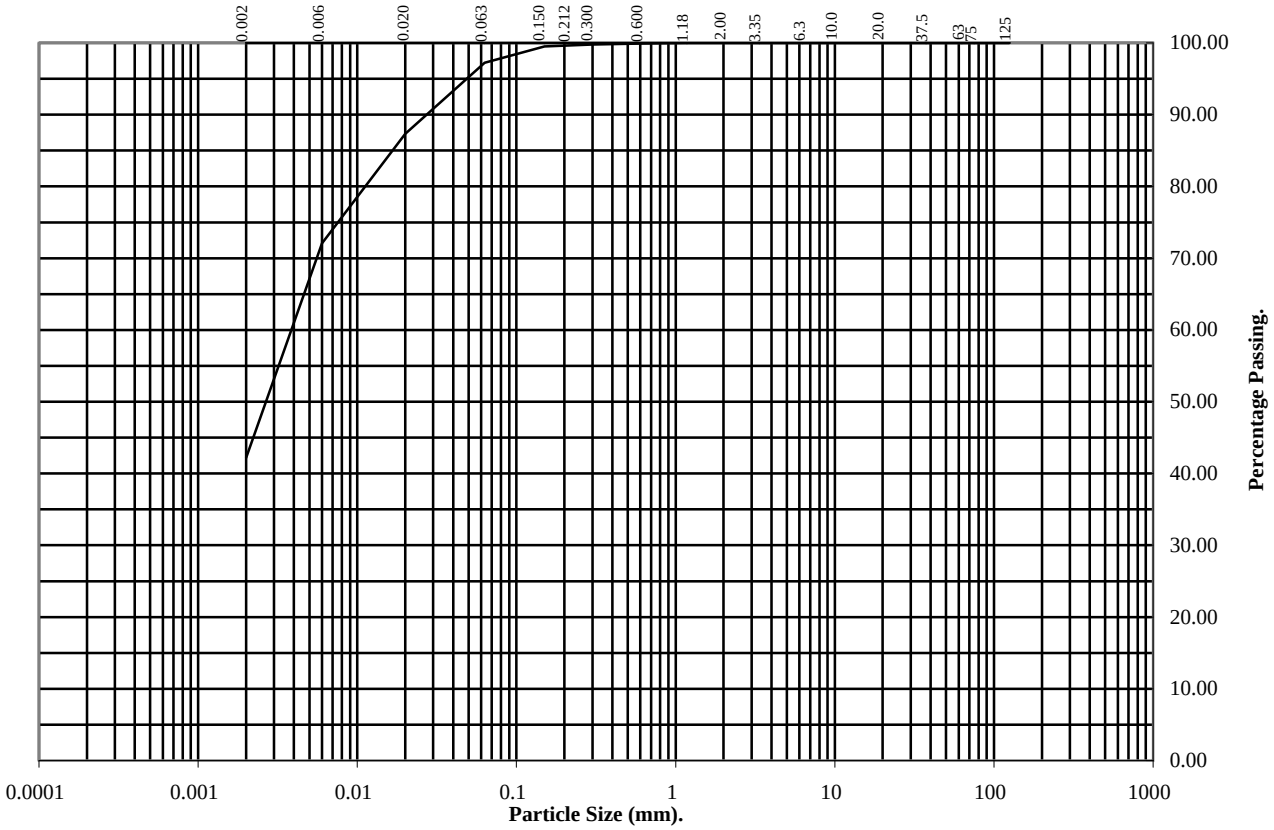
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **SA1** **Depth (m):** **8.00**

Sample Number: **24** **Sample Type:** **B**



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	100
1.18	100
0.6	100
0.3	100
0.212	100
0.15	100
0.063	97

Particle Diameter	Percentage Passing
0.02	87
0.006	72
0.002	42

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	3
Silt	55
Clay	42

Remarks:
See summary of soils descriptions.

[redacted]

PSL Professional Soils Laboratory	**FRODSHAM.**	**Contract No.: PSL13/4038**

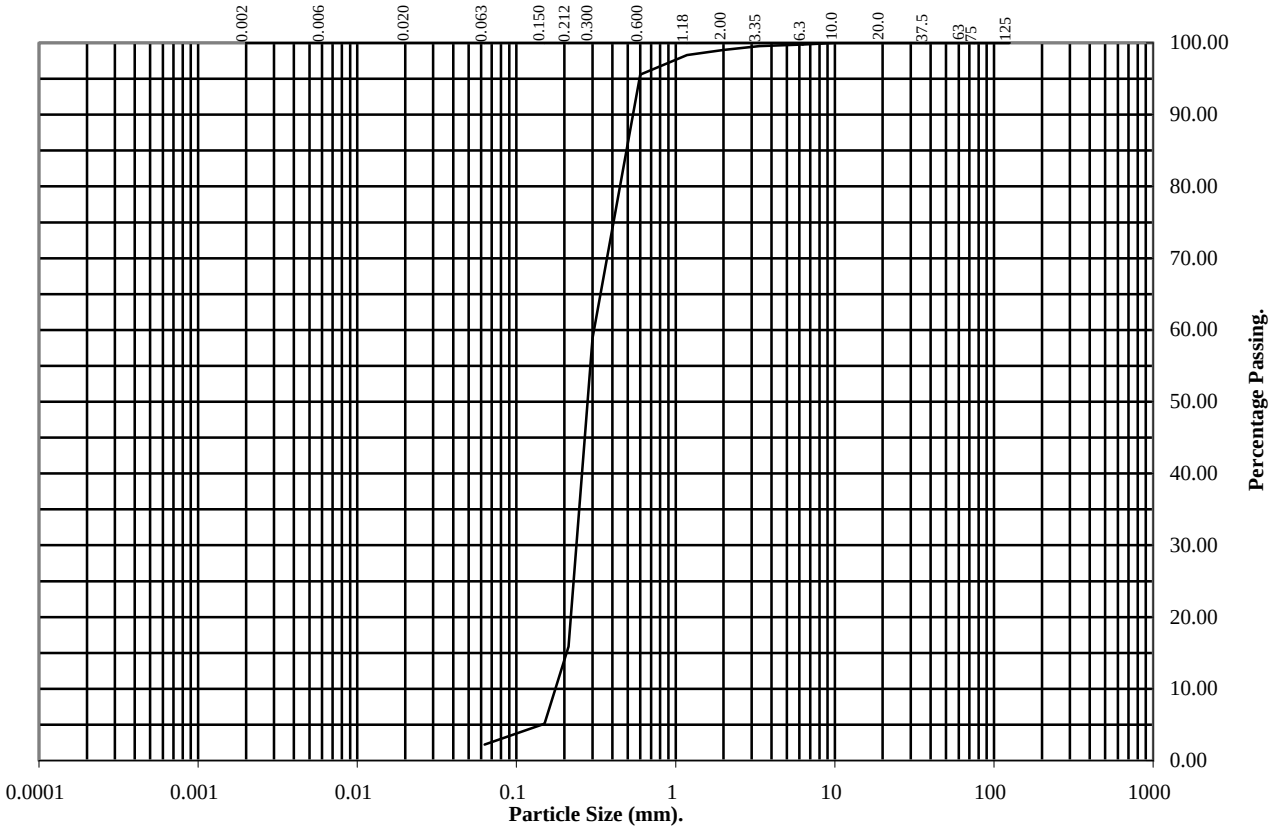
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **SA1** **Depth (m):** **16.50**

Sample Number: **42** **Sample Type:** **B**



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	99
1.18	98
0.6	96
0.3	59
0.212	16
0.15	5
0.063	2

Soil Fraction	Total Percentage
Cobbles	0
Gravel	1
Sand	97
Silt / Clay	2

Remarks:
See summary of soils descriptions.

[redacted]

PSL Professional Soils Laboratory	**FRODSHAM.**	**Contract No.: PSL13/4038**

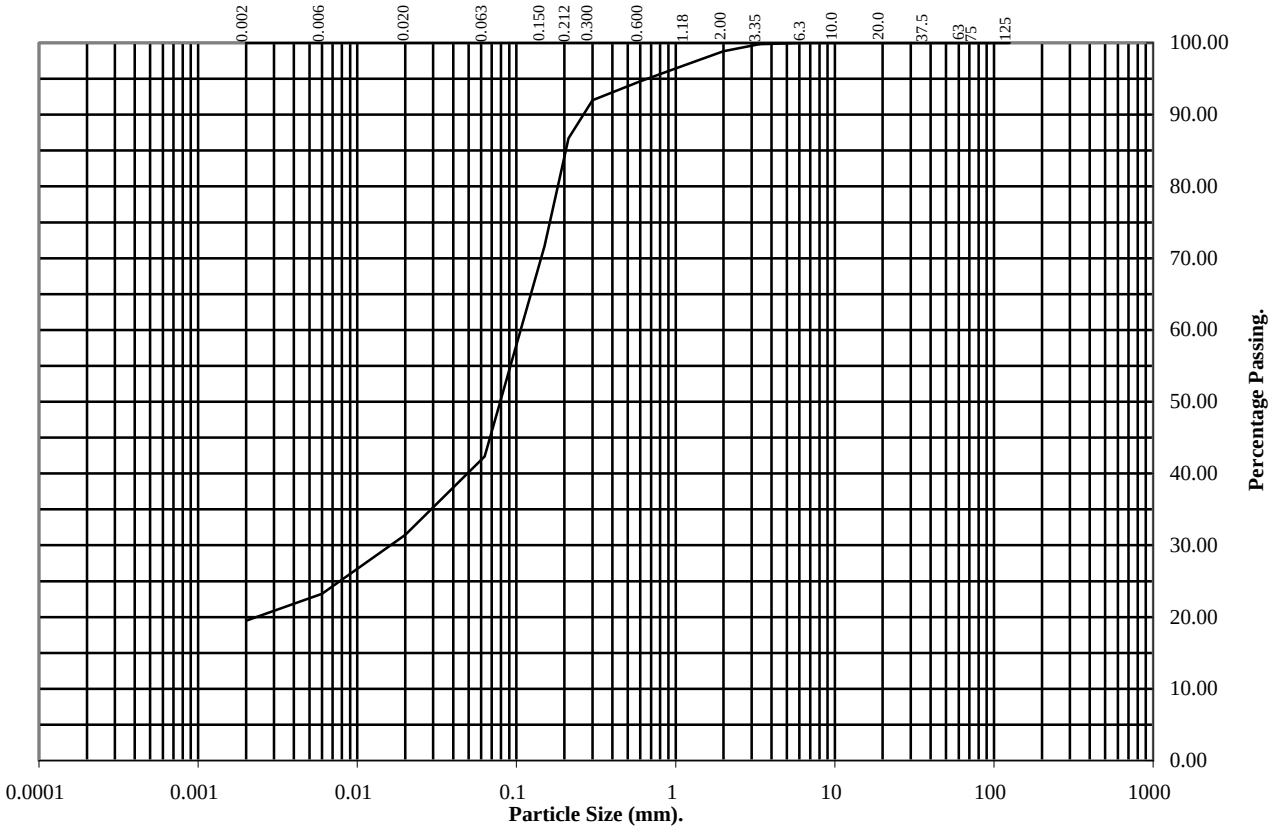
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **SA2** **Depth (m):** **0.50**

Sample Number: **3** **Sample Type:** **B**



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	99
1.18	97
0.6	95
0.3	92
0.212	87
0.15	72
0.063	42

Particle Diameter	Percentage Passing
0.02	31
0.006	23
0.002	19

Soil Fraction	Total Percentage
Cobbles	0
Gravel	1
Sand	57
Silt	23
Clay	19

Remarks:
See summary of soils descriptions.

[redacted]

PSL Professional Soils Laboratory	**FRODSHAM.**	**Contract No.: PSL13/4038**

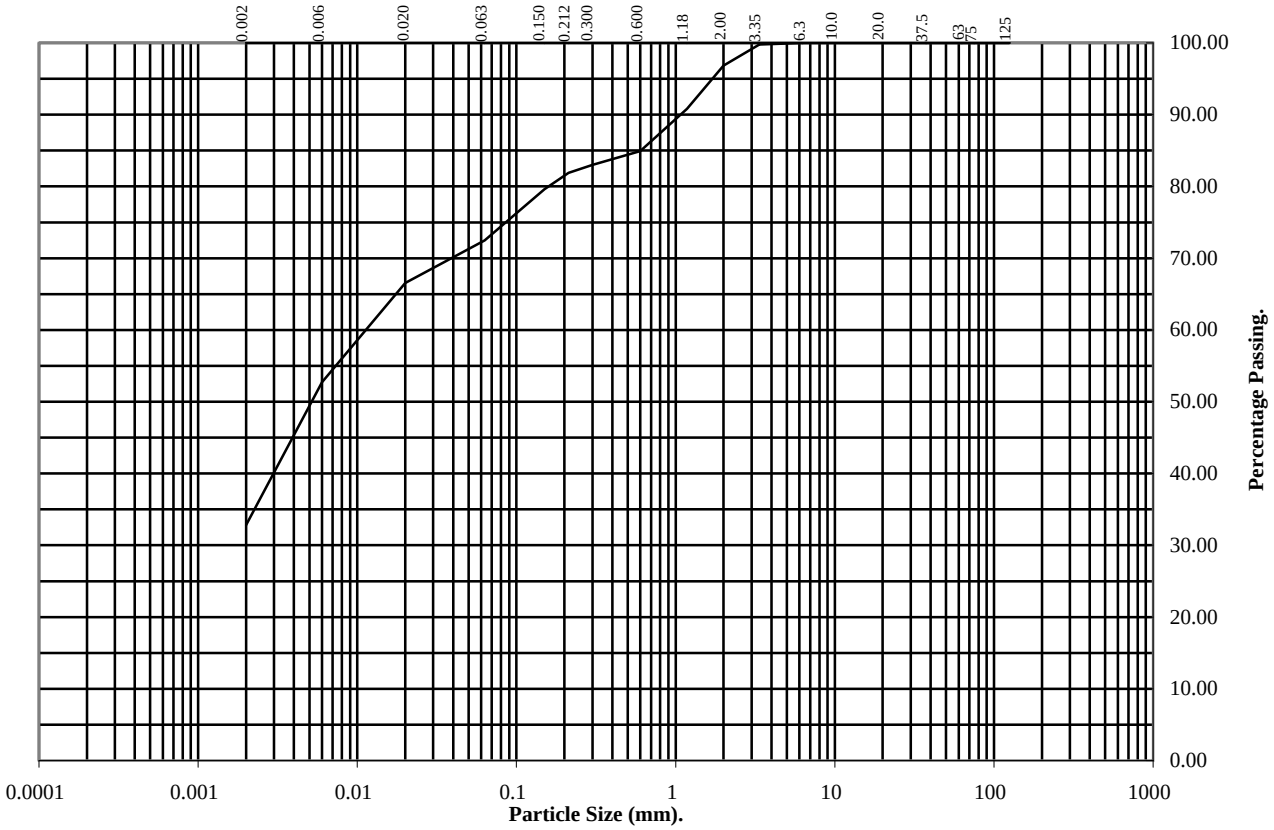
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **SA2** **Depth (m):** **2.10**

Sample Number: **8** **Sample Type:** **B**



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	97
1.18	91
0.6	85
0.3	83
0.212	82
0.15	80
0.063	72

Particle Diameter	Percentage Passing
0.02	67
0.006	53
0.002	33

Soil Fraction	Total Percentage
Cobbles	0
Gravel	3
Sand	25
Silt	39
Clay	33

Remarks:
See summary of soils descriptions.

[redacted]

PSL Professional Soils Laboratory	**FRODSHAM.**	**Contract No.: PSL13/4038**

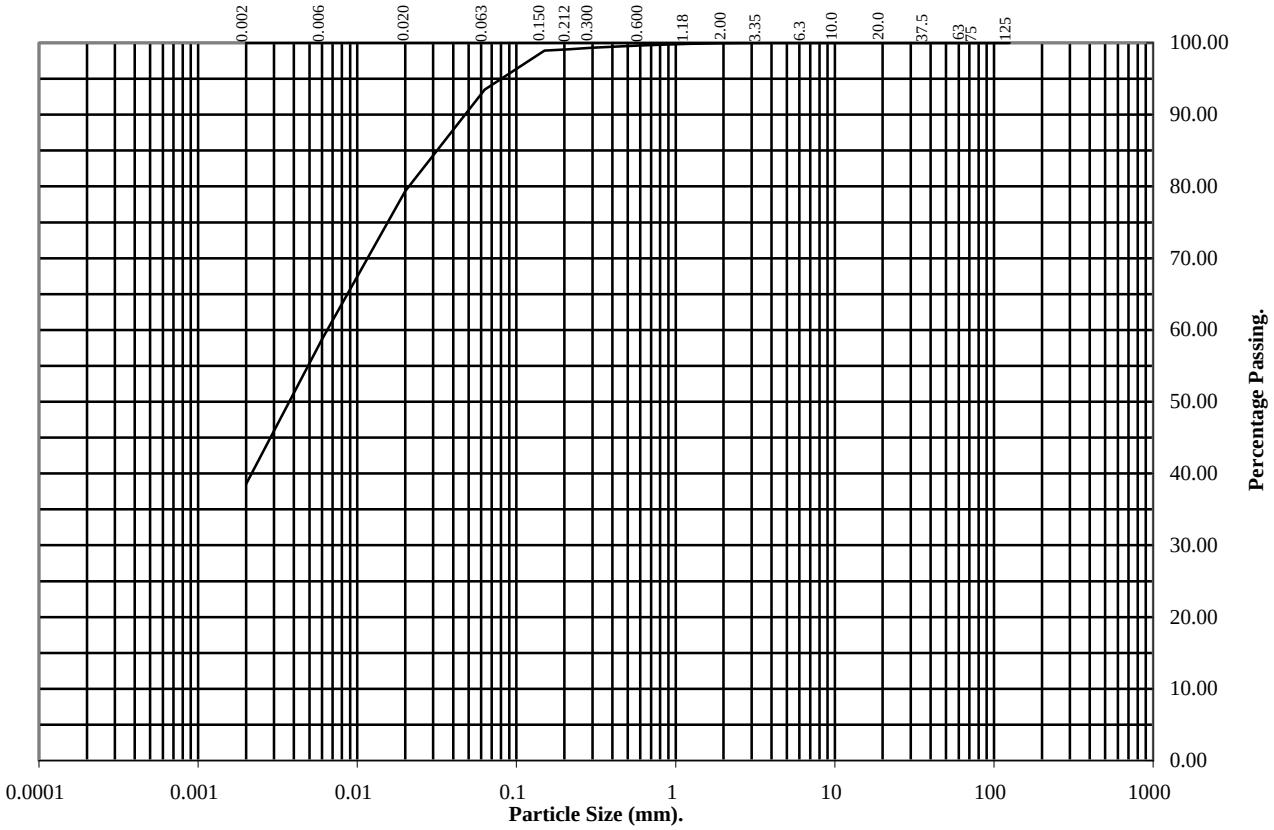
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **SA2** **Depth (m):** **12.60**

Sample Number: **26** **Sample Type:** **B**



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	100
1.18	100
0.6	100
0.3	99
0.212	99
0.15	99
0.063	93

Particle Diameter	Percentage Passing
0.02	79
0.006	59
0.002	39

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	7
Silt	54
Clay	39

Remarks:
See summary of soils descriptions.

[redacted]

PSL Professional Soils Laboratory	**FRODSHAM.**	**Contract No.: PSL13/4038**

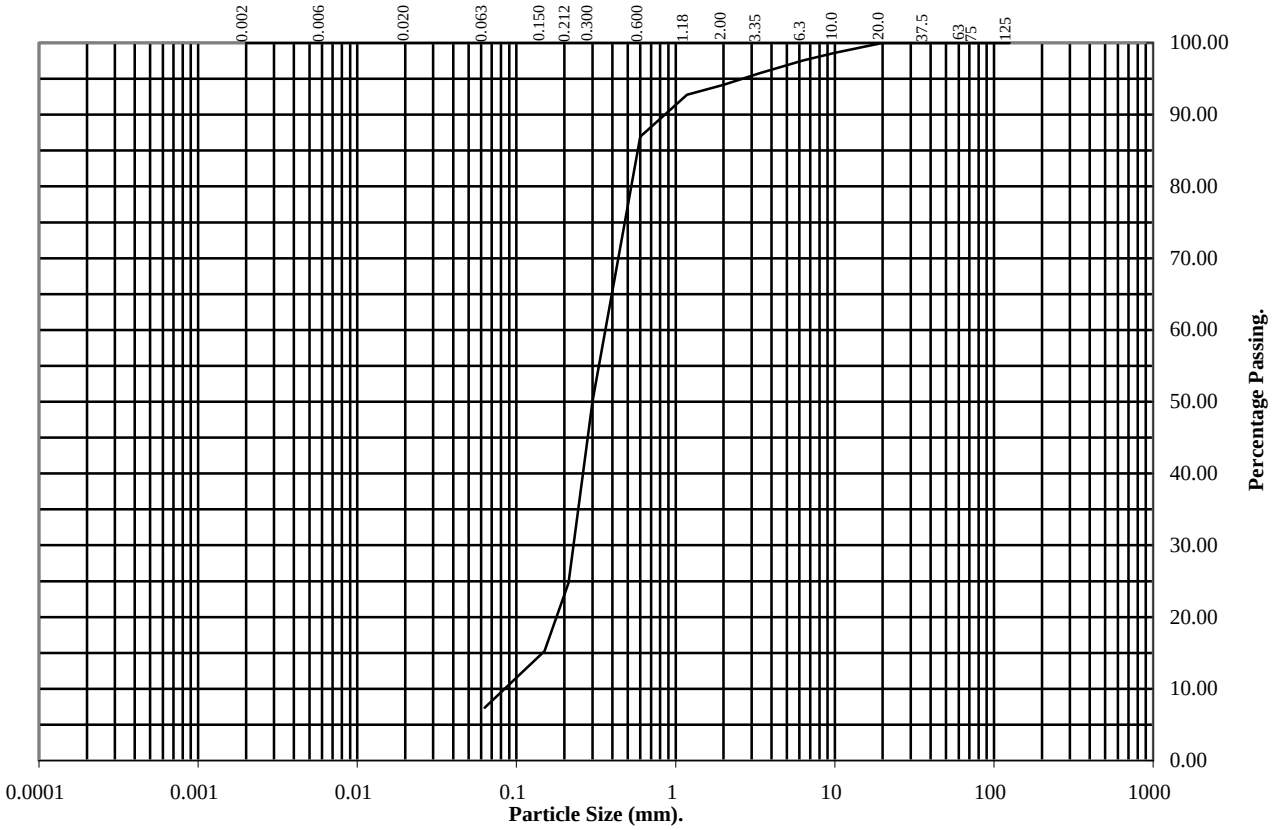
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **SA2** **Depth (m):** **17.00**

Sample Number: **35** **Sample Type:** **B**



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	99
6.3	98
3.35	96
2	94
1.18	93
0.6	87
0.3	50
0.212	25
0.15	15
0.063	7

Soil Fraction	Total Percentage
Cobbles	0
Gravel	6
Sand	87
Silt / Clay	7

Remarks:

See summary of soils descriptions.

Checked By	Date	Approved By	Date

PSL Professional Soils Laboratory	**FRODSHAM.**	**Contract No.: PSL13/4038**

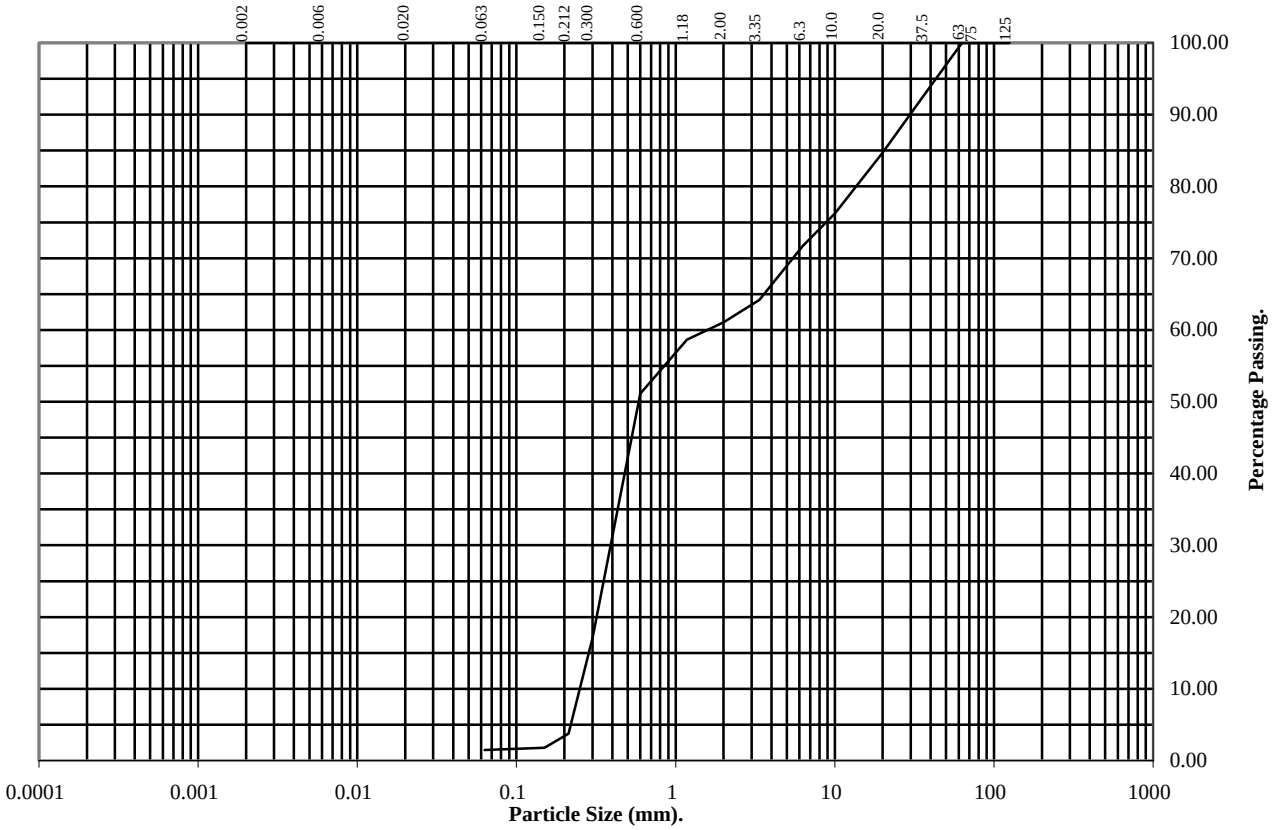
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **SA2** **Depth (m):** **17.90**

Sample Number: **38** **Sample Type:** **B**



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	93
20	85
10	76
6.3	72
3.35	64
2	61
1.18	59
0.6	51
0.3	17
0.212	4
0.15	
0.063	

Soil Fraction	Total Percentage
Cobbles	0
Gravel	39
Sand	60
Silt / Clay	1

Remarks:
See summary of soils descriptions.

[redacted]

PSL Professional Soils Laboratory	**FRODSHAM.**	**Contract No.: PSL13/4038**

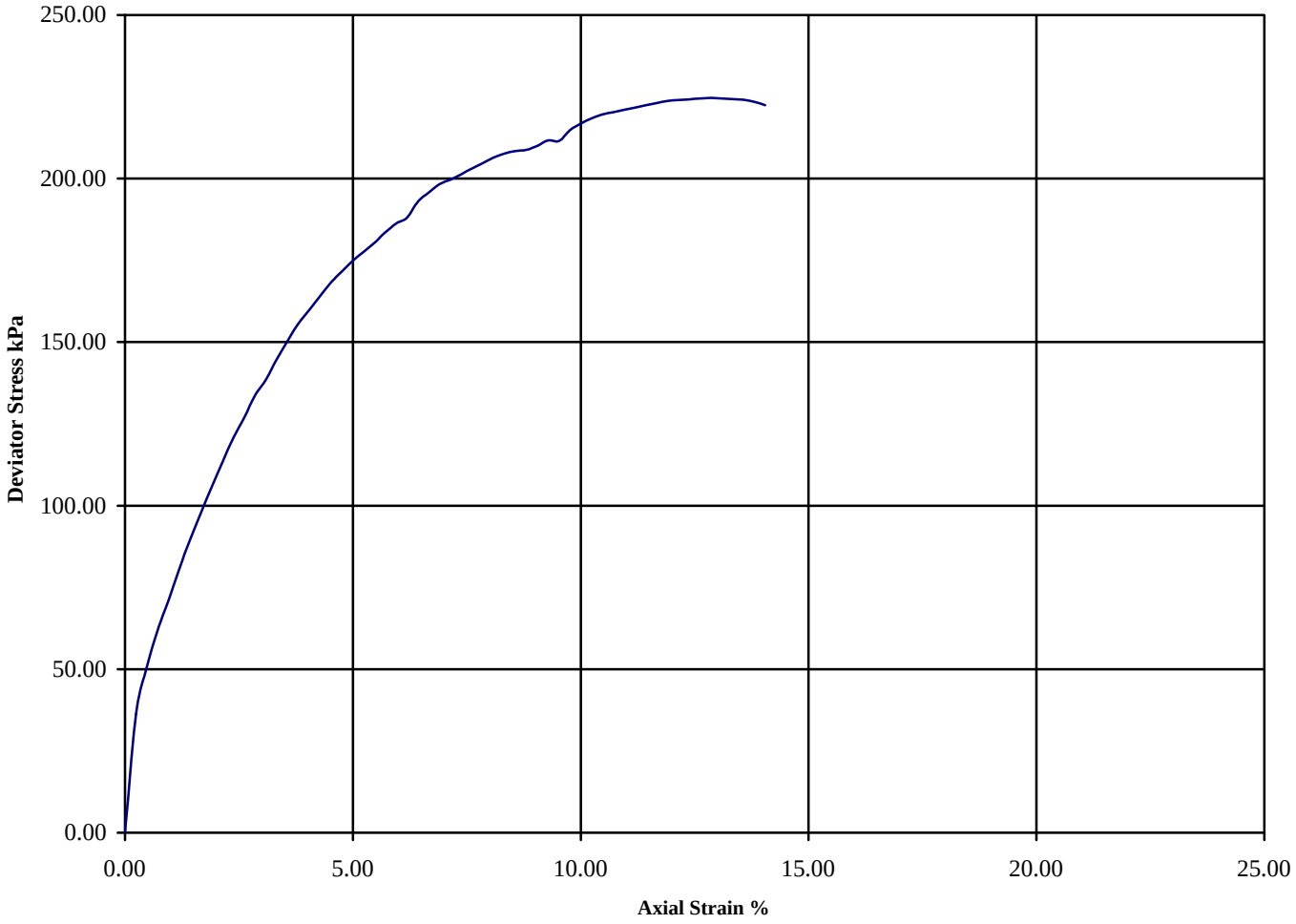
Undrained Shear Strength in Triaxial Compression

without measurement of Pore Pressure

B.S. 1377 : Part7 : Clause 9 : 1990

Hole Number: SA1 **Depth (m):** 26.20

Sample Number: 59 **Sample Type:** U



Diameter (mm):		102	Height (mm):		210	Test:	100mm Multistage		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Remarks
									Sample taken from top of tube
									Rate of strain = 1.9 %/min
									Latex Membrane used 0.2 mm thickness
									Membrane Correction applied (kPa)
A	27	2.00	1.58	350	188	94	6.2	Brittle	0.36 0.35 0.35
				450	212	106	9.3		
				550	225	112	12.9		

[redacted]

PSL Professional Soils Laboratory

FRODSHAM.

Contract No: PSL13/4038

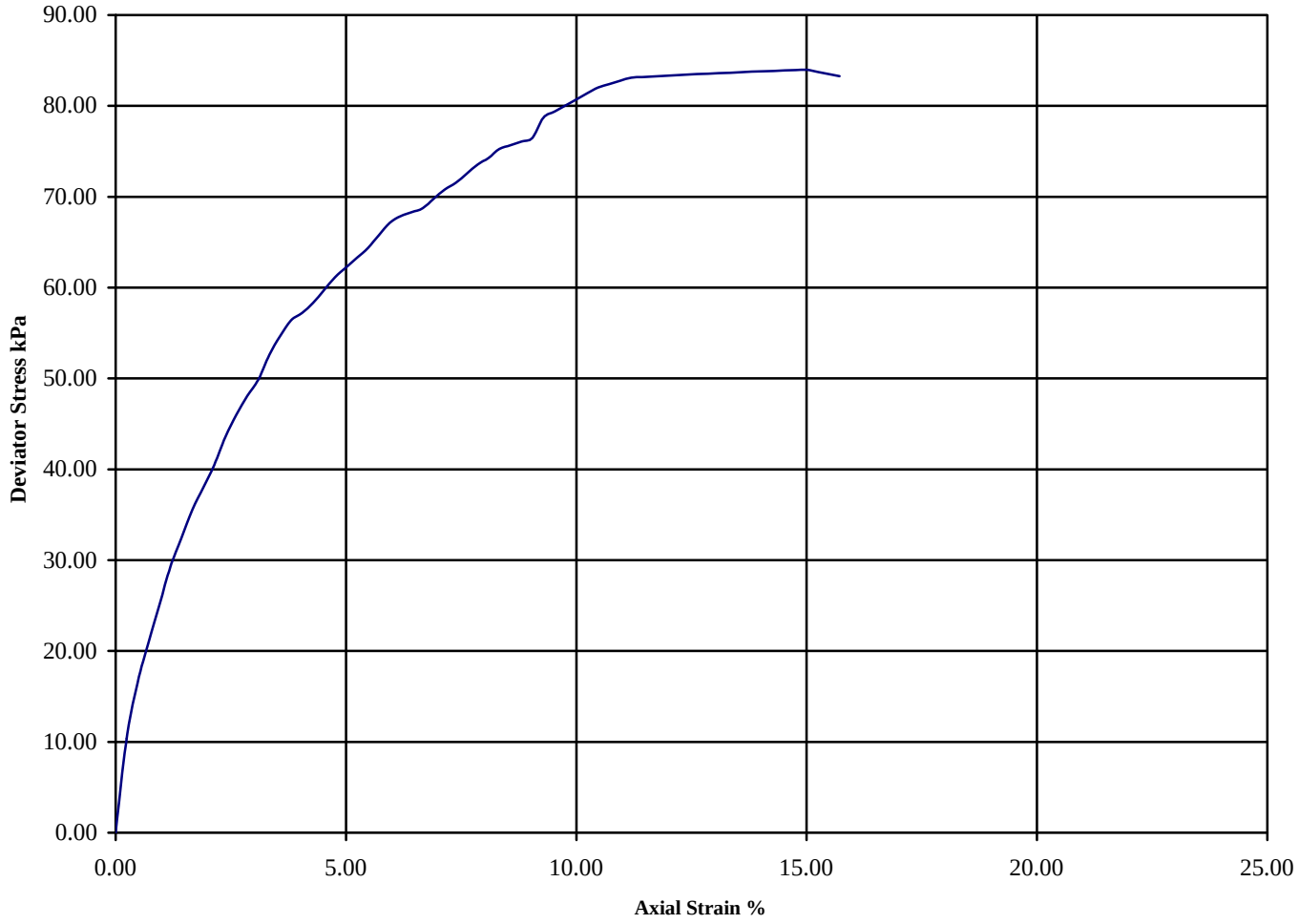
Undrained Shear Strength in Triaxial Compression

without measurement of Pore Pressure

B.S. 1377 : Part7 : Clause 9 : 1990

Hole Number: SA2 **Depth (m):** 8.50

Sample Number: 17 **Sample Type:** U



Diameter (mm):		102	Height (mm):		210	Test:	100mm Multistage		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Remarks
A	35	1.92	1.42	75	69	34	6.7	Plastic	Sample taken from top of tube Rate of strain = 1.9 %/min Latex Membrane used 0.2 mm thickness Membrane Correction applied (kPa) 0.36 0.36 0.34
				125	76	38	9.0		
				175	84	42	15.0		

[redacted]

PSL Professional Soils Laboratory

FRODSHAM.

Contract No: PSL13/4038

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Professional Soils Laboratory

LABORATORY REPORT

UKAS TESTING
4043

Contract Number: PSL13/4403

Client's Reference: Report Date: 19 November 2013

Client Name: Van Elle Ltd
Kirkby Lane
Pinxton
Nottinghamshire

NG16 6JA

For the attention of: Jordan Chapman

Contract Title: Frodsham Wind Farm

Date Received: 8/11/2013
Date Commenced: 8/11/2013
Date Completed: 19/11/2013

Notes: Observations and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

[redacted]

(Director) (Director) (Laboratory Manager)

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Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Depth m	Description of Sample
SA3	51	D	24.15	MADE GROUND dark grey sandy slightly clayey gravel.
SA3	57	U	28.00-28.45	Brown slightly gravelly very sandy CLAY.
SA4	56/58	D	27.60-29.10	Brown gravelly very sandy CLAY.

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[redacted]

FRODSHAM WIND FARM.

Contract No: PSL13/4403

Client Ref: G131520

SUMMARY OF SOIL CLASSIFICATION TESTS

(B.S. 1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Depth m	Moisture Content % Clause 3.2	Bulk Density Mg/m^3 Clause 7.2	Dry Density Mg/m^3 Clause 7.2	Particle Density Mg/m^3 Clause 8.	Liquid Limit % Clause 4.3/4.4	Plastic Limit % Clause 5.	Plasticity Index % Clause 6.	% Passing .425mm	Remarks
SA3	51	D	24.15	13					NP			

SYMBOLS : NP : Non Plastic *** : Liquid Limit and Plastic Limit Wet Sieved.**

[redacted]

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Professional Soils Laboratory

FRODSHAM WIND FARM.

Contract No: **PSL13/4403**

Client Ref: **G131520**

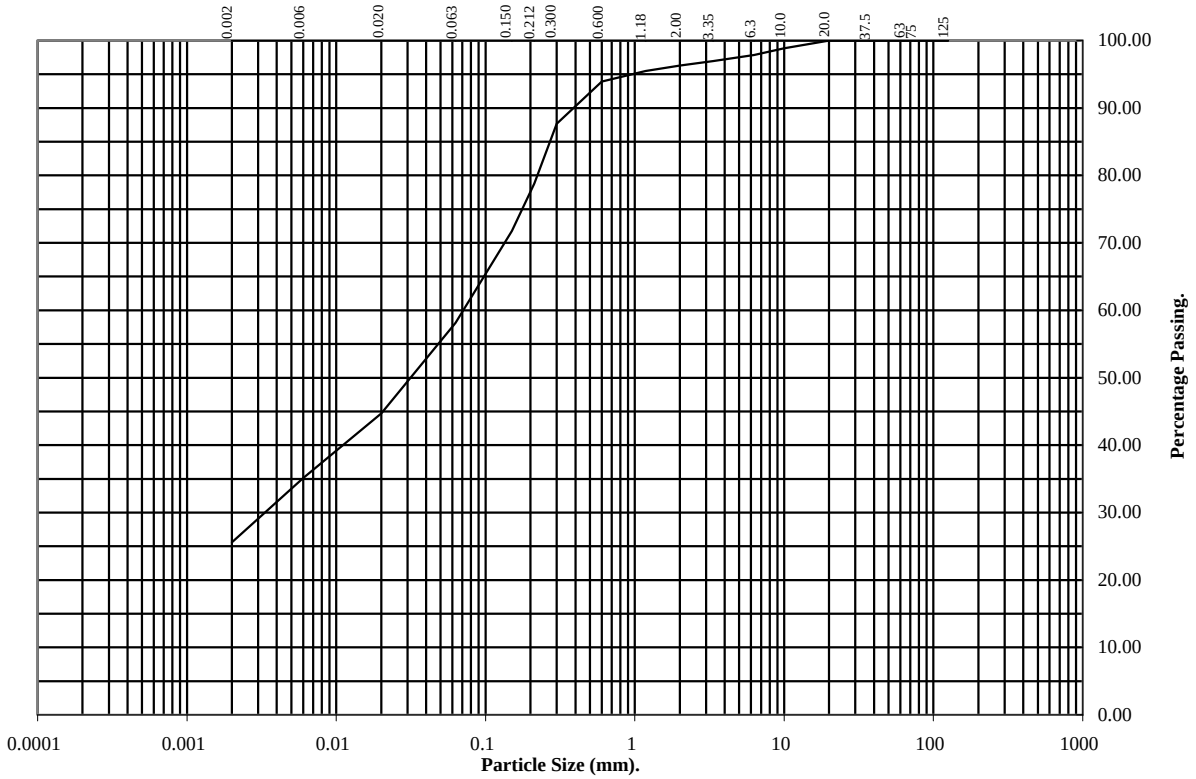
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **SA3** **Depth (m):** **28.00-28.45**

Sample Number: **57** **Sample Type:** **U**



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	99
6.3	98
3.35	97
2	96
1.18	95
0.6	94
0.3	88
0.212	79
0.15	72
0.063	58

Particle Diameter	Percentage Passing
0.02	45
0.006	35
0.002	26

Soil Fraction	Total Percentage
Cobbles	0
Gravel	4
Sand	38
Silt	32
Clay	26

Remarks:
See summary of soils descriptions.

[redacted]

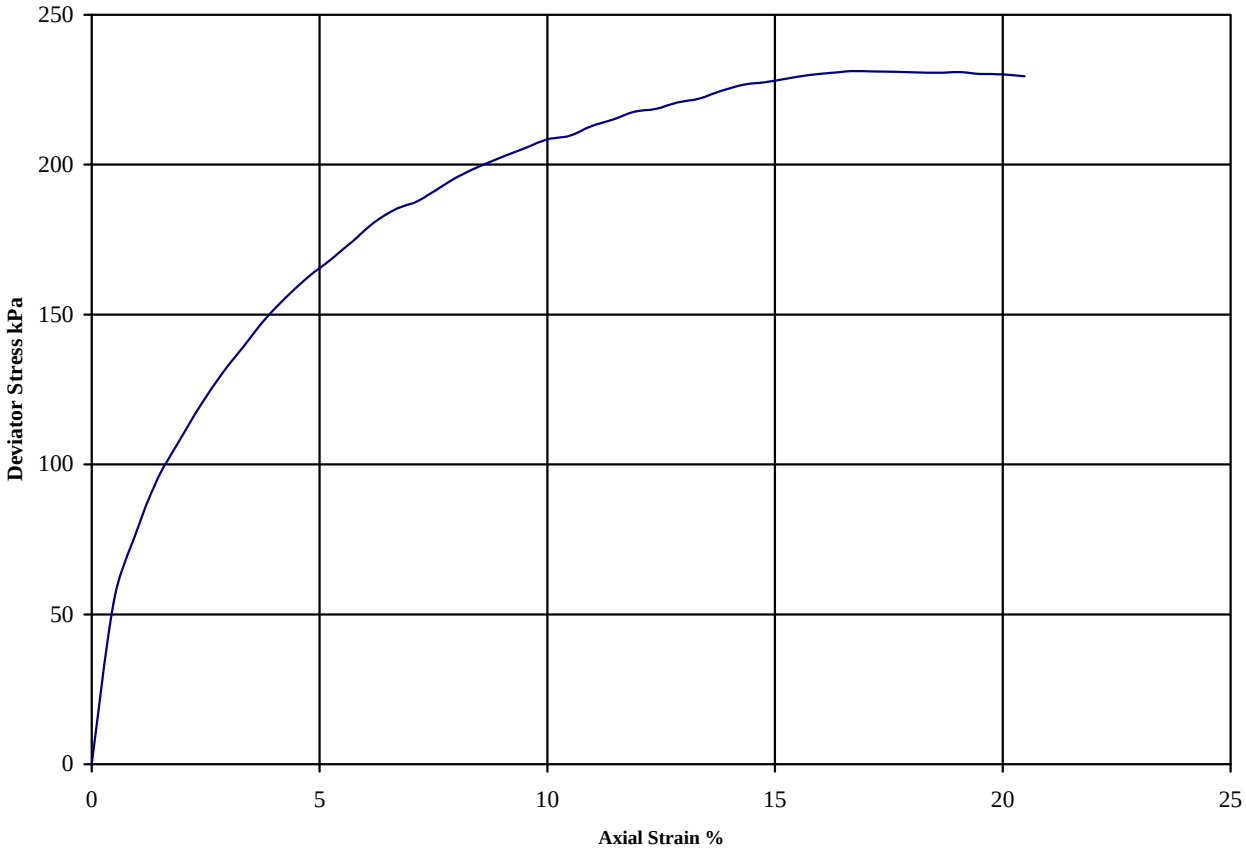
PSL Professional Soils Laboratory	**FRODSHAM WIND FARM.**	**Contract No.: PSL13/4403**

Undrained Shear Strength in Triaxial Compression

without measurement of Pore Pressure
B.S. 1377 : Part7 : Clause 8 : 1990

Hole Number: SA3 **Depth (m):** 28.00-28.45

Sample Number: 57 **Sample Type:** U



Diameter (mm):		102.0	Height (mm):		210.0	Test:	100 mm Single Stage. Undisturbed		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Remarks
									Sample taken from top of tube
									Rate of strain = 1.9 %/min
									Latex Membrane used 0.2 mm thickness,
									Correction applied 0.34 kPa
A	15	2.19	1.90	560	231	116	16.7	Plastic	See summary of soil descriptions.

[redacted]

PSL Professional Soils Laboratory

FRODSHAM WIND FARM.

Contract No: PSL13/4403

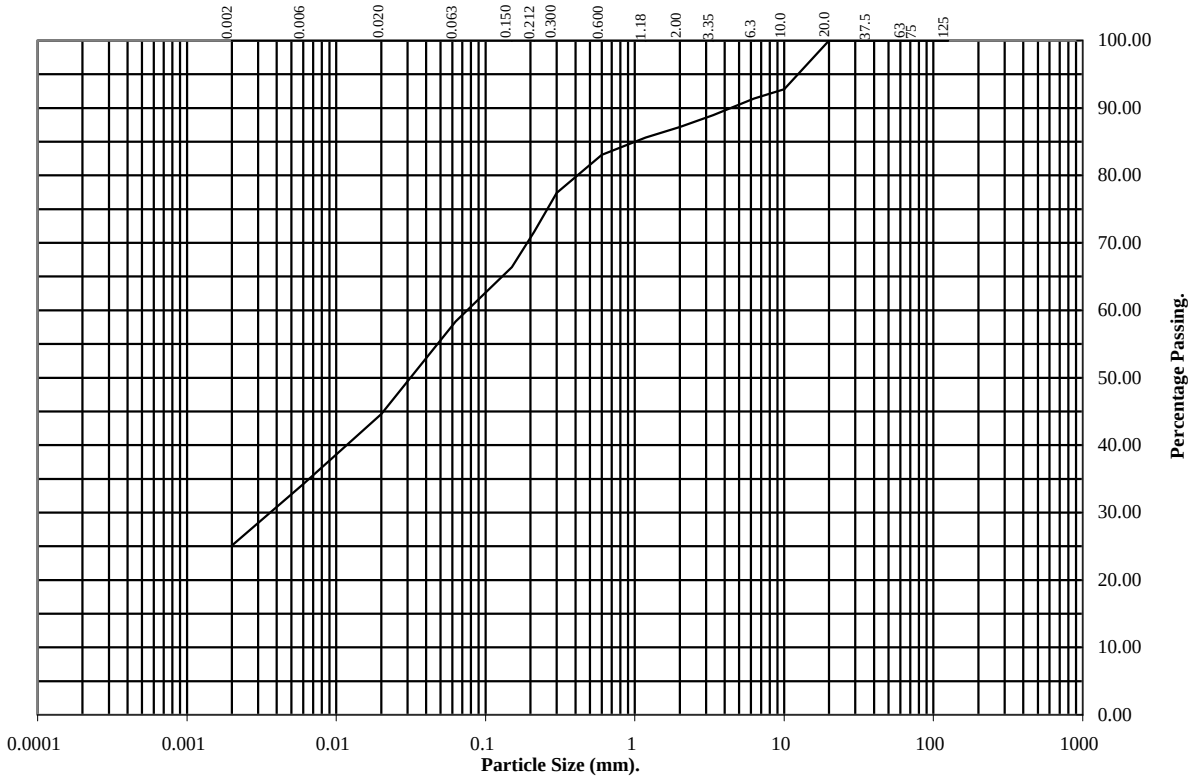
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **SA4** **Depth (m):** **27.60-29.10**

Sample Number: **56** **Sample Type:** **D**



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	93
6.3	91
3.35	89
2	87
1.18	86
0.6	83
0.3	77
0.212	72
0.15	66
0.063	58

Particle Diameter	Percentage Passing
0.02	45
0.006	34
0.002	25

Soil Fraction	Total Percentage
Cobbles	0
Gravel	13
Sand	29
Silt	33
Clay	25

Remarks:
See summary of soils descriptions.

[redacted]

PSL Professional Soils Laboratory	**FRODSHAM WIND FARM.**	**Contract No.: PSL13/4403**

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Professional Soils Laboratory

LABORATORY REPORT

UKAS TESTING
4043

Contract Number: PSL13/4179

Client's Reference: Report Date: 19 November 2013

Client Name: Van Elle
Kirkby Lane
Pinxton
Nottinghamshire

NG16 6JA

For the attention of: Andy Johnston

Contract Title: Frodsham

Date Received: 29/10/2013
Date Commenced: 29/10/2013
Date Completed: 19/11/2013

Notes: Observations and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

[redacted]

(Director) (Director) (Laboratory Manager)

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awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Depth m	Description of Sample
SA3	6	B	1.20-1.70	Brown slightly gravelly sandy very silty CLAY with some organic material.
SA3	21	B	8.00-8.50	Dark brown slightly gravelly very sandy very silty organic CLAY.
SA3	37	U	16.25-16.70	Brown slightly gravelly very sandy silty CLAY.
SA4	6	B	1.20-1.70	Grey mottled brown slightly sandy very silty CLAY.
SA4	18	B	8.40-8.90	Grey very sandy very silty CLAY.
SA4	37	B	17.00-17.50	Brown gravelly slightly silty SAND.
SA4	51	U	25.60-26.05	Stiff brown slightly gravelly slightly sandy very silty CLAY.
SA5	6	B	1.20-1.70	Brown sligtly gravelly sandy very silty CLAY with some organic material.
SA5	11	B	3.40-3.90	Dark brown slightly gravelly slightly clayey very silty SAND.
SA5	35	B	16.00-16.50	Grey slightly gravelly very sandy very silty CLAY.
SA5	46	B	23.10-23.60	Brown gravelly SAND.
SA5	54	B	27.00-27.50	Brown silty SAND.
SA5	61	U	33.00-33.45	Stiff brown sandy very silty CLAY.

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[redacted]

Client Ref: 131520

SUMMARY OF SOIL CLASSIFICATION TESTS

(B.S. 1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Depth m	Moisture Content % Clause 3.2	Bulk Density Mg/m^3 Clause 7.2	Dry Density Mg/m^3 Clause 7.2	Particle Density Mg/m^3 Clause 8.	Liquid Limit % Clause 4.3/4.4	Plastic Limit % Clause 5.	Plasticity Index % Clause 6.	% Passing .425mm	Remarks
SA3	6	B	1.20-1.70	56				68	27	41	93	High plasticity CH.
SA3	21	B	8.00-8.50	117				128	49	79	87	Extremely high plasticity CE.
SA4	6	B	1.20-1.70	55				58	25	33	98	High plasticity CH.
SA4	18	B	8.40-8.90	33				36	19	17	98	Intermediate plasticity CI.
SA5	6	B	1.20-1.70	77				68	28	40	92	High plasticity CH.
SA5	5	11	3.40-3.90	31					NP			
SA5	35	B	16.00-16.50	40				43	22	21	91	Intermediate plasticity CI.
SA5	46	B	23.10-23.60	15					NP			

SYMBOLS : NP : Non Plastic *** : Liquid Limit and Plastic Limit Wet Sieved.**

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Professional Soils Laboratory

[redacted]

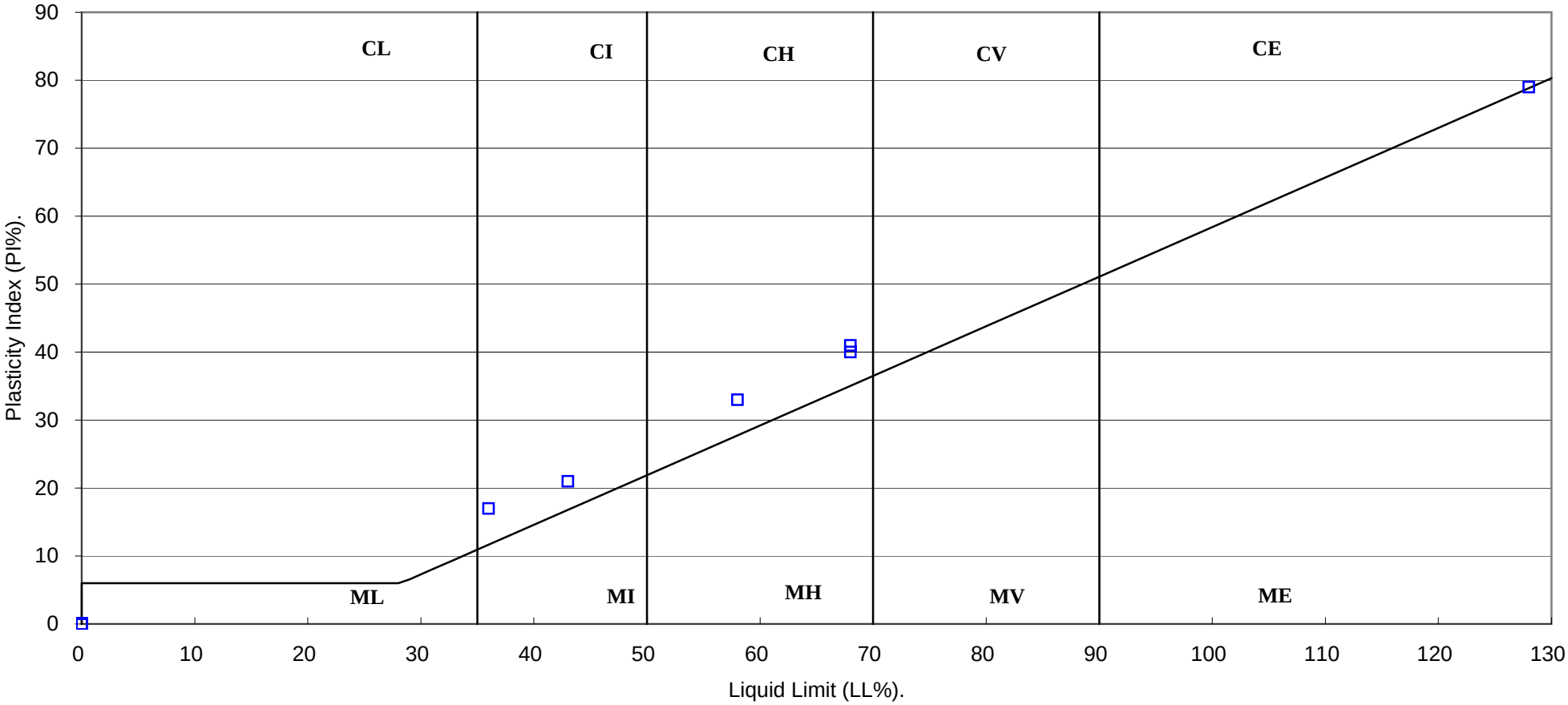
FRODSHAM.

Contract No: **PSL13/4179**

Client Ref: **131520**

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

(B.S.5930 : 1999)



Professional Soils Laboratory

FRODSHAM.

Client Ref: **131520**

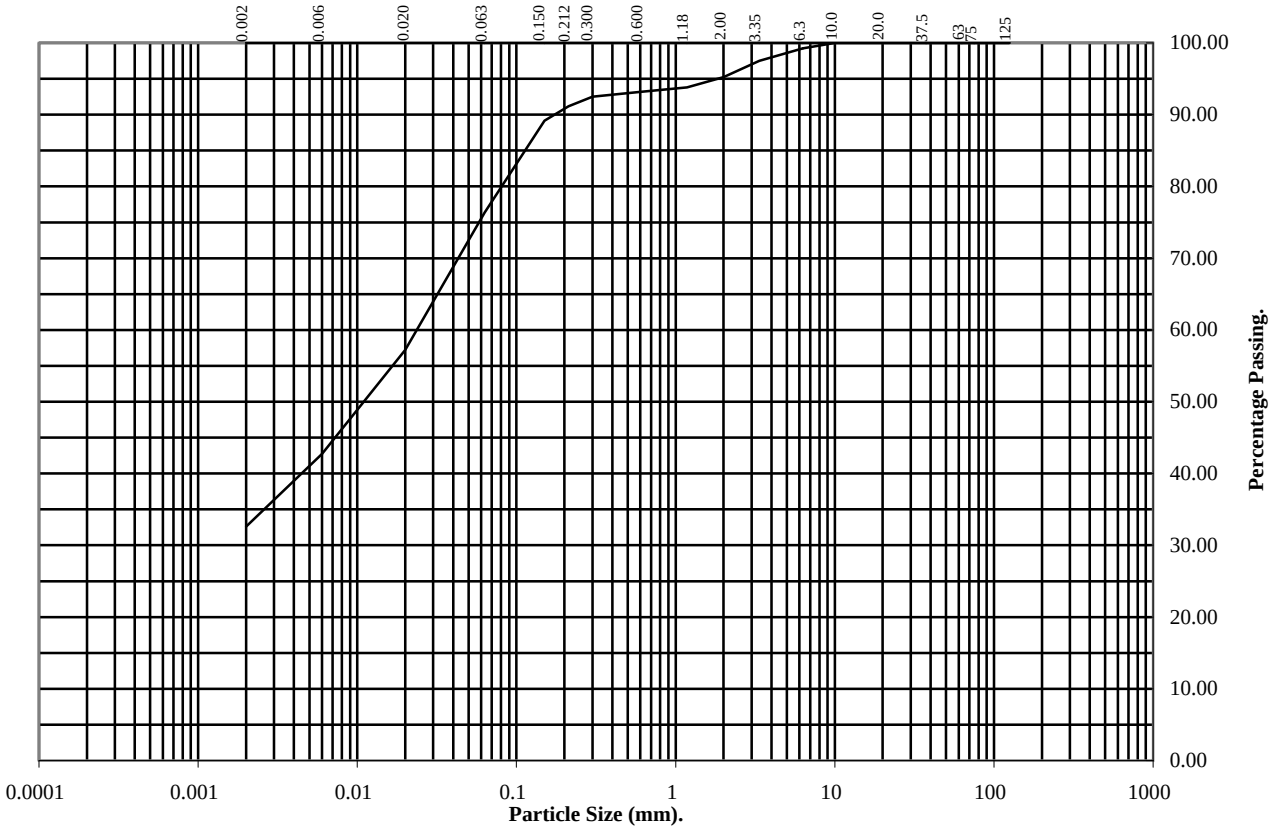
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **SA3** **Depth (m):** **1.20-1.70**

Sample Number: **6** **Sample Type:** **B**



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	99
3.35	97
2	95
1.18	94
0.6	93
0.3	92
0.212	91
0.15	89
0.063	76

Particle Diameter	Percentage Passing
0.02	57
0.006	43
0.002	33

Soil Fraction	Total Percentage
Cobbles	0
Gravel	5
Sand	19
Silt	43
Clay	33

Remarks:
See summary of soils descriptions.

[redacted]

PSL Professional Soils Laboratory	**FRODSHAM.**	**Contract No.: PSL13/4179**

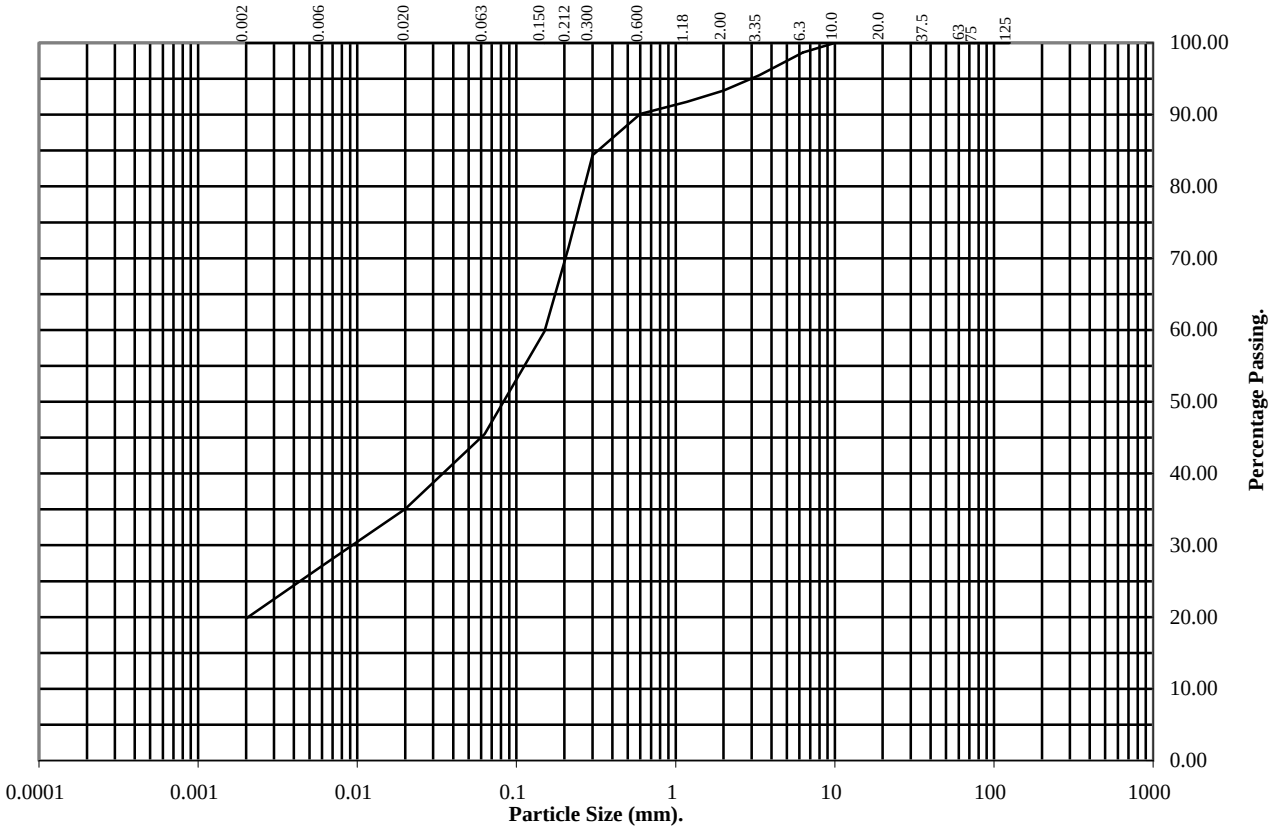
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **SA3** **Depth (m):** **8.00-8.50**

Sample Number: **21** **Sample Type:** **B**



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	99
3.35	96
2	93
1.18	92
0.6	90
0.3	84
0.212	72
0.15	60
0.063	46

Particle Diameter	Percentage Passing
0.02	35
0.006	27
0.002	20

Soil Fraction	Total Percentage
Cobbles	0
Gravel	7
Sand	47
Silt	26
Clay	20

Remarks:
See summary of soils descriptions.

[redacted]

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Professional Soils Laboratory

FRODSHAM.

Contract No.: PSL13/4179

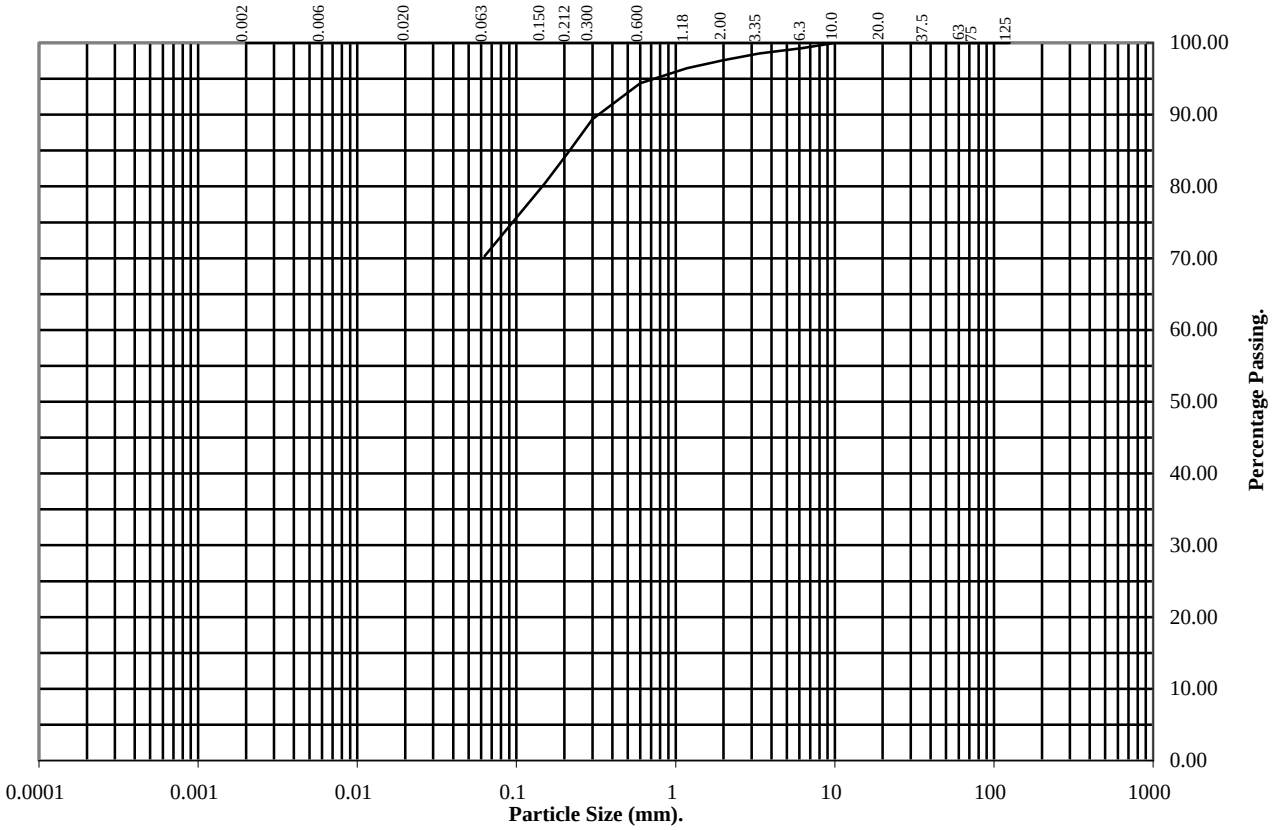
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **SA3** **Depth (m):** **16.25-16.70**

Sample Number: **37** **Sample Type:** **U**



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	99
3.35	99
2	98
1.18	96
0.6	94
0.3	89
0.212	85
0.15	80
0.063	70

Soil Fraction	Total Percentage
Cobbles	0
Gravel	2
Sand	28
Silt / Clay	70

Remarks:
See summary of soils descriptions.

[redacted]

PSL Professional Soils Laboratory	**FRODSHAM.**	**Contract No.: PSL13/4179**

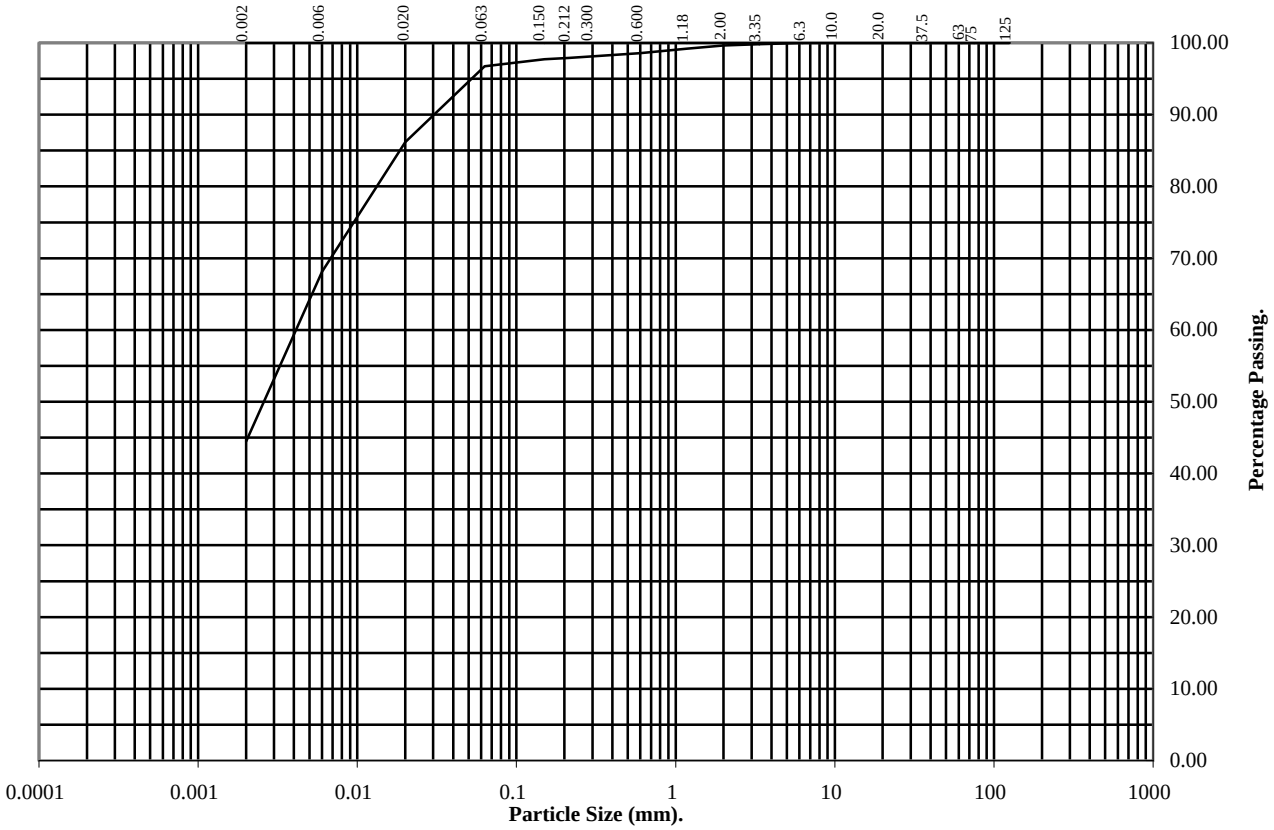
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **SA4** **Depth (m):** **1.20-1.70**

Sample Number: **6** **Sample Type:** **B**



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	100
1.18	99
0.6	99
0.3	98
0.212	98
0.15	98
0.063	97

Particle Diameter	Percentage Passing
0.02	86
0.006	68
0.002	44

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	3
Silt	53
Clay	44

Remarks:
See summary of soils descriptions.

[redacted]

PSL Professional Soils Laboratory	**FRODSHAM.**	**Contract No.: PSL13/4179**

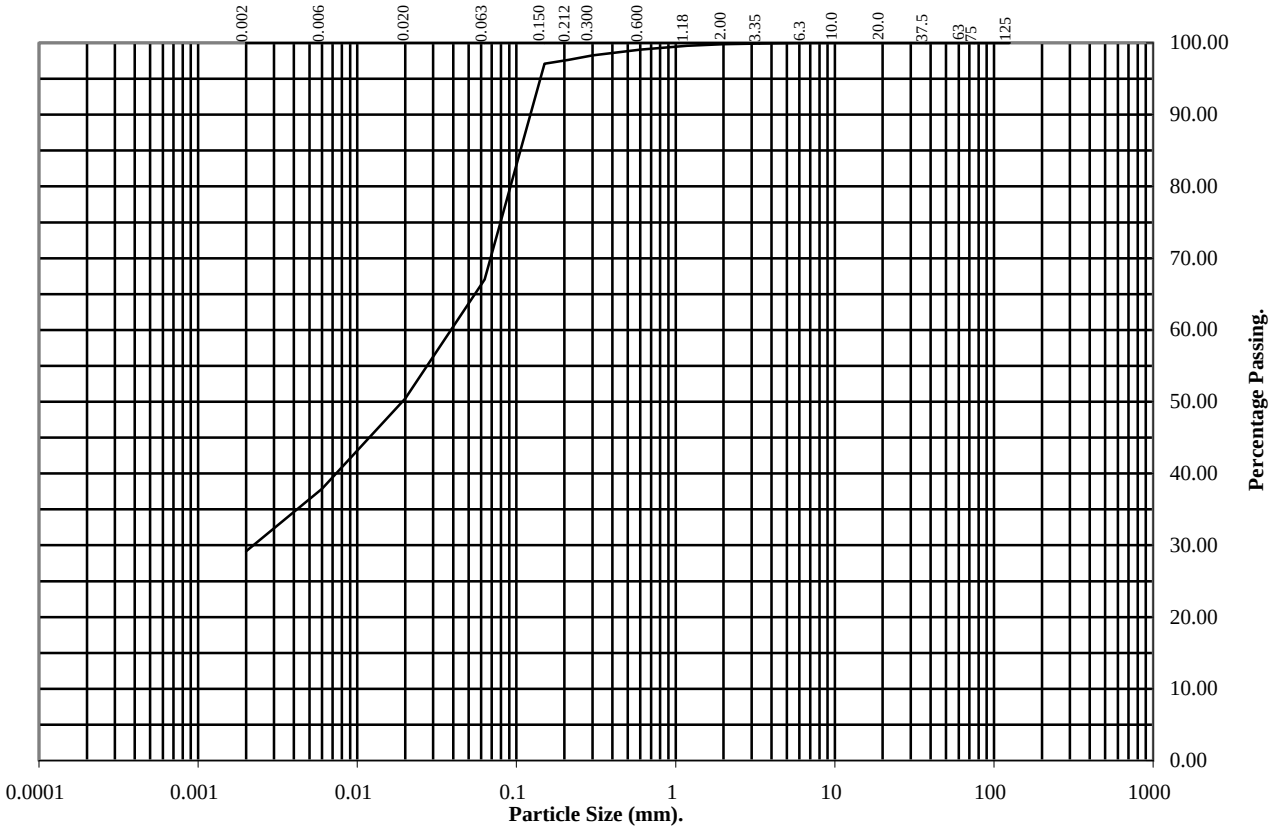
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **SA4** **Depth (m):** **8.40-8.90**

Sample Number: **18** **Sample Type:** **B**



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	100
1.18	100
0.6	99
0.3	98
0.212	98
0.15	97
0.063	67

Particle Diameter	Percentage Passing
0.02	50
0.006	38
0.002	29

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	33
Silt	38
Clay	29

Remarks:
See summary of soils descriptions.

[redacted]

PSL Professional Soils Laboratory	**FRODSHAM.**	**Contract No.: PSL13/4179**

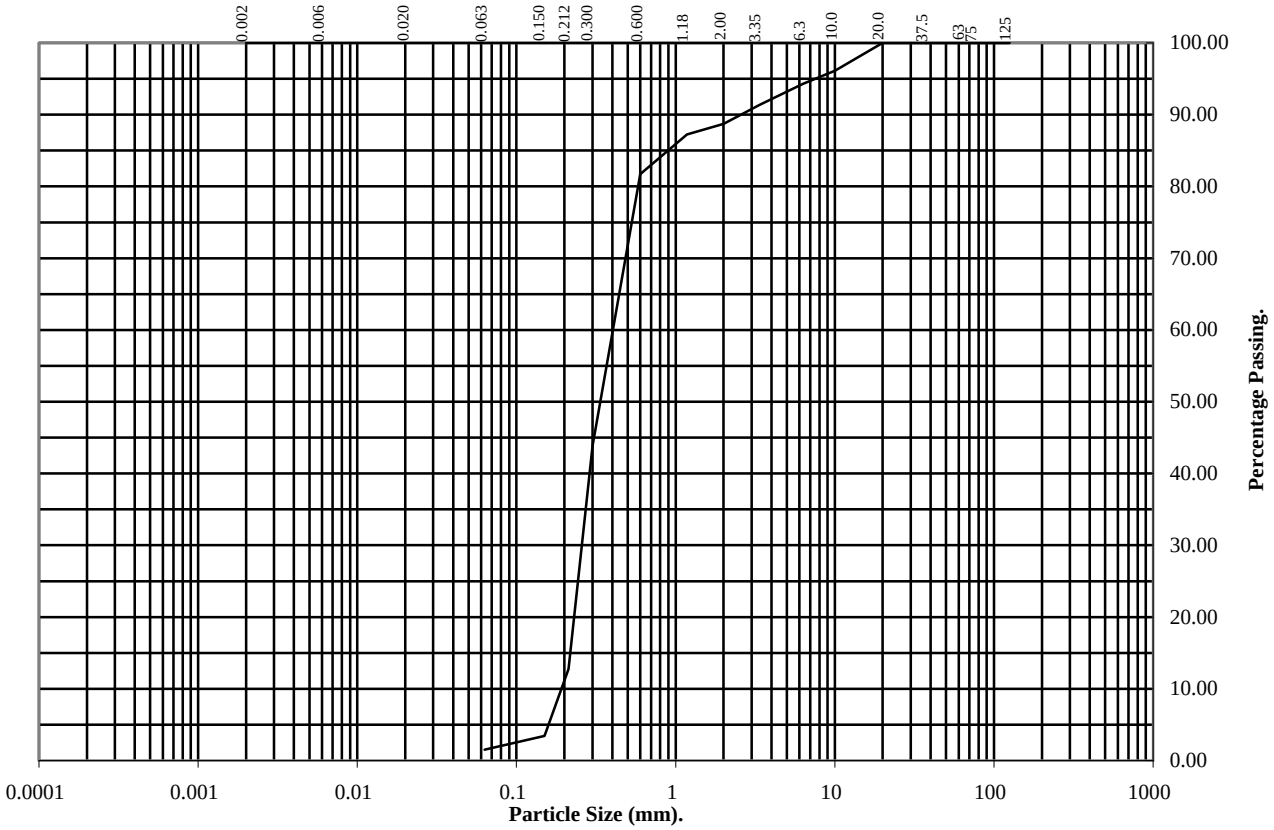
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **SA4** **Depth (m):** **17.00-17.50**

Sample Number: **37** **Sample Type:** **B**



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	96
6.3	94
3.35	91
2	89
1.18	87
0.6	82
0.3	44
0.212	13
0.15	3
0.063	2

Soil Fraction	Total Percentage
Cobbles	0
Gravel	11
Sand	87
Silt / Clay	2

Remarks:
See summary of soils descriptions.

[redacted]

PSL Professional Soils Laboratory	**FRODSHAM.**	**Contract No.: PSL13/4179**

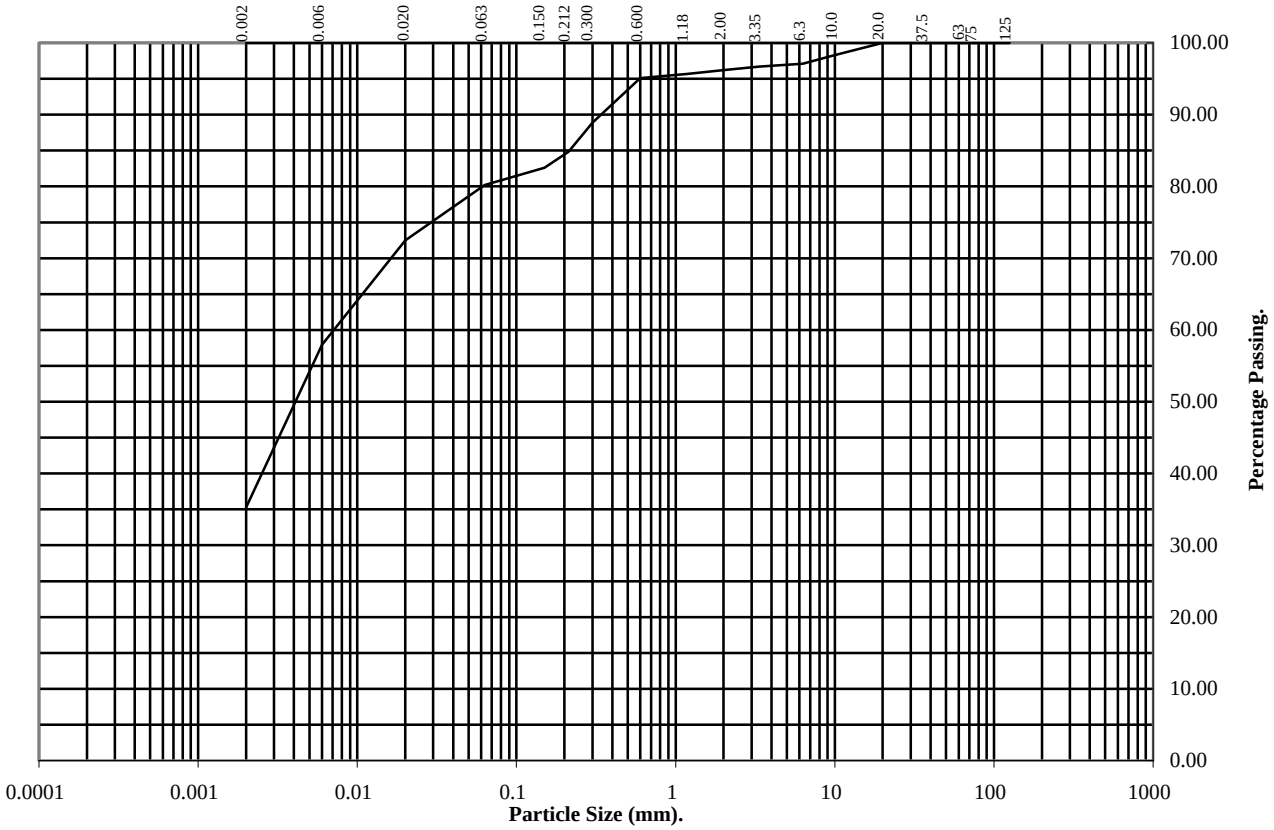
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **SA5** **Depth (m):** **1.20-1.70**

Sample Number: **6** **Sample Type:** **B**



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	98
6.3	97
3.35	97
2	96
1.18	96
0.6	95
0.3	89
0.212	85
0.15	83
0.063	80

Particle Diameter	Percentage Passing
0.02	72
0.006	58
0.002	35

Soil Fraction	Total Percentage
Cobbles	0
Gravel	4
Sand	16
Silt	45
Clay	35

Remarks:
See summary of soils descriptions.

[redacted]

PSL Professional Soils Laboratory	**FRODSHAM.**	**Contract No.: PSL13/4179**

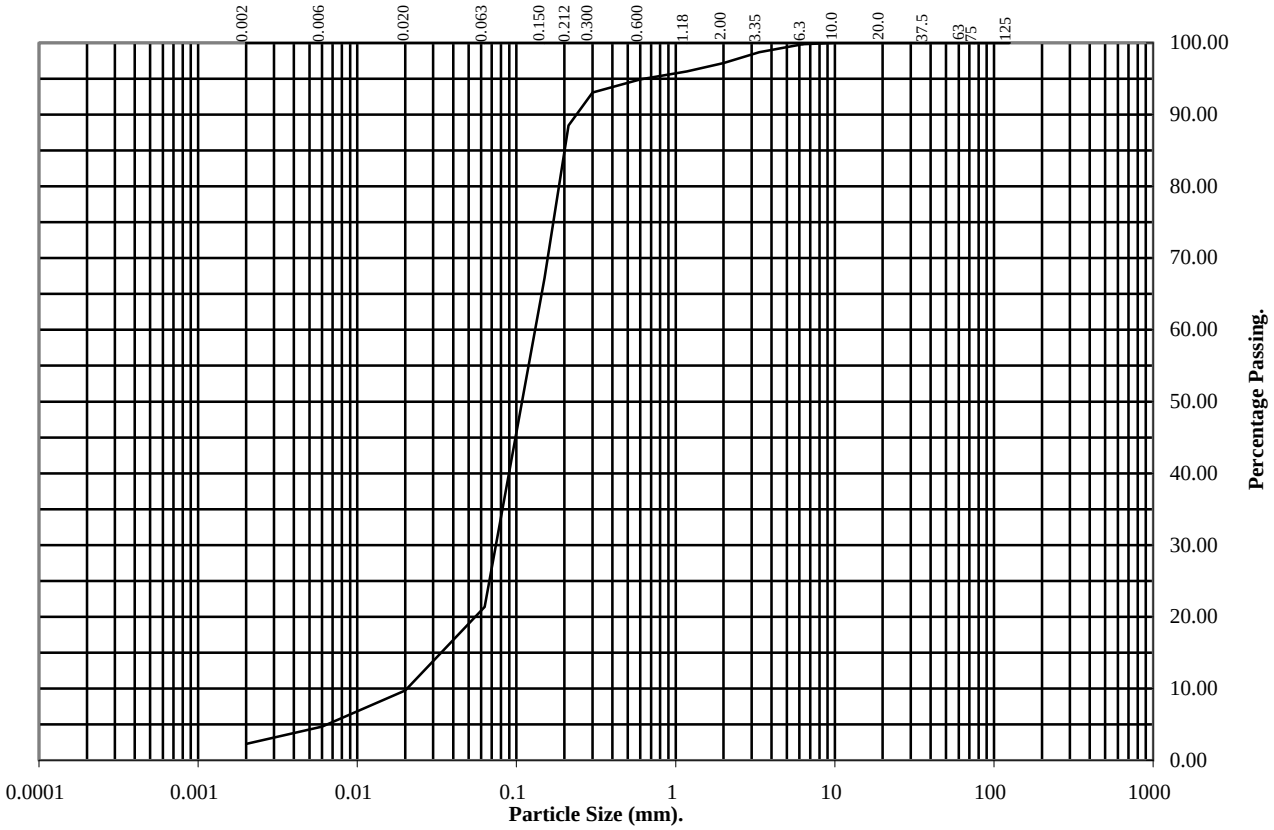
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **SA5** **Depth (m):** **3.40-3.90**

Sample Number: **11** **Sample Type:** **B**



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	99
2	97
1.18	96
0.6	95
0.3	93
0.212	88
0.15	67
0.063	21

Particle Diameter	Percentage Passing
0.02	10
0.006	5
0.002	2

Soil Fraction	Total Percentage
Cobbles	0
Gravel	3
Sand	76
Silt	19
Clay	2

Remarks:
See summary of soils descriptions.

[redacted]

PSL Professional Soils Laboratory	**FRODSHAM.**	**Contract No.: PSL13/4179**

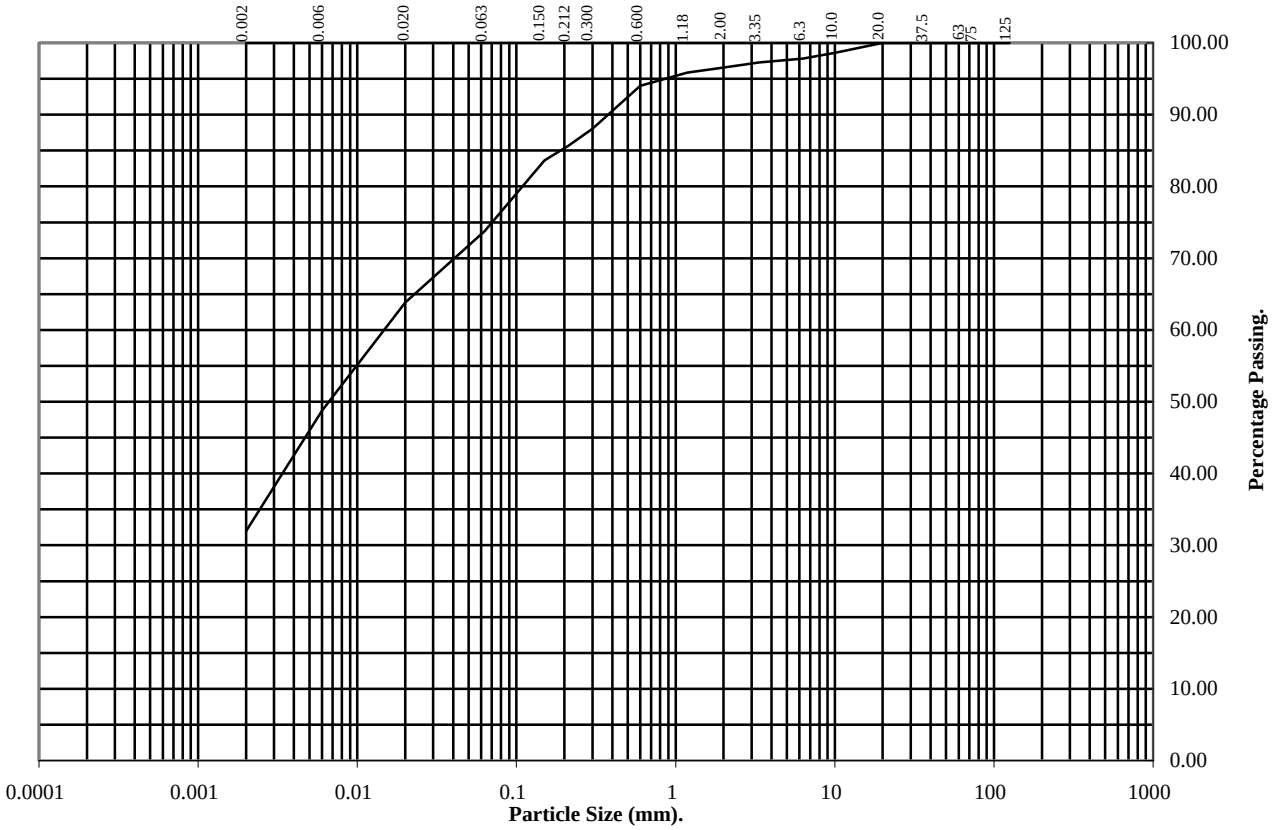
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **SA5** **Depth (m):** **16.00-16.50**

Sample Number: **35** **Sample Type:** **B**



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	99
6.3	98
3.35	97
2	97
1.18	96
0.6	94
0.3	88
0.212	86
0.15	84
0.063	74

Particle Diameter	Percentage Passing
0.02	64
0.006	49
0.002	32

Soil Fraction	Total Percentage
Cobbles	0
Gravel	3
Sand	23
Silt	42
Clay	32

Remarks:
See summary of soils descriptions.

[redacted]

PSL Professional Soils Laboratory	**FRODSHAM.**	**Contract No.: PSL13/4179**

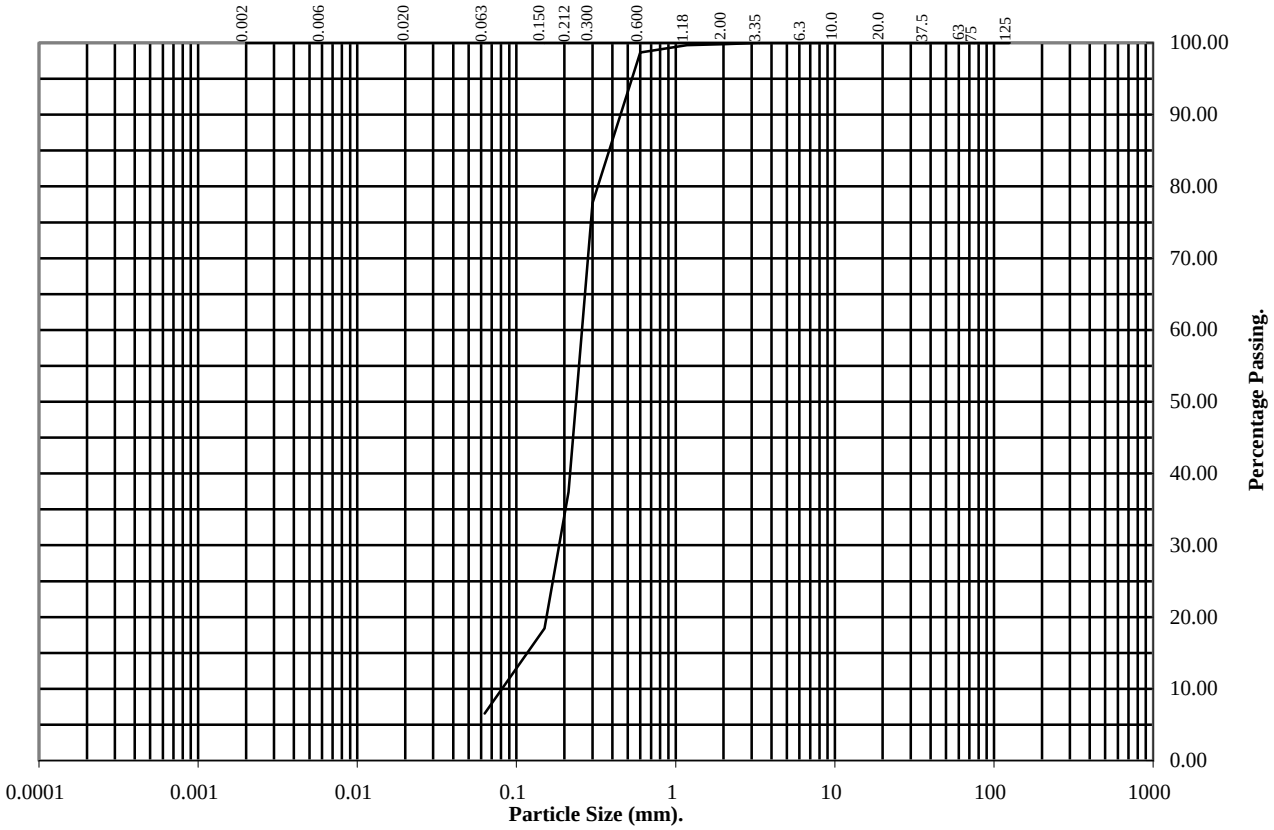
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **SA5** **Depth (m):** **27.00-27.50**

Sample Number: **54** **Sample Type:** **B**



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2	100
1.18	100
0.6	99
0.3	78
0.212	37
0.15	18
0.063	7

Soil Fraction	Total Percentage
Cobbles	0
Gravel	0
Sand	93
Silt / Clay	7

Remarks:

See summary of soils descriptions.

[redacted]

PSL Professional Soils Laboratory	**FRODSHAM.**	**Contract No.: PSL13/4179**

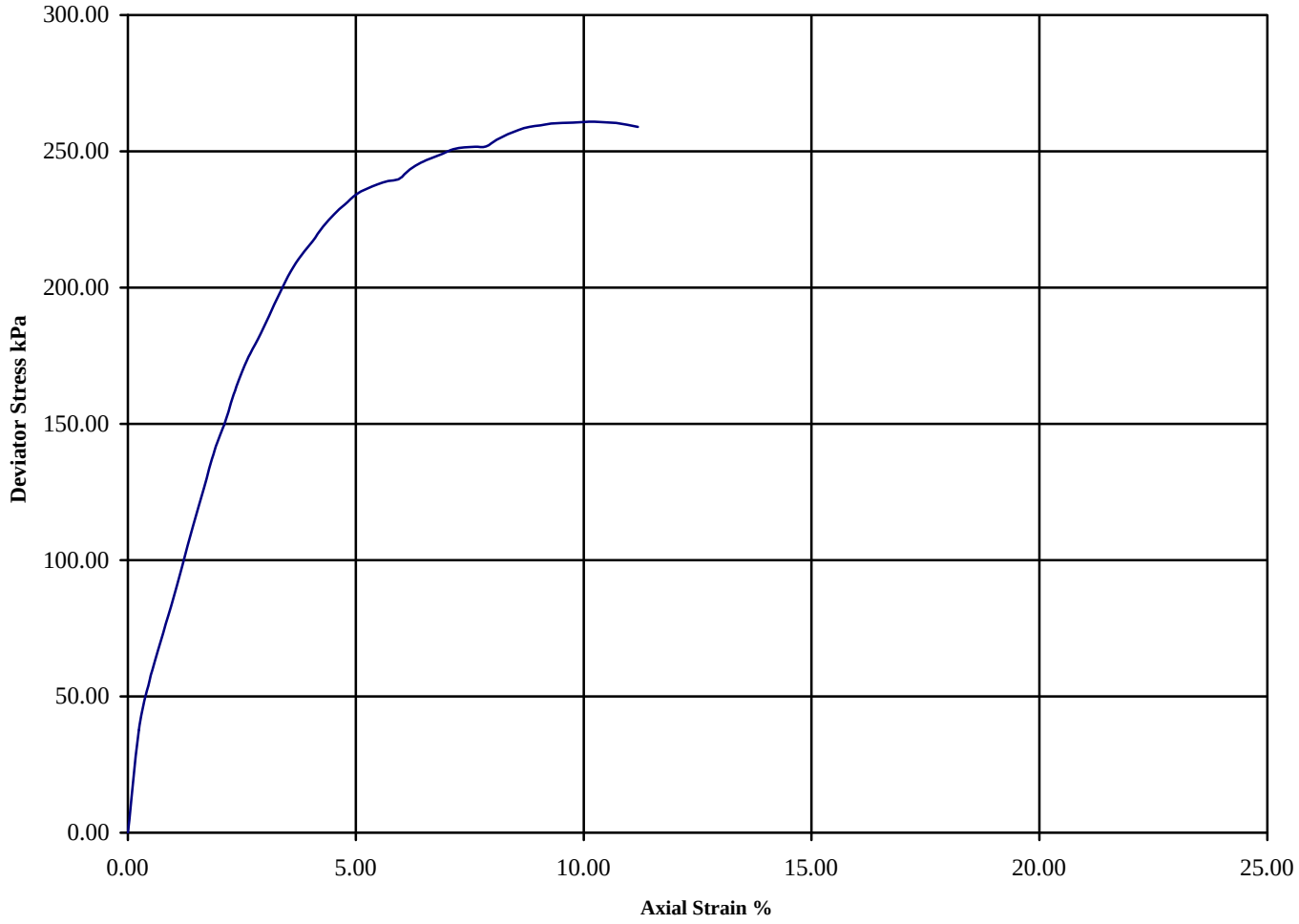
Undrained Shear Strength in Triaxial Compression

without measurement of Pore Pressure

B.S. 1377 : Part7 : Clause 9 : 1990

Hole Number: SA4 **Depth (m):** 25.60-26.05

Sample Number: 51 **Sample Type:** U



Diameter (mm):		102	Height (mm):		210	Test:	100mm Multistage		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Remarks
A	26	2.03	1.61	350	240	120	6.0	Brittle	Sample taken from top of tube Rate of strain = 1.9 %/min Latex Membrane used 0.2 mm thickness Membrane Correction applied (kPa) 0.36 0.36 0.35
				450	252	126	7.6		See summary of soil descriptions
				550	261	130	10.2		

[redacted]

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FRODSHAM.

PSL13/4179

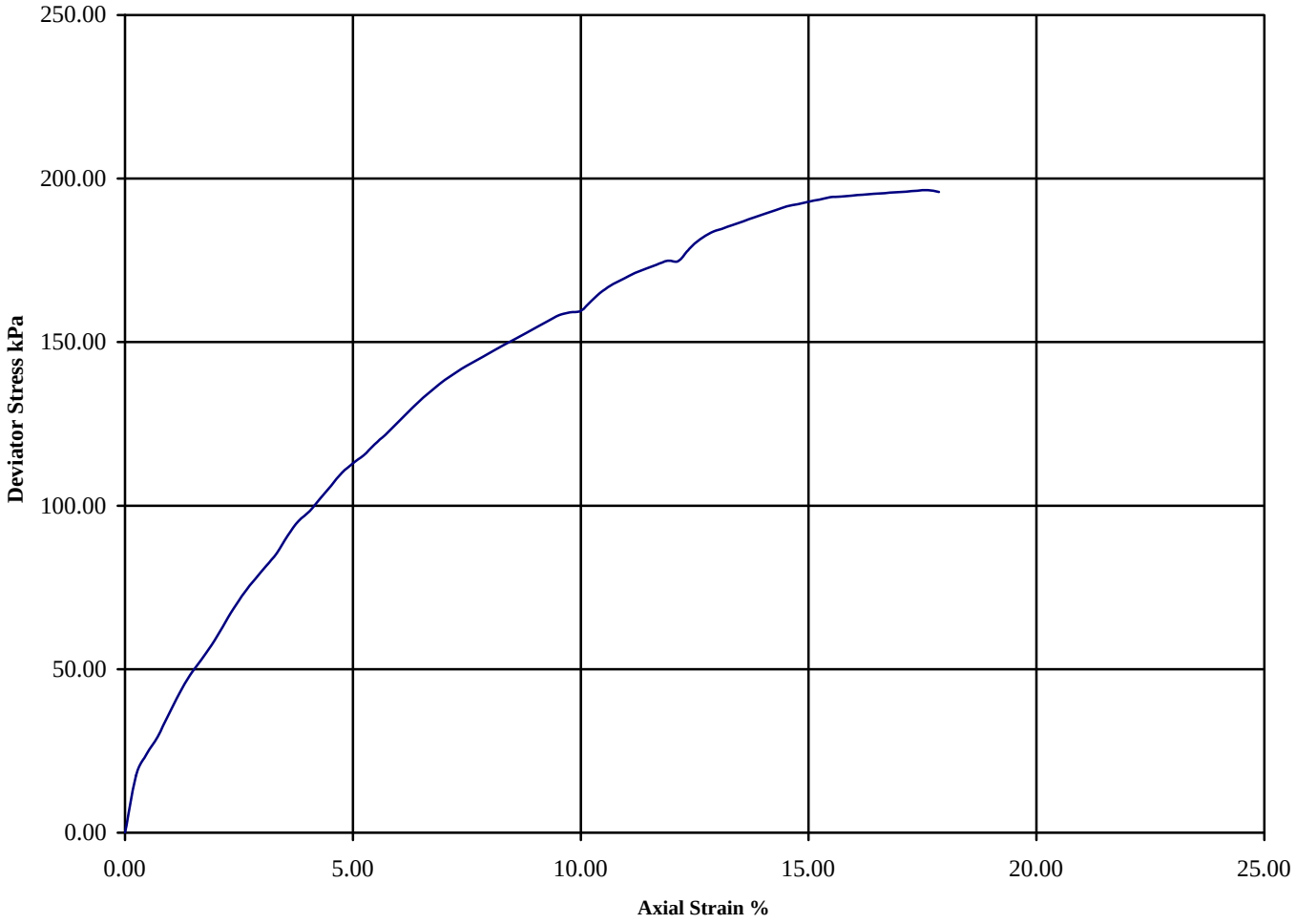
Undrained Shear Strength in Triaxial Compression

without measurement of Pore Pressure

B.S. 1377 : Part7 : Clause 9 : 1990

Hole Number: SA5 **Depth (m):** 33.00-33.45

Sample Number: 61 **Sample Type:** U



Diameter (mm):		102	Height (mm):		210	Test:	100mm Multistage		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Remarks
A	23	2.08	1.69	400	160	80	10.0	Compound	Sample taken from top of tube Rate of strain = 1.9 %/min Latex Membrane used 0.2 mm thickness Membrane Correction applied (kPa) 0.35 0.35 0.34
				550	175	87	11.9		See summary of soil descriptions.
				700	197	98	17.6		

[redacted]

PSL Professional Soils Laboratory

FRODSHAM.

Contract No: PSL13/4179

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Professional Soils Laboratory

LABORATORY REPORT

UKAS TESTING
4043

Contract Number: PSL13/4679

Client's Reference: Report Date: 27 November 2013

Client Name: Van Elle Ltd
Kirkby Lane
Pinxton
Nottinghamshire

NG16 6JA

For the attention of: Jordan Chapman

Contract Title: Frodsham Wind Farm

Date Received: 20/11/2013
Date Commenced: 20/11/2013
Date Completed: 27/11/2013

Notes: Observations and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

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fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Depth m	Description of Sample
WS5	5	D	2.00	Brown slightly sandy very silty CLAY.
WS5	8	D	4.40	Brown mottled grey slightly sandy very silty CLAY.
WS6	6	D	1.80	Brown mottled grey slightly sandy very silty CLAY.
WS6	9	D	3.80	Brown sandy very silty CLAY.

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Professional Soils Laboratory

[redacted]

FRODSHAM WIND FARM.

Contract No:

Client Ref: G131520

SUMMARY OF SOIL CLASSIFICATION TESTS

(B.S. 1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Depth m	Moisture Content % Clause 3.2	Bulk Density Mg/m^3 Clause 7.2	Dry Density Mg/m^3 Clause 7.2	Particle Density Mg/m^3 Clause 8.	Liquid Limit % Clause 4.3/4.4	Plastic Limit % Clause 5.	Plasticity Index % Clause 5.4	% Passing .425mm	Remarks
WS5	5	D	2.00	51				96	41	55	100	Extremely high plasticity CE.
WS5	8	D	4.40	81				100	35	65	100	Extremely high plasticity CE.
WS6	6	D	1.80	54				62	30	32	100	High plasticity CH.
WS6	9	D	3.80	33				47	25	22	100	Intermediate plasticity CI.

SYMBOLS : NP : Non Plastic

PSL
Professional Soils Laboratory

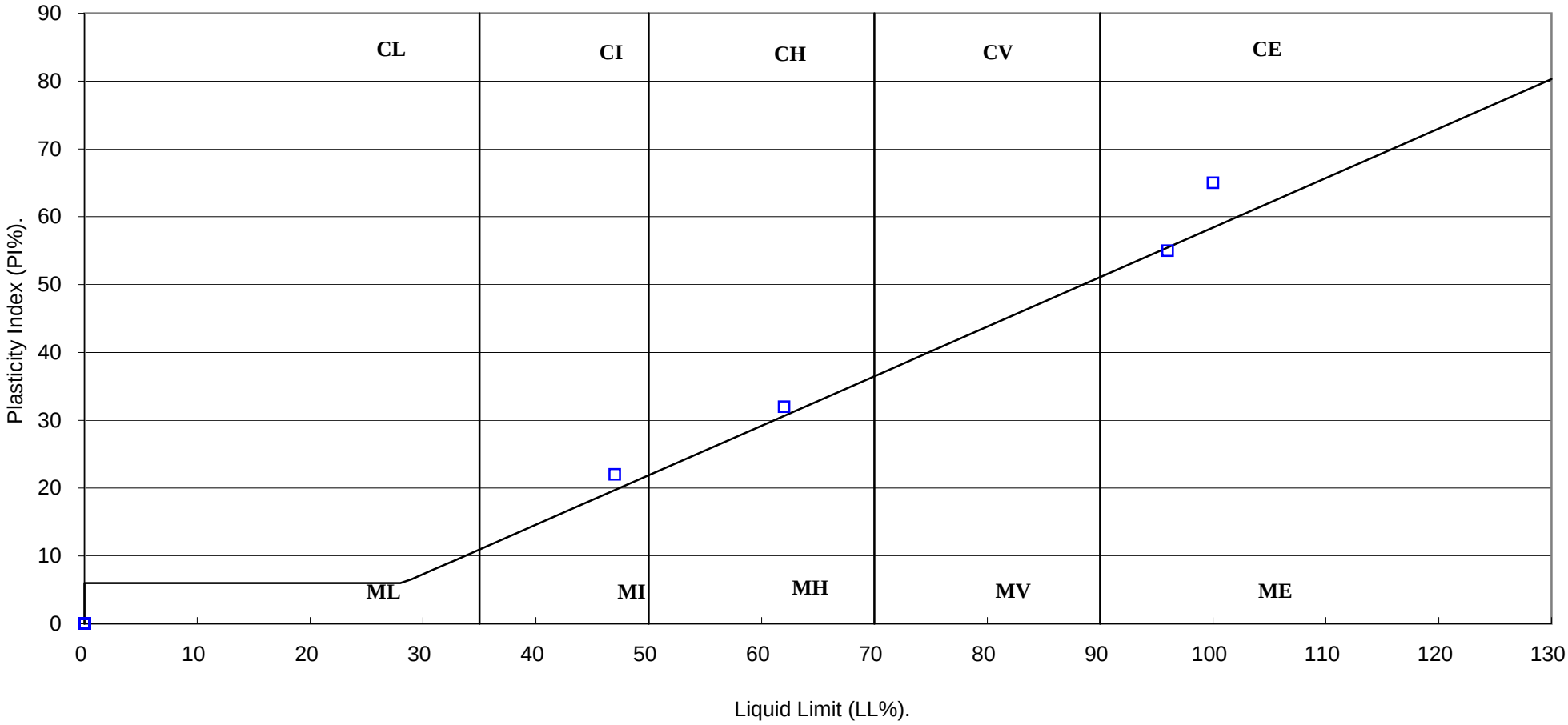
[redacted]

FRODSHAM WIND FARM.

Client Ref: G131520

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

(B.S.5930 : 1999)



Professional Soils Laboratory

FRODSHAM WIND FARM.

Client Ref: **G131520**

PSL
Professional Soils Laboratory

LABORATORY REPORT

UKAS TESTING
4043

Contract Number: PSL13/4403

Client's Reference: Report Date: 20 December 2013

Client Name: Van Elle Ltd
Kirkby Lane
Pinxton
Nottinghamshire

NG16 6JA

For the attention of: Jordan Chapman

Contract Title: Frodsham Wind Farm

Date Received: 8/11/2013
Date Commenced: 8/11/2013
Date Completed: 19/11/2013

Notes: Observations and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

[redacted]

(Director) (Director) (Laboratory Manager)

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tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Depth m	Description of Sample
SA3		D	25.0-2.45	Brown sandy CLAY.
SA3	57	U	28.00-28.45	Brown slightly gravelly very sandy CLAY.
SA4	56/58	D	27.60-29.10	Brown gravelly very sandy CLAY.

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Professional Soils Laboratory

[redacted]

FRODSHAM WIND FARM.

Client Ref: G131520

SUMMARY OF SOIL CLASSIFICATION TESTS

(B.S. 1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Depth m	Moisture Content % Clause 3.2	Bulk Density Mg/m^3 Clause 7.2	Dry Density Mg/m^3 Clause 7.2	Particle Density Mg/m^3 Clause 8.	Liquid Limit % Clause 4.3/4.4	Plastic Limit % Clause 5.	Plasticity Index % Clause 6.	% Passing .425mm	Remarks
SA3		D	25.0-2.45	21				34	17	17	100	Low plasticity CL.

SYMBOLS : **NP : Non Plastic** *** : L**

[redacted]

PSL
Professional Soils Laboratory

FRODSHAM WIND FARM.

Contract No:	**PSL13/4403**
Client Ref:	**G131520**

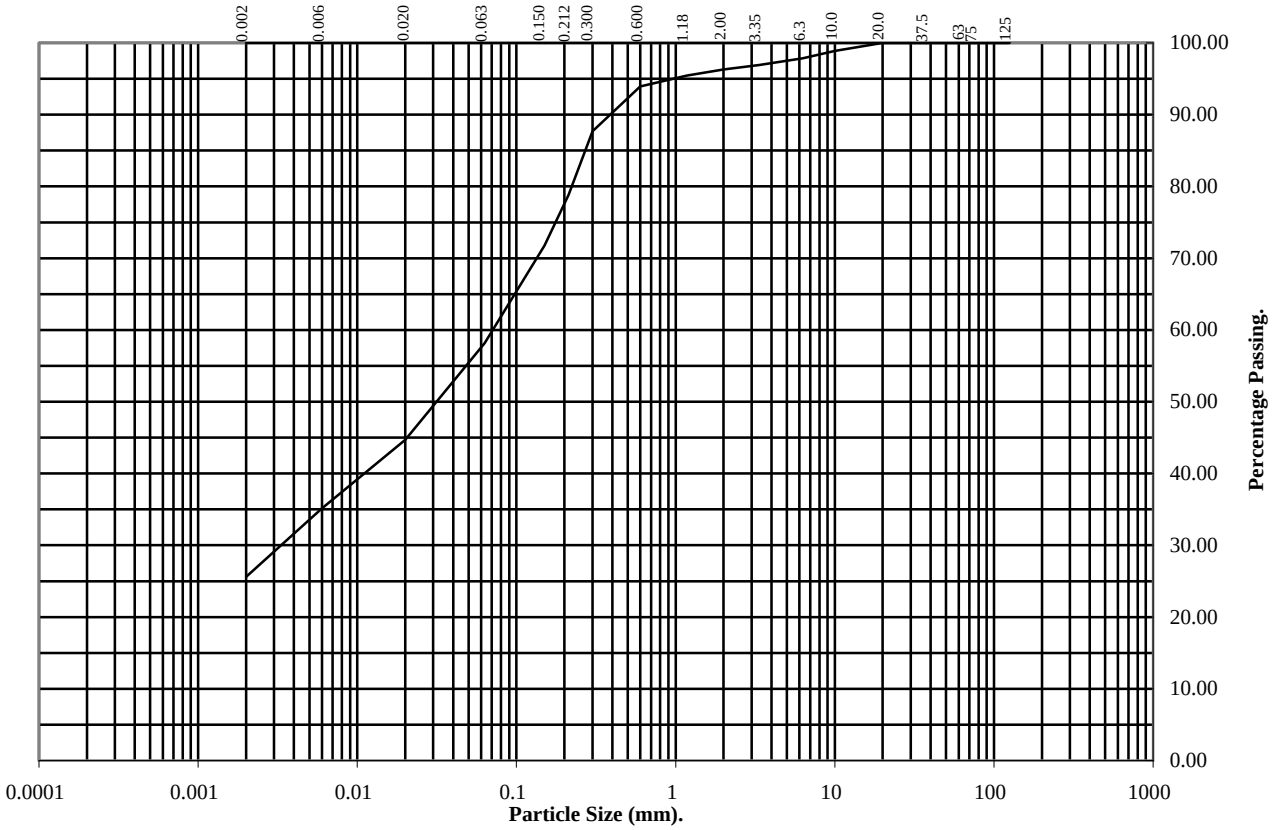
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **SA3** **Depth (m):** **28.00-28.45**

Sample Number: **57** **Sample Type:** **U**



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	99
6.3	98
3.35	97
2	96
1.18	95
0.6	94
0.3	88
0.212	79
0.15	72
0.063	58

Particle Diameter	Percentage Passing
0.02	45
0.006	35
0.002	26

Soil Fraction	Total Percentage
Cobbles	0
Gravel	4
Sand	38
Silt	32
Clay	26

Remarks:
See summary of soils descriptions.

[redacted]

PSL Professional Soils Laboratory	FRODSHAM WIND FARM.	Contract No.: PSL13/4403

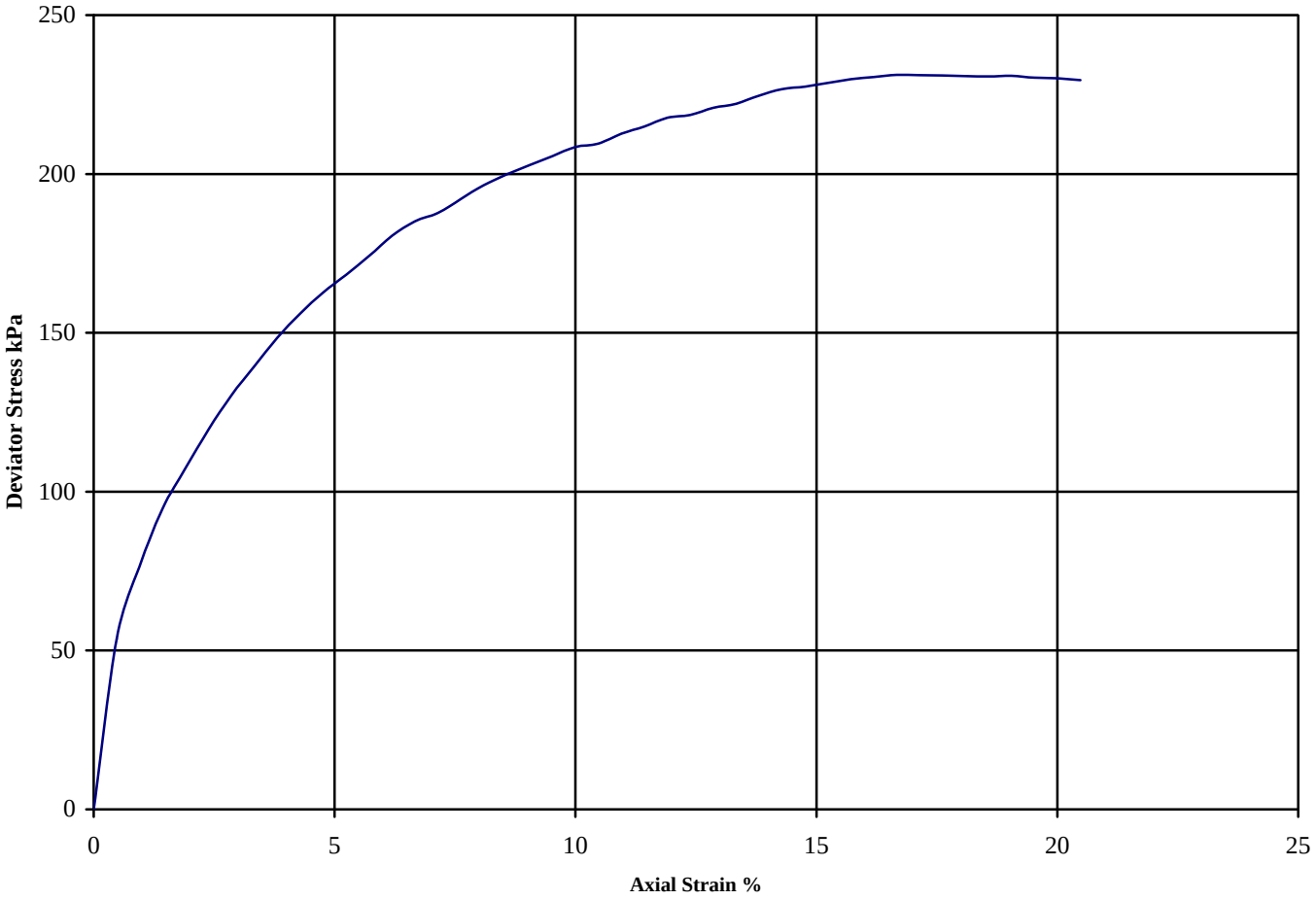
Undrained Shear Strength in Triaxial Compression

without measurement of Pore Pressure

B.S. 1377 : Part7 : Clause 8 : 1990

Hole Number: SA3 **Depth (m):** 28.00-28.45

Sample Number: 57 **Sample Type:** U



Diameter (mm):		102.0	Height (mm):		210.0	Test:	100 mm Single Stage. Undisturbed		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Remarks
A	15	2.19	1.90	560	231	116	16.7	Plastic	Sample taken from top of tube Rate of strain = 1.9 %/min Latex Membrane used 0.2 mm thickness, Correction applied 0.34 kPa See summary of soil descriptions

[redacted]

PSL Professional Soils Laboratory

FRODSHAM WIND FARM.

Contract No: PSL13/4403

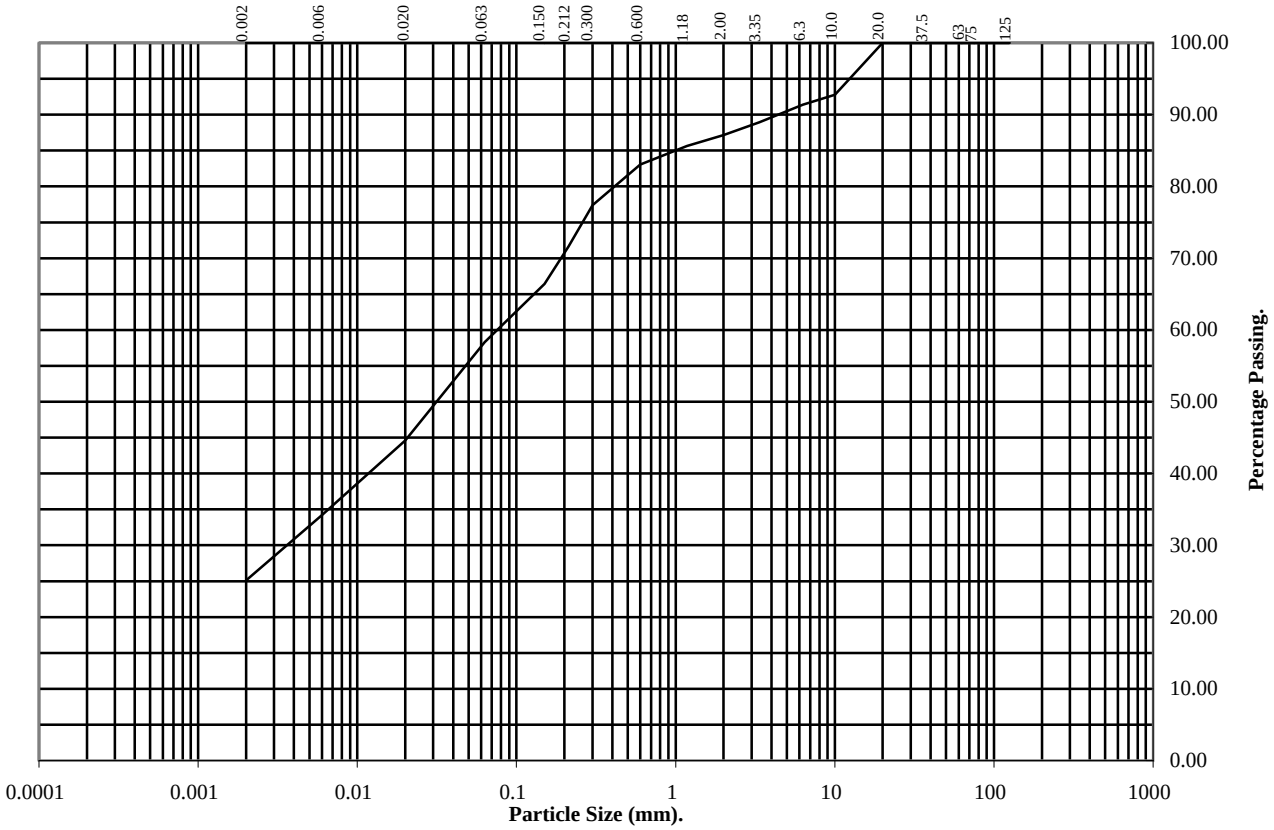
Particle Size Distribution Test

BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **SA4** **Depth (m):** **27.60-29.10**

Sample Number: **56** **Sample Type:** **D**



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	93
6.3	91
3.35	89
2	87
1.18	86
0.6	83
0.3	77
0.212	72
0.15	66
0.063	58

Particle Diameter	Percentage Passing
0.02	45
0.006	34
0.002	25

Soil Fraction	Total Percentage
Cobbles	0
Gravel	13
Sand	29
Silt	33
Clay	25

Remarks:
See summary of soils descriptions.

[redacted]

PSL Professional Soils Laboratory	FRODSHAM WIND FARM.	Contract No.: PSL13/4403

Appendix 3

Gas and Groundwater Monitoring Results, November 2013

Gas and Groundwater monitoring results for the Frodsham Wind Farm Site. Data collected by Wardell Armstrong LLP.

Table 1. Gas and Groundwater monitoring results - 8th November 2013

Job No. ST13418 Site: Frodsham Windfarm Date: 08 November 2013

Atmospheric Pressure: Start: 1002 mb End: 999 mb Monitoring Equipment: Gas Data GFM436 Gas Analyser

BH Ref	Steady State						Flow (l/hr)	Peak Flow (l/hr)	Differential Pressure (Pa)	Depth to liquid (mbgl)	Depth to base (mbgl)	Groundwater field tests				Notes
	CH4 (% v/v)	CO2 (% v/v)	O2 (% v/v)	Hex (% v/v)	CO (ppm)	H2S (ppm)						pH	Electrical Conductivity (µs)	Dissolved Oxygen (ppm)	Temp (˚C)	
SA5	66.5	9.9	2.7	1.074	0	0	3	4.6	10	1.41	5.28					Standpipe bent so could not reach water with bailer.
SA4	17.7	6.3	14.7	0.508	0	0	3.1	3.1	14	0.2	5.17	6.8	>3995	2.39	10	Purged 30 litres
SA3	0	0.2	19.5	0.023	1	0	2.8	3	13	0.15	28.8	8.5	492	2.27	10	Purged 90 litres
SA2	27.7	6.6	12.6	0.641	0	0	3.2	5.5	14	0.6	5.63	12.4	>3995	0.82	9.7	Purged 30 litres
SA1	SA1 not sampled due to being given the wrong key for the borehole covers by the contractor and ran out of time breaking in to the boreholes															

Table 2. Gas and Groundwater monitoring results - 18th November 2013

Job No. ST13418 Site: Frodsham Windfarm Date: 18 November 2013

Atmospheric Pressure: Start: 1010 mb End: 1008 mb Monitoring Equipment: Gas Data GFM436 Gas Analyser

BH Ref	Steady State						Flow (l/hr)	Peak Flow (l/hr)	Differential Pressure (Pa)	Depth to liquid (mbgl)	Depth to base (mbgl)	Groundwater field tests				Notes
	CH4 (% v/v)	CO2 (% v/v)	O2 (% v/v)	Hex (% v/v)	CO (ppm)	H2S (ppm)						pH	Electrical Conductivity (µs)	Dissolved Oxygen (ppm)	Temp (˚C)	
SA1							>120	>120	>1000	2.96	27.44	7.25	>3995	0.33	9.4	Purged 75 litres. Gas analyser set up incorrectly, gas volumes invalid
SA1							57	59.8	919							Gas flow measured after water sampling, 30 mins later.
SA3	0.4	0.2	19.3	0.079	0	0	0.3	0.3	2	0.2	28.97	8.23	518	2.08	9.9	Purged 90 litres
SA2	86.7	12.7	0.5	1.307	0	0	0.4	0.8	5	0.4	5.46	7.18	>3995	1.83	8.5	Purged 30 litres
SA1	85.7	14.6	0	1.275	0	0	117	117	>1000							Gas resampled
SA4	40.2	7.1	11.6	0.791	0	0	0.15	0.3	1	0.24	5.1	6.8	>3995	1.96	9.9	Purged 30 litres
SA5	13	4.5	15.4	0.435	0	0	0.1	0.1	1	0.52	5.43	7.11	2545	1.63	9.9	Purged 30 litres

Appendix 4

Geochemical Laboratory Results, ALcontrol, October and November 2013

ALcontrol Laboratories

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: mkt@alcontrol.com
Website: www.alcontrol.com

Wardell Armstrong LLP
Sir Henry Doulton House
Forge Lane
Etruria
Stoke on Trent
Staffordshire
ST1 5BD

Attention: Tim Cawood

CERTIFICATE OF ANALYSIS

Date:	25 November 2013
Customer:	H_WARDELL_SKT
Sample Delivery Group (SDG):	130927-147
Your Reference:	ST13418
Location:	Frodsham
Report No:	251110

We received 31 samples on Friday September 27, 2013 and 25 of these samples were scheduled for analysis which was completed on Monday November 25, 2013. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

[redacted]

Operations Manager

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
8178174	SA2-1		0.50 - 1.00	27/09/2013
8178179	SA2-2		8.00 - 8.50	27/09/2013
8178184	SA2-3		13.00 - 13.00	27/09/2013
8178210	WS1-1		2.75 - 2.75	16/09/2013
8178215	WS1-2		4.50 - 4.50	16/09/2013
8178087	WS2-1		1.10 - 1.10	24/09/2013
8178093	WS2-2		2.80 - 2.80	24/09/2013
8178116	WS3-1		2.20 - 2.20	24/09/2013
8178122	WS3-2		3.10 - 3.10	24/09/2013
8178195	WS4-1		2.30 - 2.30	27/09/2013
8178200	WS4-2		0.60 - 0.60	27/09/2013
8178098	WS7-1		2.20 - 2.20	24/09/2013
8178103	WS7-2		4.40 - 4.40	24/09/2013
8178110	WS8-1		3.60 - 3.60	24/09/2013
8178132	WS10-1		1.60 - 1.60	12/09/2013
8178189	WS10-2		2.60 - 2.60	12/09/2013
8178071	WS11-1		0.25 - 0.25	12/09/2013
8178205	WS11-2		3.60 - 3.60	12/09/2013
8178082	WS12-1		0.80 - 0.80	16/09/2013
8178220	WS12-2		3.80 - 3.80	16/09/2013
8178076	WS13-1		2.25 - 2.25	16/09/2013
8178225	WS14-1		1.50 - 1.50	16/09/2013
8178230	WS15-1		1.80 - 1.80	16/09/2013
8178143	WS17-1		2.60 - 2.60	27/09/2013
8178148	WS17-2		4.60 - 4.60	27/09/2013
8178153	WS18-1		2.20 - 2.20	27/09/2013
8178158	WS18-2		2.90 - 2.90	27/09/2013
8178127	WS19-1		2.50 - 2.50	27/09/2013
8178138	WS19-2		3.50 - 3.50	27/09/2013
8178163	WS20-1		2.10 - 2.10	27/09/2013
8178169	WS20-2		4.00 - 4.00	27/09/2013

Only received samples which have had analysis scheduled will be shown on the following pages.

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

SOLID

Results Legend

X **Test**

N **No Determination Possible**

Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container	NDPs / Tests
8178174	SA2-1		0.50 - 1.00	250g Amber Jar (AL	
8178184	SA2-3		13.00 - 13.00	400g Tub (ALE214)	
8178210	WS1-1		2.75 - 2.75	250g Amber Jar (AL	
8178215	WS1-2		4.50 - 4.50	400g Tub (ALE214)	
8178087	WS2-1		1.10 - 1.10	250g Amber Jar (AL	
8178093	WS2-2		2.80 - 2.80	400g Tub (ALE214)	
8178116	WS3-1		2.20 - 2.20	250g Amber Jar (AL	
8178122	WS3-2		3.10 - 3.10	400g Tub (ALE214)	
8178195	WS4-1		2.30 - 2.30	250g Amber Jar (AL	
8178200	WS4-2		0.60 - 0.60	400g Tub (ALE214)	
8178098	WS7-1		2.20 - 2.20	250g Amber Jar (AL	
8178110	WS8-1		3.60 - 3.60	400g Tub (ALE214)	
8178132	WS10-1		1.60 - 1.60	250g Amber Jar (AL	
8178189	WS10-2		2.60 - 2.60	400g Tub (ALE214)	
8178071	WS11-1		0.25 - 0.25	250g Amber Jar (AL	
8178205	WS11-2		3.60 - 3.60	400g Tub (ALE214)	
8178082	WS12-1		0.80 - 0.80	250g Amber Jar (AL	
8178076	WS13-1		2.25 - 2.25	400g Tub (ALE214)	
8178225	WS14-1		1.50 - 1.50	250g Amber Jar (AL	

| | | | | |

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

SOLID

Results Legend

X Test

N No Determination Possible

Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container	Analysis	Method	Status	NDPs / Tests
8178174	SA2-1		0.50 - 1.00	250g Amber Jar (AL	Magnesium (BRE)	All		NDPs: 0 Tests: 9
8178184	SA2-3		13.00 - 13.00	400g Tub (ALE214)				
8178210	WS1-1		2.75 - 2.75	250g Amber Jar (AL				
8178215	WS1-2		4.50 - 4.50	400g Tub (ALE214)				
8178087	WS2-1		1.10 - 1.10	250g Amber Jar (AL				
8178093	WS2-2		2.80 - 2.80	400g Tub (ALE214)				
8178116	WS3-1		2.20 - 2.20	250g Amber Jar (AL				
8178122	WS3-2		3.10 - 3.10	400g Tub (ALE214)				
8178195	WS4-1		2.30 - 2.30	250g Amber Jar (AL				
8178200	WS4-2		0.60 - 0.60	400g Tub (ALE214)				
8178098	WS7-1		2.20 - 2.20	60g VOC (ALE215)				
8178110	WS8-1		3.60 - 3.60	250g Amber Jar (AL				
8178132	WS10-1		1.60 - 1.60	400g Tub (ALE214)				
8178189	WS10-2		2.60 - 2.60	250g Amber Jar (AL				
8178071	WS11-1		0.25 - 0.25	400g Tub (ALE214)				
8178205	WS11-2		3.60 - 3.60	250g Amber Jar (AL				
8178082	WS12-1		0.80 - 0.80	60g VOC (ALE215)				
8178076	WS13-1		2.25 - 2.25	250g Amber Jar (AL				
8178225	WS14-1		1.50 - 1.50	400g Tub (ALE214)				
				60g VOC (ALE215)				
				250g Amber Jar (AL				
				250g Amber Jar (AL	Mercury Dissolved	All		NDPs: 0 Tests: 4
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				250g Amber Jar (AL				
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				60g VOC (ALE215)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				60g VOC (ALE215)				
				250g Amber Jar (AL				
				250g Amber Jar (AL	Metals in solid samples by OES	All		NDPs: 0 Tests: 17
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				250g Amber Jar (AL				
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				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				60g VOC (ALE215)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				60g VOC (ALE215)				
				250g Amber Jar (AL				
				250g Amber Jar (AL	NO3, NO2 and TON by KONE (s)	All		NDPs: 1 Tests: 8
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
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				60g VOC (ALE215)				
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				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				60g VOC (ALE215)				
				250g Amber Jar (AL				
				250g Amber Jar (AL	NRA Leachate	All		NDPs: 0 Tests: 2
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
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				60g VOC (ALE215)				
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				250g Amber Jar (AL				
				400g Tub (ALE214)				
				60g VOC (ALE215)				
				250g Amber Jar (AL				
				250g Amber Jar (AL	PAH by GCMS	All		NDPs: 0 Tests: 17
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				250g Amber Jar (AL				
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				250g Amber Jar (AL				
				400g Tub (ALE214)				
				60g VOC (ALE215)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				60g VOC (ALE215)				
				250g Amber Jar (AL				
				250g Amber Jar (AL	PAH in waters by GC-MS (diss.filt)	All		NDPs: 0 Tests: 4
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				250g Amber Jar (AL				
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				400g Tub (ALE214)				
				60g VOC (ALE215)				
				250g Amber Jar (AL				
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				250g Amber Jar (AL				
				400g Tub (ALE214)				
				60g VOC (ALE215)				
				250g Amber Jar (AL				
				250g Amber Jar (AL	PCBs by GCMS	All		NDPs: 0 Tests: 8
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
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				60g VOC (ALE215)				
				250g Amber Jar (AL				
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				250g Amber Jar (AL				
				400g Tub (ALE214)				
				60g VOC (ALE215)				
				250g Amber Jar (AL				
				250g Amber Jar (AL	pH	All		NDPs: 0 Tests: 21
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				250g Amber Jar (AL				
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				250g Amber Jar (AL				
				400g Tub (ALE214)				
				60g VOC (ALE215)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				60g VOC (ALE215)				
				250g Amber Jar (AL				
				250g Amber Jar (AL	pH Value of Filtered Water	All		NDPs: 0 Tests: 4
				400g Tub (ALE214)				
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				400g Tub (ALE214)				
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				400g Tub (ALE214)				
				60g VOC (ALE215)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				60g VOC (ALE215)				
				250g Amber Jar (AL				
				250g Amber Jar (AL	Phenols by HPLC (S)	All		NDPs: 0 Tests: 17
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
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				250g Amber Jar (AL				
				400g Tub (ALE214)				
				60g VOC (ALE215)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				60g VOC (ALE215)				
				250g Amber Jar (AL				
				250g Amber Jar (AL	Phenols by HPLC (W)	All		NDPs: 0 Tests: 4
				400g Tub (ALE214)				
				250g Amber Jar (AL				
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				400g Tub (ALE214)				
				60g VOC (ALE215)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				60g VOC (ALE215)				
				250g Amber Jar (AL				
				250g Amber Jar (AL	Sample description	All		NDPs: 0 Tests: 25
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
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				400g Tub (ALE214)				
				250g Amber Jar (AL				
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				250g Amber Jar (AL				
				400g Tub (ALE214)				
				60g VOC (ALE215)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				60g VOC (ALE215)				
				250g Amber Jar (AL				
				250g Amber Jar (AL	Sulphide	All		NDPs: 0 Tests: 4
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
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				250g Amber Jar (AL				
				400g Tub (ALE214)				
				60g VOC (ALE215)				
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				250g Amber Jar (AL				
				400g Tub (ALE214)				
				60g VOC (ALE215)				
				250g Amber Jar (AL				
				250g Amber Jar (AL	Sulphur Dissolved by ICP-OES	All		NDPs: 0 Tests: 4
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				60g VOC (ALE215)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				250g Amber Jar (AL				
				400g Tub (ALE214)				
				60g VOC (ALE215)				
				250g Amber Jar (AL				

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

SOLID

Results Legend

X Test

N No Determination Possible

Lab Sample No(s)	8178174	8178184	8178210	8178215	8178087	8178093	8178116	8178122	8178195	8178200	8178098	8178110	8178132	8178189	8178071	8178205	8178082	8178076	8178225
Customer Sample Reference	SA2-1	SA2-3	WS1-1	WS1-2	WS2-1	WS2-2	WS3-1	WS3-2	WS4-1	WS4-2	WS7-1	WS8-1	WS10-1	WS10-2	WS11-1	WS11-2	WS12-1	WS13-1	WS14-1
AGS Reference																			
Depth (m)	0.50 - 1.00	13.00 - 13.00	2.75 - 2.75	4.50 - 4.50	1.10 - 1.10	2.80 - 2.80	2.20 - 2.20	3.10 - 3.10	2.30 - 2.30	0.60 - 0.60	2.20 - 2.20	3.60 - 3.60	1.60 - 1.60	2.60 - 2.60	0.25 - 0.25	3.60 - 3.60	0.80 - 0.80	2.25 - 2.25	1.50 - 1.50
Container	250g Amber Jar (AL	400g Tub (ALE214)	250g Amber Jar (AL	400g Tub (ALE214)	250g Amber Jar (AL	400g Tub (ALE214)	250g Amber Jar (AL	400g Tub (ALE214)	250g Amber Jar (AL	400g Tub (ALE214)	250g Amber Jar (AL	400g Tub (ALE214)	250g Amber Jar (AL	400g Tub (ALE214)	250g Amber Jar (AL	400g Tub (ALE214)	250g Amber Jar (AL	400g Tub (ALE214)	250g Amber Jar (AL	400g Tub (ALE214)	250g Amber Jar (AL	400g Tub (ALE214)	250g Amber Jar (AL	400g Tub (ALE214)	250g Amber Jar (AL	60g VOC (ALE215)	250g Amber Jar (AL	400g Tub (ALE214)	250g Amber Jar (AL	400g Tub (ALE214)	250g Amber Jar (AL	60g VOC (ALE215)	250g Amber Jar (AL
Total Organic Carbon (All) NDPs: 0 Tests: 11		X		X		X			X		X	X	X					X		X
Total Sulphate (All) NDPs: 0 Tests: 9	X	X	X	X		X		X						X						
Total Sulphur (All) NDPs: 1 Tests: 20	N	X	X	X		X	X	X	X		X		X	X	X		X	X		X
TPH CWG GC (S) (All) NDPs: 0 Tests: 10				X					X							X		X		X

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

SOLID

Results Legend

X **Test**

N **No Determination Possible**

Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container		NDPs / Tests
8178225	WS14-1		1.50 - 1.50	400g Tub (ALE214)		
				60g VOC (ALE215)		
8178230	WS15-1		1.80 - 1.80	250g Amber Jar (AL		
				400g Tub (ALE214)	Ammoniacal N as NH4 in 2:1 extract	NDPs: 0 Tests: 9
8178143	WS17-1		2.60 - 2.60	60g VOC (ALE215)		
				250g Amber Jar (AL		
8178153	WS18-1		2.20 - 2.20	400g Tub (ALE214)		
				60g VOC (ALE215)		
8178127	WS19-1		2.50 - 2.50	250g Amber Jar (AL		
				400g Tub (ALE214)		
8178138	WS19-2		3.50 - 3.50	60g VOC (ALE215)		
				250g Amber Jar (AL	Anions by Kone (soil)	NDPs: 1 Tests: 20
8178163	WS20-1		2.10 - 2.10	400g Tub (ALE214)	Anions by Kone (w)	NDPs: 0 Tests: 4
				60g VOC (ALE215)	Asbestos ID in Solid Samples	NDPs: 0 Tests: 18
					Boron Water Soluble	NDPs: 0 Tests: 17
					CEN Readings	NDPs: 0 Tests: 2
					Cyanide Comp/Free/Total/Thiocyanate	NDPs: 0 Tests: 21
					Dissolved Metals by ICP-MS	NDPs: 0 Tests: 4
					Easily Liberated Sulphide	NDPs: 0 Tests: 17
					EPH CWG (Aliphatic) GC (S)	NDPs: 0 Tests: 10
					EPH CWG (Aromatic) GC (S)	NDPs: 0 Tests: 10
					GRO by GC-FID (S)	NDPs: 0 Tests: 10
					Hexavalent Chromium (s)	NDPs: 0 Tests: 17
					Hexavalent Chromium (w)	NDPs: 0 Tests: 4
					Magnesium (BRE)	NDPs: 0 Tests: 9

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

SOLID

Results Legend

X **Test**

N **No Determination Possible**

Lab Sample No(s)	8178225	8178230	8178143	8178153	8178127	8178138	8178163
Customer Sample Reference	WS14-1	WS15-1	WS17-1	WS18-1	WS19-1	WS19-2	WS20-1
AGS Reference							
Depth (m)	1.50 - 1.50	1.80 - 1.80	2.60 - 2.60	2.20 - 2.20	2.50 - 2.50	3.50 - 3.50	2.10 - 2.10
Container	400g Tub (ALE214)	60g VOC (ALE215)	250g Amber Jar (AL	400g Tub (ALE214)	60g VOC (ALE215)	250g Amber Jar (AL	400g Tub (ALE214)	60g VOC (ALE215)	250g Amber Jar (AL	400g Tub (ALE214)	60g VOC (ALE215)	250g Amber Jar (AL	400g Tub (ALE214)	60g VOC (ALE215)	250g Amber Jar (AL	400g Tub (ALE214)	60g VOC (ALE215)	250g Amber Jar (AL	400g Tub (ALE214)	60g VOC (ALE215)
Mercury Dissolved	All	NDPs: 0 Tests: 4														X				
Metals in solid samples by OES	All	NDPs: 0 Tests: 17			X			X			X			X					X		
NO3, NO2 and TON by KONE (s)	All	NDPs: 1 Tests: 8			X														X		
PAH by GCMS	All	NDPs: 0 Tests: 17			X			X			X			X					X		
PAH in waters by GC-MS (diss.filt)	All	NDPs: 0 Tests: 4														X				
PCBs by GCMS	All	NDPs: 0 Tests: 8			X			X						X					X		
pH	All	NDPs: 0 Tests: 21	X			X			X			X			X					X	
pH Value of Filtered Water	All	NDPs: 0 Tests: 4														X				
Phenols by HPLC (S)	All	NDPs: 0 Tests: 17	X			X			X			X			X					X	
Phenols by HPLC (W)	All	NDPs: 0 Tests: 4														X				
Sample description	All	NDPs: 0 Tests: 25			X			X			X			X			X		X		
Sulphide	All	NDPs: 0 Tests: 4														X				
Sulphur Dissolved by ICP-OES	All	NDPs: 0 Tests: 4														X				
Total Organic Carbon	All	NDPs: 0 Tests: 11					X						X							
Total Sulphate	All	NDPs: 0 Tests: 9			X														X		

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

SOLID

Results Legend

X **Test**

N **No Determination Possible**

			8178225	8178230	8178143	8178153	8178127	8178138	8178163
Lab Sample No(s)									
Customer Sample Reference			WS14-1	WS15-1	WS17-1	WS18-1	WS19-1	WS19-2	WS20-1
AGS Reference									
Depth (m)			1.50 - 1.50	1.80 - 1.80	2.60 - 2.60	2.20 - 2.20	2.50 - 2.50	3.50 - 3.50	2.10 - 2.10
Container			400g Tub (ALE214)	60g VOC (ALE215)	250g Amber Jar (AL	400g Tub (ALE214)	60g VOC (ALE215)	250g Amber Jar (AL	400g Tub (ALE214)	60g VOC (ALE215)	250g Amber Jar (AL	400g Tub (ALE214)	60g VOC (ALE215)	250g Amber Jar (AL	400g Tub (ALE214)	60g VOC (ALE215)	250g Amber Jar (AL	400g Tub (ALE214)	60g VOC (ALE215)
Total Sulphur	All	NDPs: 1 Tests: 20		X		X		X		X				X				
TPH CWG GC (S)	All	NDPs: 0 Tests: 10		X		X		X		X				X				

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions	Inclusions 2
8178174	SA2-1	0.50 - 1.00	Dark Brown	Silty Clay	0.063 - 0.1 mm	None	None
8178184	SA2-3	13.00 - 13.00	Dark Brown	Silty Clay	0.063 - 0.1 mm	None	None
8178210	WS1-1	2.75 - 2.75	Dark Brown	Sandy Clay Loam	0.1 - 2 mm	Stones	None
8178215	WS1-2	4.50 - 4.50	Grey	Silty Clay Loam	0.063 - 0.1 mm	None	None
8178087	WS2-1	1.10 - 1.10	Light Brown	Clay	<0.063 mm	None	None
8178093	WS2-2	2.80 - 2.80	Dark Brown	Silt Loam	0.063 - 0.1 mm	None	None
8178116	WS3-1	2.20 - 2.20	Light Brown	Sandy Clay Loam	0.1 - 2 mm	Stones	None
8178122	WS3-2	3.10 - 3.10	Dark Brown	Silty Clay	0.063 - 0.1 mm	None	None
8178195	WS4-1	2.30 - 2.30	Dark Brown	Silty Clay Loam	0.063 - 0.1 mm	None	None
8178200	WS4-2	0.60 - 0.60	Dark Brown	Sandy Loam	0.1 - 2 mm	Vegetation	None
8178098	WS7-1	2.20 - 2.20	Grey	Silty Clay Loam	0.063 - 0.1 mm	None	None
8178110	WS8-1	3.60 - 3.60	Dark Brown	Silty Clay	0.063 - 0.1 mm	None	None
8178132	WS10-1	1.60 - 1.60	Light Brown	Clay	<0.063 mm	None	None
8178189	WS10-2	2.60 - 2.60	Light Brown	Sandy Clay Loam	0.1 - 2 mm	Vegetation	None
8178071	WS11-1	0.25 - 0.25	Light Brown	Sand	0.1 - 2 mm	Stones	None
8178205	WS11-2	3.60 - 3.60	Dark Brown	Silty Clay Loam	0.063 - 0.1 mm	Vegetation	None
8178082	WS12-1	0.80 - 0.80	Light Brown	Silt Loam	0.063 - 0.1 mm	None	None
8178076	WS13-1	2.25 - 2.25	Dark Brown	Silty Clay Loam	0.063 - 0.1 mm	None	None
8178225	WS14-1	1.50 - 1.50	Dark Brown	Silt Loam	0.063 - 0.1 mm	None	None
8178230	WS15-1	1.80 - 1.80	Dark Brown	Sandy Silt Loam	0.1 - 2 mm	None	None
8178143	WS17-1	2.60 - 2.60	Dark Brown	Silty Clay	0.063 - 0.1 mm	Vegetation	None
8178153	WS18-1	2.20 - 2.20	Dark Brown	Sandy Loam	0.1 - 2 mm	Stones	Glass
8178127	WS19-1	2.50 - 2.50	Dark Brown	Silty Clay	0.063 - 0.1 mm	None	None
8178138	WS19-2	3.50 - 3.50	Dark Brown	Clay Loam	0.063 - 0.1 mm	None	None
8178163	WS20-1	2.10 - 2.10	Dark Brown	Silty Clay	0.063 - 0.1 mm	None	None

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	SA2-1	SA2-3	WS1-1	WS1-2	WS2-1	WS2-2
			Depth (m)	0.50 - 1.00	13.00 - 13.00	2.75 - 2.75	4.50 - 4.50	1.10 - 1.10	2.80 - 2.80
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	27/09/2013	27/09/2013	16/09/2013	16/09/2013	24/09/2013	24/09/2013
			Sample Time	.	.	.	.	.	.
			Date Received	27/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013
			SDG Ref	130927-147	130927-147	130927-147	130927-147	130927-147	130927-147
			Lab Sample No.(s)	8178174	8178184	8178210	8178215	8178087	8178093
			AGS Reference						
Phenol	<0.01 mg/kg	TM062 (S)		<0.01 & M	<0.01 & M		<0.01 M		<0.01 M
Sulphide NRA leach	<0.01 mg/l	TM101				<0.01			
Organic Carbon, Total	<0.2 %	TM132			0.761 #		0.628 @ #		0.885 #
Sulphur, Total	<0.02 %	TM132			0.72 #	4.75 #	0.746 #	0.0848 #	1.53 #
pH	1 pH Units	TM133		7.98 M	8.38 M	6.2 M	8.48 M	7.98 M	7.64 M
Chromium, Hexavalent	<0.6 mg/kg	TM151		<0.6 #	<0.6 #		<0.6 #		<0.6 #
Arsenic (diss.filt) NRA leach	<0.12 µg/l	TM152				0.693			
Boron (diss.filt) NRA leach	<9.4 µg/l	TM152				1130			
Cadmium (diss.filt) NRA leach	<0.1 µg/l	TM152				<0.1			
Chromium (diss.filt) NRA leach	<0.22 µg/l	TM152				0.401			
Copper (diss.filt) NRA leach	<0.85 µg/l	TM152				1.93			
Lead (diss.filt) NRA leach	<0.02 µg/l	TM152				0.387			
Nickel (diss.filt) NRA leach	<0.15 µg/l	TM152				0.454			
Selenium (diss.filt) NRA leach	<0.39 µg/l	TM152				1.01			
Zinc (diss.filt) NRA leach	<0.41 µg/l	TM152				3.79			
Cyanide, Total	<1 mg/kg	TM153		<1 & M	<1 & M		<1 @ M		<1 M
Cyanide, Free	<1 mg/kg	TM153		<1 & M	<1 & M		<1 @ M		<1 M
Thiocyanate	<1 mg/kg	TM153		<1 & M	<1 & M		<1 @ M		<1 M
PCB congener 118	<3 µg/kg	TM168					<3 M		
PCB congener 81	<3 µg/kg	TM168					<3 M		
PCB congener 77	<3 µg/kg	TM168					<3 M		
PCB congener 123	<3 µg/kg	TM168					<3 M		
PCB congener 114	<3 µg/kg	TM168					<3 M		
PCB congener 105	<3 µg/kg	TM168					<3 M		
PCB congener 126	<3 µg/kg	TM168					<3 M		
PCB congener 167	<3 µg/kg	TM168					<3 M		
PCB congener 156	<3 µg/kg	TM168					<3 M		
PCB congener 157	<3 µg/kg	TM168					<3 M		
PCB congener 169	<3 µg/kg	TM168					<3 M		
PCB congener 189	<3 µg/kg	TM168					<3 M		
Sum of detected WHO 12 PCBs	<36 µg/kg	TM168					<36		
Naphthalene (diss.filt) NRA leach	<0.1 µg/l	TM178				<0.1			

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	SA2-1	SA2-3	WS1-1	WS1-2	WS2-1	WS2-2
			Depth (m)	0.50 - 1.00	13.00 - 13.00	2.75 - 2.75	4.50 - 4.50	1.10 - 1.10	2.80 - 2.80
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	27/09/2013	27/09/2013	16/09/2013	16/09/2013	24/09/2013	24/09/2013
			Sample Time	.	.	.	.	.	.
			Date Received	27/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013
			SDG Ref	130927-147	130927-147	130927-147	130927-147	130927-147	130927-147
			Lab Sample No.(s)	8178174	8178184	8178210	8178215	8178087	8178093
			AGS Reference						
Acenaphthene (diss.filt) NRA leach	<0.015 µg/l	TM178				<0.015			
Acenaphthylene (diss.filt) NRA leach	<0.011 µg/l	TM178				<0.011			
Fluoranthene (diss.filt) NRA leach	<0.017 µg/l	TM178				<0.017			
Anthracene (diss.filt) NRA leach	<0.015 µg/l	TM178				<0.015			
Phenanthrene (diss.filt) NRA leach	<0.022 µg/l	TM178				<0.022			
Fluorene (diss.filt) NRA leach	<0.014 µg/l	TM178				<0.014			
Chrysene (diss.filt) NRA leach	<0.013 µg/l	TM178				<0.013			
Pyrene (diss.filt) NRA leach	<0.015 µg/l	TM178				<0.015			
Benzo(a)anthracene (diss.filt) NRA leach	<0.017 µg/l	TM178				<0.017			
Benzo(b)fluoranthene (diss.filt) NRA leach	<0.023 µg/l	TM178				<0.023			
Benzo(k)fluoranthene (diss.filt) NRA leach	<0.027 µg/l	TM178				<0.027			
Benzo(a)pyrene (diss.filt) NRA leach	<0.009 µg/l	TM178				<0.009			
Dibenzo(a,h)anthracene (diss.filt) NRA leach	<0.016 µg/l	TM178				<0.016			
Benzo(g,h,i)perylene (diss.filt) NRA leach	<0.016 µg/l	TM178				<0.016			
Indeno(1,2,3-cd)pyrene (diss.filt) NRA leach	<0.014 µg/l	TM178				<0.014			
PAH Sum of EPA 16 detected (Diss filt) NRA	<0.341 µg/l	TM178				<0.341			
Sulphide, Easily liberated	<15 mg/kg	TM180		441 & #	24.3 & #		61.1 @ #		44.9 #
Arsenic	<0.6 mg/kg	TM181		25.3 M	9.28 M		10.7 M		13.4 M
Cadmium	<0.02 mg/kg	TM181		1.38 M	<0.02 M		<0.02 M		<0.02 M
Chromium	<0.9 mg/kg	TM181		80.2 M	22.6 M		22.2 M		20.1 M
Copper	<1.4 mg/kg	TM181		70.4 M	10.4 M		8.56 M		6.63 M
Lead	<0.7 mg/kg	TM181		284 M	11.2 M		10.1 M		8.85 M
Mercury	<0.14 mg/kg	TM181		6.14 M	<0.14 M		<0.14 M		<0.14 M
Nickel	<0.2 mg/kg	TM181		28.2 M	21.4 M		22.8 M		21.7 M
Selenium	<1 mg/kg	TM181		1.06 #	<1 #		<1 #		<1 #
Zinc	<1.9 mg/kg	TM181		383 M	52.4 M		51.8 M		46.3 M
Mercury (diss.filt) NRA leach	<0.01 µg/l	TM183				<0.01			
Sulphate NRA leach	<2 mg/l	TM184				168			
Sulphate, acid soluble (total)	<0.02 %	TM221		0.207	0.204	0.623	0.166	0.0483	
Total Sulphur (ASB)	<0.0016 %	TM221		0.0691			0.0553		
Boron, water soluble	<1 mg/kg	TM222		2.81 M	1.99 M		1.57 M		2.29 M
Cyanide, Total NRA leach	<0.05 mg/l	TM227				<0.05			

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	SA2-1	SA2-3	WS1-1	WS1-2	WS2-1	WS2-2
			Depth (m)	0.50 - 1.00	13.00 - 13.00	2.75 - 2.75	4.50 - 4.50	1.10 - 1.10	2.80 - 2.80
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	27/09/2013	27/09/2013	16/09/2013	16/09/2013	24/09/2013	24/09/2013
			Sample Time	.	.	.	.	.	.
			Date Received	27/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013
			SDG Ref	130927-147	130927-147	130927-147	130927-147	130927-147	130927-147
			Lab Sample No.(s)	8178174	8178184	8178210	8178215	8178087	8178093
			AGS Reference						
Cyanide, Free NRA leach	<0.05 mg/l	TM227				<0.05			
Thiocyanate NRA leach	<0.05 mg/l	TM227				<0.05			
Sulphur Dissolved NRA leach	<1 mg/l	TM228				63.9			
Chromium, Hexavalent NRA leach	<0.03 mg/l	TM241				<0.03			
Water Soluble Sulphate as SO4 2:1 Extract	<0.004 g/l	TM243		0.501 M	0.264 M		0.324 M		0.413 M
Soluble Sulphate 2:1 extract as SO4 BRE	<0.004 g/l	TM243		0.501 M	0.264 M		0.324 M	0.195 M	
Chloride 2:1 water/soil extract BRE	<0.0025 g/l	TM243		2.71 M	0.396 M		0.188 M	0.319 M	
Nitrate as NO3, 2:1 water soluble (BRE)	<0.0003 g/l	TM243		<0.0003	<0.0003		0.00164	0.000683	
Ammoniacal N as NH4 in 2:1 extract BRE	<0.0003 g/l	TM248		0.0143	0.00073	0.00365	0.00109	0.00058	
pH (diss.filt) NRA leach	1 pH Units	TM256				6.77			
Phenol NRA leach	<0.002 mg/l	TM259				<0.002			
Magnesium (BRE)	<0.008 g/l	TM282		0.0217	<0.008	0.0614	<0.008	<0.008	

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	WS3-1	WS3-2	WS4-1	WS4-2	WS7-1	WS8-1
			Depth (m)	2.20 - 2.20	3.10 - 3.10	2.30 - 2.30	0.60 - 0.60	2.20 - 2.20	3.60 - 3.60
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	24/09/2013	24/09/2013	27/09/2013	27/09/2013	24/09/2013	24/09/2013
			Sample Time	.	.	.	.	.	.
			Date Received	27/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013
			SDG Ref	130927-147	130927-147	130927-147	130927-147	130927-147	130927-147
			Lab Sample No.(s)	8178116	8178122	8178195	8178200	8178098	8178110
			AGS Reference						
Phenol	<0.01 mg/kg	TM062 (S)		<0.01 M			<0.01 & M	<0.01 @ M	
Sulphide NRA leach	<0.01 mg/l	TM101				<0.01			
Organic Carbon, Total	<0.2 %	TM132					1.59 #	0.823 #	20.7 #
Sulphur, Total	<0.02 %	TM132		0.39 #	0.216 #		0.102 #	0.0738 #	
pH	1 pH Units	TM133		7.45 M	7.48 M		8.05 M	8.92 M	
Chromium, Hexavalent	<0.6 mg/kg	TM151		<0.6 #			<0.6 #	<0.6 #	
Arsenic (diss.filt) NRA leach	<0.12 µg/l	TM152				32.6			
Boron (diss.filt) NRA leach	<9.4 µg/l	TM152				310			
Cadmium (diss.filt) NRA leach	<0.1 µg/l	TM152				<0.1			
Chromium (diss.filt) NRA leach	<0.22 µg/l	TM152				5.35			
Copper (diss.filt) NRA leach	<0.85 µg/l	TM152				2.67			
Lead (diss.filt) NRA leach	<0.02 µg/l	TM152				1.41			
Nickel (diss.filt) NRA leach	<0.15 µg/l	TM152				2.74			
Selenium (diss.filt) NRA leach	<0.39 µg/l	TM152				1.45			
Zinc (diss.filt) NRA leach	<0.41 µg/l	TM152				2.56			
Cyanide, Total	<1 mg/kg	TM153		<1 M			<1 & M	<1 @ M	
Cyanide, Free	<1 mg/kg	TM153		<1 M			<1 & M	<1 @ M	
Thiocyanate	<1 mg/kg	TM153		<1 M			<1 & M	<1 @ M	
PCB congener 118	<3 µg/kg	TM168					7.76 M		
PCB congener 81	<3 µg/kg	TM168					<3 M		
PCB congener 77	<3 µg/kg	TM168					<3 M		
PCB congener 123	<3 µg/kg	TM168					<3 M		
PCB congener 114	<3 µg/kg	TM168					<3 M		
PCB congener 105	<3 µg/kg	TM168					<3 M		
PCB congener 126	<3 µg/kg	TM168					<3 M		
PCB congener 167	<3 µg/kg	TM168					<3 M		
PCB congener 156	<3 µg/kg	TM168					<3 M		
PCB congener 157	<3 µg/kg	TM168					<3 M		
PCB congener 169	<3 µg/kg	TM168					<3 M		
PCB congener 189	<3 µg/kg	TM168					<3 M		
Sum of detected WHO 12 PCBs	<36 µg/kg	TM168					<36		
Naphthalene (diss.filt) NRA leach	<0.1 µg/l	TM178				<0.1			

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	WS3-1	WS3-2	WS4-1	WS4-2	WS7-1	WS8-1
			Depth (m)	2.20 - 2.20	3.10 - 3.10	2.30 - 2.30	0.60 - 0.60	2.20 - 2.20	3.60 - 3.60
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	24/09/2013	24/09/2013	27/09/2013	27/09/2013	24/09/2013	24/09/2013
			Sample Time	.	.	.	.	.	.
			Date Received	27/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013
			SDG Ref	130927-147	130927-147	130927-147	130927-147	130927-147	130927-147
			Lab Sample No.(s)	8178116	8178122	8178195	8178200	8178098	8178110
			AGS Reference						
Acenaphthene (diss.filt) NRA leach	<0.015 µg/l	TM178				0.0597			
Acenaphthylene (diss.filt) NRA leach	<0.011 µg/l	TM178				<0.011			
Fluoranthene (diss.filt) NRA leach	<0.017 µg/l	TM178				0.093			
Anthracene (diss.filt) NRA leach	<0.015 µg/l	TM178				0.0469			
Phenanthrene (diss.filt) NRA leach	<0.022 µg/l	TM178				0.0314			
Fluorene (diss.filt) NRA leach	<0.014 µg/l	TM178				0.021			
Chrysene (diss.filt) NRA leach	<0.013 µg/l	TM178				0.0335			
Pyrene (diss.filt) NRA leach	<0.015 µg/l	TM178				0.0913			
Benzo(a)anthracene (diss.filt) NRA leach	<0.017 µg/l	TM178				<0.017			
Benzo(b)fluoranthene (diss.filt) NRA leach	<0.023 µg/l	TM178				<0.023			
Benzo(k)fluoranthene (diss.filt) NRA leach	<0.027 µg/l	TM178				<0.027			
Benzo(a)pyrene (diss.filt) NRA leach	<0.009 µg/l	TM178				0.0151			
Dibenzo(a,h)anthracene (diss.filt) NRA leach	<0.016 µg/l	TM178				<0.016			
Benzo(g,h,i)perylene (diss.filt) NRA leach	<0.016 µg/l	TM178				0.0195			
Indeno(1,2,3-cd)pyrene (diss.filt) NRA leach	<0.014 µg/l	TM178				<0.014			
PAH Sum of EPA 16 detected (Diss filt) NRA	<0.341 µg/l	TM178				0.412			
Sulphide, Easily liberated	<15 mg/kg	TM180		338 #			<15 & #	<15 @ #	
Arsenic	<0.6 mg/kg	TM181		25.4 M			34.4 M	3.41 M	
Cadmium	<0.02 mg/kg	TM181		0.0982 M			2.23 M	<0.02 M	
Chromium	<0.9 mg/kg	TM181		27 M			121 M	32 M	
Copper	<1.4 mg/kg	TM181		24.3 M			120 M	13.3 M	
Lead	<0.7 mg/kg	TM181		60.9 M			357 M	16.6 M	
Mercury	<0.14 mg/kg	TM181		0.149 M			12.1 M	<0.14 M	
Nickel	<0.2 mg/kg	TM181		23.5 M			49.7 M	26.6 M	
Selenium	<1 mg/kg	TM181		<1 #			1.21 #	<1 #	
Zinc	<1.9 mg/kg	TM181		100 M			548 M	71.7 M	
Mercury (diss.filt) NRA leach	<0.01 µg/l	TM183				0.0881			
Sulphate NRA leach	<2 mg/l	TM184				111			
Sulphate, acid soluble (total)	<0.02 %	TM221			0.125				
Boron, water soluble	<1 mg/kg	TM222		4.73 M			1.45 M	2.47 M	
Cyanide, Total NRA leach	<0.05 mg/l	TM227				<0.05			
Cyanide, Free NRA leach	<0.05 mg/l	TM227				<0.05			

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	WS3-1	WS3-2	WS4-1	WS4-2	WS7-1	WS8-1
			Depth (m)	2.20 - 2.20	3.10 - 3.10	2.30 - 2.30	0.60 - 0.60	2.20 - 2.20	3.60 - 3.60
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	24/09/2013	24/09/2013	27/09/2013	27/09/2013	24/09/2013	24/09/2013
			Sample Time	.	.	.	.	.	.
			Date Received	27/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013
			SDG Ref	130927-147	130927-147	130927-147	130927-147	130927-147	130927-147
			Lab Sample No.(s)	8178116	8178122	8178195	8178200	8178098	8178110
			AGS Reference						
Thiocyanate NRA leach	<0.05 mg/l	TM227				<0.05			
Sulphur Dissolved NRA leach	<1 mg/l	TM228				41.4			
Chromium, Hexavalent NRA leach	<0.03 mg/l	TM241				<0.03			
Water Soluble Sulphate as SO4 2:1 Extract	<0.004 g/l	TM243		0.572 M			0.264 M	0.173 M	
Soluble Sulphate 2:1 extract as SO4 BRE	<0.004 g/l	TM243			0.47 M				
Chloride 2:1 water/soil extract BRE	<0.0025 g/l	TM243			0.313 M				
Nitrate as NO3, 2:1 water soluble (BRE)	<0.0003 g/l	TM243			<0.0003				
Ammoniacal N as NH4 in 2:1 extract BRE	<0.0003 g/l	TM248			0.00856				
pH (diss.filt) NRA leach	1 pH Units	TM256				8.1			
Phenol NRA leach	<0.002 mg/l	TM259				<0.002			
Magnesium (BRE)	<0.008 g/l	TM282			<0.008				

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	WS10-1	WS10-2	WS11-1	WS11-2	WS12-1	WS13-1
			Depth (m)	1.60 - 1.60	2.60 - 2.60	0.25 - 0.25	3.60 - 3.60	0.80 - 0.80	2.25 - 2.25
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	12/09/2013	12/09/2013	12/09/2013	12/09/2013	16/09/2013	16/09/2013
			Sample Time	.	.	.	.	.	.
			Date Received	27/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013
			SDG Ref	130927-147	130927-147	130927-147	130927-147	130927-147	130927-147
			Lab Sample No.(s)	8178132	8178189	8178071	8178205	8178082	8178076
			AGS Reference						
Phenol	<0.01 mg/kg	TM062 (S)		<0.01 @ M		<0.01 @ M		<0.01 M	<0.01 M
Organic Carbon, Total	<0.2 %	TM132		0.471 @ #					2.66 @ #
Sulphur, Total	<0.02 %	TM132		0.0933 #	0.182 #	<0.02 #		0.251 #	0.165 #
pH	1 pH Units	TM133		8.12 M	7.67 M	8.54 M		7.78 M	7.92 M
Chromium, Hexavalent	<0.6 mg/kg	TM151		<0.6 #		<0.6 #		<0.6 #	<0.6 #
Cyanide, Total	<1 mg/kg	TM153		<1 @ M		<1 @ M		5.77 M	1.51 M
Cyanide, Free	<1 mg/kg	TM153		<1 @ M		<1 @ M		<1 M	<1 M
Thiocyanate	<1 mg/kg	TM153		<1 @ M		<1 @ M		<1 M	<1 M
PCB congener 118	<3 µg/kg	TM168					<3 @ M		5.23 M
PCB congener 81	<3 µg/kg	TM168					<3 @ M		<3 M
PCB congener 77	<3 µg/kg	TM168					<3 @ M		<3 M
PCB congener 123	<3 µg/kg	TM168					<3 @ M		<3 M
PCB congener 114	<3 µg/kg	TM168					<3 @ M		<3 M
PCB congener 105	<3 µg/kg	TM168					<3 @ M		<3 M
PCB congener 126	<3 µg/kg	TM168					<3 @ M		<3 M
PCB congener 167	<3 µg/kg	TM168					<3 @ M		<3 M
PCB congener 156	<3 µg/kg	TM168					<3 @ M		<3 M
PCB congener 157	<3 µg/kg	TM168					<3 @ M		<3 M
PCB congener 169	<3 µg/kg	TM168					<3 @ M		<3 M
PCB congener 189	<3 µg/kg	TM168					<3 @ M		<3 M
Sum of detected WHO 12 PCBs	<36 µg/kg	TM168					<36		<36
Sulphide, Easily liberated	<15 mg/kg	TM180		<15 @ #		<15 @ #		545 @ #	226 @ #
Arsenic	<0.6 mg/kg	TM181		10.1 M		15.9 M		57.6 M	27.8 M
Cadmium	<0.02 mg/kg	TM181		<0.02 M		0.104 M		3.13 M	0.522 M
Chromium	<0.9 mg/kg	TM181		30.6 M		7.87 M		107 M	54.4 M
Copper	<1.4 mg/kg	TM181		10.2 M		6.61 M		176 M	55.2 M
Lead	<0.7 mg/kg	TM181		15.3 M		30.9 M		607 M	112 M
Mercury	<0.14 mg/kg	TM181		<0.14 M		0.235 M		18.1 M	3.91 M
Nickel	<0.2 mg/kg	TM181		32.5 M		6.53 M		40.7 M	29.6 M
Selenium	<1 mg/kg	TM181		<1 #		<1 #		1.04 #	<1 #
Zinc	<1.9 mg/kg	TM181		72.3 M		70.6 M		890 M	300 M
Sulphate, acid soluble (total)	<0.02 %	TM221			0.0663				

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	WS10-1	WS10-2	WS11-1	WS11-2	WS12-1	WS13-1
			Depth (m)	1.60 - 1.60	2.60 - 2.60	0.25 - 0.25	3.60 - 3.60	0.80 - 0.80	2.25 - 2.25
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	12/09/2013	12/09/2013	12/09/2013	12/09/2013	16/09/2013	16/09/2013
			Sample Time	.	.	.	.	.	.
			Date Received	27/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013
			SDG Ref	130927-147	130927-147	130927-147	130927-147	130927-147	130927-147
			Lab Sample No.(s)	8178132	8178189	8178071	8178205	8178082	8178076
			AGS Reference						
Boron, water soluble	<1 mg/kg	TM222		1.58 M		<1 M		3.32 M	4.93 M
Water Soluble Sulphate as SO4 2:1 Extract	<0.004 g/l	TM243		<0.004 M		0.0215 M		0.568 M	0.318 M
Soluble Sulphate 2:1 extract as SO4 BRE	<0.004 g/l	TM243			0.105 M				
Chloride 2:1 water/soil extract BRE	<0.0025 g/l	TM243			0.101 M				
Nitrate as NO3, 2:1 water soluble (BRE)	<0.0003 g/l	TM243			0.00223				
Ammoniacal N as NH4 in 2:1 extract BRE	<0.0003 g/l	TM248			0.00794				
Magnesium (BRE)	<0.008 g/l	TM282			<0.008				

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	WS14-1	WS15-1	WS17-1	WS18-1	WS19-1	WS20-1
			Depth (m)	1.50 - 1.50	1.80 - 1.80	2.60 - 2.60	2.20 - 2.20	2.50 - 2.50	2.10 - 2.10
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	16/09/2013	16/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013
			Sample Time	.	.	.	.	.	.
			Date Received	27/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013
			SDG Ref	130927-147	130927-147	130927-147	130927-147	130927-147	130927-147
			Lab Sample No.(s)	8178225	8178230	8178143	8178153	8178127	8178163
			AGS Reference						
Phenol	<0.01 mg/kg	TM062 (S)		<0.01 M	<0.01 @ M	<0.01 & M	<0.01 & M	<0.01 & M	<0.01 & M
Organic Carbon, Total	<0.2 %	TM132		1.91 @ #		2.68 #		2.42 #	
Sulphur, Total	<0.02 %	TM132		0.3 #	0.333 #	0.234 #	0.196 #	0.183 #	0.292 #
pH	1 pH Units	TM133		7.3 M	7.9 @ M	7.74 M	7.61 M	7.92 M	7.39 M
Chromium, Hexavalent	<0.6 mg/kg	TM151		<0.6 #	<0.6 @ #	<0.6 #	<0.6 #	<0.6 #	<0.6 #
Cyanide, Total	<1 mg/kg	TM153		1.89 M	2.5 @ M	1.56 & M	<1 & M	<1 & M	<1 & M
Cyanide, Free	<1 mg/kg	TM153		<1 M	<1 @ M	<1 & M	<1 & M	<1 & M	<1 & M
Thiocyanate	<1 mg/kg	TM153		<1 M	<1 @ M	<1 & M	<1 & M	<1 & M	<1 & M
PCB congener 118	<3 µg/kg	TM168			32.9 @ M	<3 M		<3 M	<3 M
PCB congener 81	<3 µg/kg	TM168			<3 @ M	<3 M		<3 M	<3 M
PCB congener 77	<3 µg/kg	TM168			<3 @ M	<3 M		<3 M	<3 M
PCB congener 123	<3 µg/kg	TM168			<3 @ M	<3 M		<3 M	<3 M
PCB congener 114	<3 µg/kg	TM168			<3 @ M	<3 M		<3 M	<3 M
PCB congener 105	<3 µg/kg	TM168			<3 @ M	<3 M		<3 M	<3 M
PCB congener 126	<3 µg/kg	TM168			<3 @ M	<3 M		<3 M	<3 M
PCB congener 167	<3 µg/kg	TM168			<3 @ M	<3 M		<3 M	<3 M
PCB congener 156	<3 µg/kg	TM168			7.52 @ M	<3 M		<3 M	<3 M
PCB congener 157	<3 µg/kg	TM168			<3 @ M	<3 M		<3 M	<3 M
PCB congener 169	<3 µg/kg	TM168			<3 @ M	<3 M		<3 M	<3 M
PCB congener 189	<3 µg/kg	TM168			<3 @ M	<3 M		<3 M	<3 M
Sum of detected WHO 12 PCBs	<36 µg/kg	TM168			40.4	<36		<36	<36
Sulphide, Easily liberated	<15 mg/kg	TM180		132 @ #	<15 @ #	<15 & #	48.6 & #	40.9 & #	91.4 & #
Arsenic	<0.6 mg/kg	TM181		34.8 M	40.4 M	11.7 M	26 M	47.3 M	36.4 M
Cadmium	<0.02 mg/kg	TM181		1.16 M	1.42 M	0.0741 M	1.07 M	1.93 M	1.36 M
Chromium	<0.9 mg/kg	TM181		79.6 M	113 M	14.3 M	36.6 M	78.7 M	43.5 M
Copper	<1.4 mg/kg	TM181		97.2 M	131 M	20.4 M	56.2 M	121 M	54.5 M
Lead	<0.7 mg/kg	TM181		252 M	480 M	15.6 M	167 M	166 M	93.1 M
Mercury	<0.14 mg/kg	TM181		6.41 M	12.4 @ M	<0.14 & M	2.7 M	10.8 M	5.82 M
Nickel	<0.2 mg/kg	TM181		30.2 M	37.4 M	13.1 M	20.3 M	30.1 M	21.1 M
Selenium	<1 mg/kg	TM181		<1 #	<1 #	1.18 #	<1 #	1.64 #	<1 #
Zinc	<1.9 mg/kg	TM181		516 M	619 M	80.2 M	317 M	539 M	329 M
Sulphate, acid soluble (total)	<0.02 %	TM221			0.422				0.291

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	WS14-1	WS15-1	WS17-1	WS18-1	WS19-1	WS20-1
			Depth (m)	1.50 - 1.50	1.80 - 1.80	2.60 - 2.60	2.20 - 2.20	2.50 - 2.50	2.10 - 2.10
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	16/09/2013	16/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013
			Sample Time	.	.	.	.	.	.
			Date Received	27/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013
			SDG Ref	130927-147	130927-147	130927-147	130927-147	130927-147	130927-147
			Lab Sample No.(s)	8178225	8178230	8178143	8178153	8178127	8178163
			AGS Reference						
Total Sulphur (ASB)	<0.0016 %	TM221			0.141				0.0968
Boron, water soluble	<1 mg/kg	TM222		5.56 M	2.86 @ M	<1 M	1.58 M	2.36 M	1.63 M
Water Soluble Sulphate as SO4 2:1 Extract	<0.004 g/l	TM243		1.03 M	1.52 @ M	0.448 M	0.738 M	0.227 M	0.812 M
Soluble Sulphate 2:1 extract as SO4 BRE	<0.004 g/l	TM243			1.52 @ M				0.812 M
Chloride 2:1 water/soil extract BRE	<0.0025 g/l	TM243			0.618 @ M				0.0423 M
Nitrate as NO3, 2:1 water soluble (BRE)	<0.0003 g/l	TM243			0.00522				<0.0003
Ammoniacal N as NH4 in 2:1 extract BRE	<0.0003 g/l	TM248			0.000936				0.0123
Magnesium (BRE)	<0.008 g/l	TM282			0.019				0.00921

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

PAH by GCMS

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	SA2-1	SA2-3	WS1-2	WS2-2	WS3-1	WS4-2
			Depth (m)	0.50 - 1.00	13.00 - 13.00	4.50 - 4.50	2.80 - 2.80	2.20 - 2.20	0.60 - 0.60
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	27/09/2013	27/09/2013	16/09/2013	24/09/2013	24/09/2013	27/09/2013
			Sample Time	.	.	.	.	.	.
			Date Received	27/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013
			SDG Ref	130927-147	130927-147	130927-147	130927-147	130927-147	130927-147
			Lab Sample No.(s)	8178174	8178184	8178215	8178093	8178116	8178200
			AGS Reference						
Naphthalene-d8 % recovery**	%	TM218		94.1	115	96.2	95.9	98.2	107
Acenaphthene-d10 % recovery**	%	TM218		83	109	92.9	97.8	101	96.6
Phenanthrene-d10 % recovery**	%	TM218		75.3	108	93.7	94.6	98.6	94.5
Chrysene-d12 % recovery**	%	TM218		69.9	103	91	90.8	98.1	95.3
Perylene-d12 % recovery**	%	TM218		70.2	102	92	90.3	105	97.9
Naphthalene	<9 µg/kg	TM218		152 & M	<9 & M	<9 M	<9 M	21.5 M	176 & M
Acenaphthylene	<12 µg/kg	TM218		<12 & M	<12 & M	<12 M	<12 M	<12 M	72.4 & M
Acenaphthene	<8 µg/kg	TM218		54.1 & M	<8 & M	<8 M	<8 M	58.2 M	46.5 & M
Fluorene	<10 µg/kg	TM218		61.7 & M	<10 & M	<10 M	<10 M	20.5 M	54.6 & M
Phenanthrene	<15 µg/kg	TM218		246 & M	<15 & M	<15 M	<15 M	74.8 M	351 & M
Anthracene	<16 µg/kg	TM218		152 & M	<16 & M	<16 M	<16 M	<16 M	129 & M
Fluoranthene	<17 µg/kg	TM218		567 & M	<17 & M	<17 M	<17 M	116 M	583 & M
Pyrene	<15 µg/kg	TM218		586 & M	<15 & M	<15 M	<15 M	131 M	613 & M
Benz(a)anthracene	<14 µg/kg	TM218		267 & M	<14 & M	<14 M	<14 M	<14 M	404 & M
Chrysene	<10 µg/kg	TM218		255 & M	<10 & M	<10 M	<10 M	56.7 M	432 & M
Benzo(b)fluoranthene	<15 µg/kg	TM218		293 & M	<15 & M	<15 M	<15 M	64.7 M	762 & M
Benzo(k)fluoranthene	<14 µg/kg	TM218		132 & M	<14 & M	<14 M	<14 M	<14 M	315 & M
Benzo(a)pyrene	<15 µg/kg	TM218		283 & M	<15 & M	<15 M	<15 M	47 M	560 & M
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218		131 & M	<18 & M	<18 M	<18 M	31.6 M	416 & M
Dibenzo(a,h)anthracene	<23 µg/kg	TM218		<23 & M	<23 & M	<23 M	<23 M	<23 M	117 & M
Benzo(g,h,i)perylene	<24 µg/kg	TM218		156 & M	<24 & M	<24 M	<24 M	43.5 M	502 & M
PAH, Total Detected USEPA 16	<118 µg/kg	TM218		3340	<118	<118	<118	665	5530

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

PAH by GCMS

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	WS7-1	WS10-1	WS11-1	WS12-1	WS13-1	WS14-1
			Depth (m)	2.20 - 2.20	1.60 - 1.60	0.25 - 0.25	0.80 - 0.80	2.25 - 2.25	1.50 - 1.50
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	24/09/2013	12/09/2013	12/09/2013	16/09/2013	16/09/2013	16/09/2013
			Sample Time	.	.	.	.	.	.
			Date Received	27/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013
			SDG Ref	130927-147	130927-147	130927-147	130927-147	130927-147	130927-147
			Lab Sample No.(s)	8178098	8178132	8178071	8178082	8178076	8178225
			AGS Reference						
Naphthalene-d8 % recovery**	%	TM218		95.3	96.3	95.1	91.9	109	110
Acenaphthene-d10 % recovery**	%	TM218		88.8	97.2	94.7	92.9	106	113
Phenanthrene-d10 % recovery**	%	TM218		86.9	94.2	91.4	87.1	102	109
Chrysene-d12 % recovery**	%	TM218		84.5	86.5	83.1	91.4	103	113
Perylene-d12 % recovery**	%	TM218		81.2	89.6	77.6	95.8	110	117
Naphthalene	<9 µg/kg	TM218		<9 @ M	<9 @ M	<9 @ M	722 M	187 M	160 M
Acenaphthylene	<12 µg/kg	TM218		<12 @ M	<12 @ M	<12 @ M	354 M	85.5 M	66.6 M
Acenaphthene	<8 µg/kg	TM218		<8 @ M	<8 @ M	<8 @ M	282 M	79.6 M	69 M
Fluorene	<10 µg/kg	TM218		<10 @ M	<10 @ M	<10 @ M	411 M	129 M	145 M
Phenanthrene	<15 µg/kg	TM218		<15 @ M	<15 @ M	<15 @ M	1180 M	560 M	662 M
Anthracene	<16 µg/kg	TM218		<16 @ M	<16 @ M	<16 @ M	1040 M	507 M	1130 M
Fluoranthene	<17 µg/kg	TM218		<17 @ M	<17 @ M	<17 @ M	1650 M	1000 M	811 M
Pyrene	<15 µg/kg	TM218		<15 @ M	<15 @ M	<15 @ M	1670 M	1080 M	1010 M
Benz(a)anthracene	<14 µg/kg	TM218		<14 @ M	<14 @ M	<14 @ M	1000 M	561 M	480 M
Chrysene	<10 µg/kg	TM218		<10 @ M	<10 @ M	<10 @ M	966 M	530 M	487 M
Benzo(b)fluoranthene	<15 µg/kg	TM218		<15 @ M	<15 @ M	<15 @ M	1830 M	935 M	676 M
Benzo(k)fluoranthene	<14 µg/kg	TM218		<14 @ M	<14 @ M	<14 @ M	692 M	367 M	254 M
Benzo(a)pyrene	<15 µg/kg	TM218		<15 @ M	<15 @ M	<15 @ M	1650 M	735 M	589 M
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218		<18 @ M	<18 @ M	<18 @ M	1120 M	440 M	341 M
Dibenzo(a,h)anthracene	<23 µg/kg	TM218		<23 @ M	<23 @ M	<23 @ M	303 M	115 M	93.4 M
Benzo(g,h,i)perylene	<24 µg/kg	TM218		<24 @ M	<24 @ M	<24 @ M	1330 M	534 M	391 M
PAH, Total Detected USEPA 16	<118 µg/kg	TM218		<118	<118	<118	16200	7850	7360

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

PAH by GCMS

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	WS15-1	WS17-1	WS18-1	WS19-1	WS20-1
			Depth (m)	1.80 - 1.80	2.60 - 2.60	2.20 - 2.20	2.50 - 2.50	2.10 - 2.10
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	16/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013
			Sample Time	.	.	.	.	.
			Date Received	27/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013
			SDG Ref	130927-147	130927-147	130927-147	130927-147	130927-147
			Lab Sample No.(s)	8178230	8178143	8178153	8178127	8178163
			AGS Reference					
Naphthalene-d8 % recovery**	%	TM218		112	120	110	115	117
Acenaphthene-d10 % recovery**	%	TM218		110	119	108	116	119
Phenanthrene-d10 % recovery**	%	TM218		111	111	104	115	120
Chrysene-d12 % recovery**	%	TM218		124	108	98.5	109	113
Perylene-d12 % recovery**	%	TM218		123	109	100	112	118
Naphthalene	<9 µg/kg	TM218		192 @ M	885 & M	106 & M	297 & M	388 & M
Acenaphthylene	<12 µg/kg	TM218		133 @ M	113 & M	44.4 & M	164 & M	160 & M
Acenaphthene	<8 µg/kg	TM218		64 @ M	204 & M	41.7 & M	106 & M	313 & M
Fluorene	<10 µg/kg	TM218		222 @ M	302 & M	36.4 & M	139 & M	418 & M
Phenanthrene	<15 µg/kg	TM218		1230 @ M	1050 & M	262 & M	808 & M	3480 & M
Anthracene	<16 µg/kg	TM218		2030 @ M	445 & M	99.7 & M	446 & M	818 & M
Fluoranthene	<17 µg/kg	TM218		1240 @ M	1600 & M	611 & M	2000 & M	6740 & M
Pyrene	<15 µg/kg	TM218		2450 @ M	1190 & M	493 & M	1710 & M	5090 & M
Benz(a)anthracene	<14 µg/kg	TM218		374 @ M	788 & M	288 & M	1040 & M	2580 & M
Chrysene	<10 µg/kg	TM218		933 @ M	645 & M	287 & M	1050 & M	2640 & M
Benzo(b)fluoranthene	<15 µg/kg	TM218		1170 @ M	1170 & M	370 & M	1830 & M	3340 & M
Benzo(k)fluoranthene	<14 µg/kg	TM218		472 @ M	438 & M	168 & M	691 & M	1260 & M
Benzo(a)pyrene	<15 µg/kg	TM218		1050 @ M	1190 & M	358 & M	1370 & M	2680 & M
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218		576 @ M	745 & M	254 & M	1020 & M	1320 & M
Dibenzo(a,h)anthracene	<23 µg/kg	TM218		162 @ M	187 & M	67.4 & M	296 & M	423 & M
Benzo(g,h,i)perylene	<24 µg/kg	TM218		777 @ M	958 & M	342 & M	1240 & M	1550 & M
PAH, Total Detected USEPA 16	<118 µg/kg	TM218		13100	11900	3830	14200	33200

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

TPH CWG (S)

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	WS1-2	WS4-2	WS11-2	WS13-1	WS14-1	WS15-1
			Depth (m)	4.50 - 4.50	0.60 - 0.60	3.60 - 3.60	2.25 - 2.25	1.50 - 1.50	1.80 - 1.80
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	16/09/2013	27/09/2013	12/09/2013	16/09/2013	16/09/2013	16/09/2013
			Sample Time	.	.	.	.	.	.
			Date Received	27/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013
			SDG Ref	130927-147	130927-147	130927-147	130927-147	130927-147	130927-147
			Lab Sample No.(s)	8178215	8178200	8178205	8178076	8178225	8178230
			AGS Reference						
GRO Surrogate % recovery**	%	TM089		85	57	52	38	71	67
GRO TOT (Moisture Corrected)	<44 µg/kg	TM089		11800 M	<44 M	28500 M	31800 M	15800 M	53800 M
Methyl tertiary butyl ether (MTBE)	<5 µg/kg	TM089		<5 @ M	<5 & M	<5 @ M	<5 @ M	<5 @ M	<5 @ M
Benzene	<10 µg/kg	TM089		<10 @ M	<10 & M	<10 @ M	<10 @ M	<10 @ M	28.5 @ M
Toluene	<2 µg/kg	TM089		<2 @ M	<2 & M	<2 @ M	<2 @ M	<2 @ M	<2 @ M
Ethylbenzene	<3 µg/kg	TM089		<3 @ M	<3 & M	<3 @ M	<3 @ M	<3 @ M	<3 @ M
m,p-Xylene	<6 µg/kg	TM089		<6 @ M	<6 & M	<6 @ M	<6 @ M	<6 @ M	<6 @ M
o-Xylene	<3 µg/kg	TM089		<3 @ M	<3 & M	<3 @ M	<3 @ M	<3 @ M	<3 @ M
sum of detected mpo xylene by GC	<9 µg/kg	TM089		<9	<9	<9	<9	<9	<9
sum of detected BTEX by GC	<24 µg/kg	TM089		<24	<24	<24	<24	<24	28.5
Aliphatics >C5-C6	<10 µg/kg	TM089		<10	<10	25.2	35	28.2	49.8
Aliphatics >C6-C8	<10 µg/kg	TM089		42.6	<10	1160	2500	1720	4040
Aliphatics >C8-C10	<10 µg/kg	TM089		4220	<10	7140	10100	5180	15900
Aliphatics >C10-C12	<10 µg/kg	TM089		2820	<10	9260	7460	3260	13900
Aliphatics >C12-C16	<100 µg/kg	TM173		5080	16900	342000	93500	278000	429000
Aliphatics >C16-C21	<100 µg/kg	TM173		4400	94100	548000	128000	261000	479000
Aliphatics >C21-C35	<100 µg/kg	TM173		14400	391000	476000	344000	522000	946000
Aliphatics >C35-C44	<100 µg/kg	TM173		1310	97700	40900	58900	83400	245000
Total Aliphatics >C12-C44	<100 µg/kg	TM173		25100	600000	1410000	624000	1140000	2100000
Aromatics >EC5-EC7	<10 µg/kg	TM089		<10	<10	<10	<10	<10	28.5
Aromatics >EC7-EC8	<10 µg/kg	TM089		<10	<10	<10	<10	<10	<10
Aromatics >EC8-EC10	<10 µg/kg	TM089		2810	<10	4760	6730	3450	10600
Aromatics >EC10-EC12	<10 µg/kg	TM089		1880	<10	6170	4970	2170	9260
Aromatics >EC12-EC16	<100 µg/kg	TM173		189	2530	51900	20000	55800	68000
Aromatics >EC16-EC21	<100 µg/kg	TM173		378	28000	288000	79900	180000	361000
Aromatics >EC21-EC35	<100 µg/kg	TM173		5310	231000	426000	249000	394000	724000
Aromatics >EC35-EC44	<100 µg/kg	TM173		1580	82200	89300	79600	117000	195000
Aromatics >EC40-EC44	<100 µg/kg	TM173		279	28600	29900	28300	42300	69100
Total Aromatics >EC12-EC44	<100 µg/kg	TM173		7460	343000	856000	429000	747000	1350000
Total Aliphatics >C5-35	<100 µg/kg	TM173		30900	502000	1380000	586000	1070000	1890000
Total Aromatics >C5-35	<100 µg/kg	TM173		10600	261000	778000	361000	636000	1170000
Total Aliphatics & Aromatics >C5-35	<100 µg/kg	TM173		41500	764000	2160000	946000	1710000	3060000

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

TPH CWG (S)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
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**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	WS1-2	WS4-2	WS11-2	WS13-1	WS14-1	WS15-1
			Depth (m)	4.50 - 4.50	0.60 - 0.60	3.60 - 3.60	2.25 - 2.25	1.50 - 1.50	1.80 - 1.80
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	16/09/2013	27/09/2013	12/09/2013	16/09/2013	16/09/2013	16/09/2013
			Sample Time	.	.	.	.	.	.
			Date Received	27/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013	27/09/2013
			SDG Ref	130927-147	130927-147	130927-147	130927-147	130927-147	130927-147
			Lab Sample No.(s)	8178215	8178200	8178205	8178076	8178225	8178230
			AGS Reference						
Total Aliphatics & Aromatics >C5-C44	<100 µg/kg	TM173		44400	943000	2290000	1080000	1910000	3500000

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

TPH CWG (S)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	WS17-1	WS18-1	WS19-1	WS20-1		
			Depth (m)	2.60 - 2.60	2.20 - 2.20	2.50 - 2.50	2.10 - 2.10		
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid		
			Date Sampled	27/09/2013	27/09/2013	27/09/2013	27/09/2013		
			Sample Time	.	.	.	.		
			Date Received	27/09/2013	27/09/2013	27/09/2013	27/09/2013		
			SDG Ref	130927-147	130927-147	130927-147	130927-147		
			Lab Sample No.(s)	8178143	8178153	8178127	8178163		
			AGS Reference						
GRO Surrogate % recovery**	%	TM089		72	103	97	109		
GRO TOT (Moisture Corrected)	<44 µg/kg	TM089		7900 M	606 M	848 M	9960 M		
Methyl tertiary butyl ether (MTBE)	<5 µg/kg	TM089		<5 & M	<5 & M	<5 & M	<5 & M		
Benzene	<10 µg/kg	TM089		<10 & M	<10 & M	<10 & M	<10 & M		
Toluene	<2 µg/kg	TM089		<2 & M	2.34 & M	7.3 & M	<2 & M		
Ethylbenzene	<3 µg/kg	TM089		15.4 & M	<3 & M	<3 & M	<3 & M		
m,p-Xylene	<6 µg/kg	TM089		<6 & M	<6 & M	<6 & M	<6 & M		
o-Xylene	<3 µg/kg	TM089		<3 & M	<3 & M	<3 & M	<3 & M		
sum of detected mpo xylene by GC	<9 µg/kg	TM089		<9	<9	<9	<9		
sum of detected BTEX by GC	<24 µg/kg	TM089		<24	<24	<24	<24		
Aliphatics >C5-C6	<10 µg/kg	TM089		21.6	<10	21.9	21.6		
Aliphatics >C6-C8	<10 µg/kg	TM089		707	14	74.5	464		
Aliphatics >C8-C10	<10 µg/kg	TM089		2270	104	220	3210		
Aliphatics >C10-C12	<10 µg/kg	TM089		2020	246	222	2470		
Aliphatics >C12-C16	<100 µg/kg	TM173		93500	4650	156000	36000		
Aliphatics >C16-C21	<100 µg/kg	TM173		213000	26600	353000	74800		
Aliphatics >C21-C35	<100 µg/kg	TM173		436000	86500	585000	183000		
Aliphatics >C35-C44	<100 µg/kg	TM173		64700	15300	90300	22500		
Total Aliphatics >C12-C44	<100 µg/kg	TM173		808000	133000	1180000	316000		
Aromatics >EC5-EC7	<10 µg/kg	TM089		<10	<10	<10	<10		
Aromatics >EC7-EC8	<10 µg/kg	TM089		<10	<10	<10	<10		
Aromatics >EC8-EC10	<10 µg/kg	TM089		1530	69	150	2140		
Aromatics >EC10-EC12	<10 µg/kg	TM089		1350	164	149	1650		
Aromatics >EC12-EC16	<100 µg/kg	TM173		15900	<100	7490	7740		
Aromatics >EC16-EC21	<100 µg/kg	TM173		76000	6330	86400	48400		
Aromatics >EC21-EC35	<100 µg/kg	TM173		311000	35600	360000	161000		
Aromatics >EC35-EC44	<100 µg/kg	TM173		77200	12300	97300	38100		
Aromatics >EC40-EC44	<100 µg/kg	TM173		25500	4540	31700	12700		
Total Aromatics >EC12-EC44	<100 µg/kg	TM173		480000	54100	551000	256000		
Total Aliphatics >C5-35	<100 µg/kg	TM173		748000	118000	1090000	300000		
Total Aromatics >C5-35	<100 µg/kg	TM173		406000	42000	454000	221000		
Total Aliphatics & Aromatics >C5-35	<100 µg/kg	TM173		1150000	160000	1550000	522000		

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

TPH CWG (S)

Results Legend		Customer Sample R	WS17-1	WS18-1	WS19-1	WS20-1		
#	ISO17025 accredited.							
M	*m*CERTS accredited.							
aq	Aqueous / settled sample.							
diss.filt	Dissolved / filtered sample.	Depth (m)	2.60 - 2.60	2.20 - 2.20	2.50 - 2.50	2.10 - 2.10		
tot.unfilt	Total / unfiltered sample.	Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid		
*	Subcontracted test.	Date Sampled	27/09/2013	27/09/2013	27/09/2013	27/09/2013		
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery	Sample Time	.	.	.	.		
		Date Received	27/09/2013	27/09/2013	27/09/2013	27/09/2013		
		SDG Ref	130927-147	130927-147	130927-147	130927-147		
(F)	Trigger breach confirmed	Lab Sample No.(s)	8178143	8178153	8178127	8178163		
1-4&+§@	Sample deviation (see appendix)	AGS Reference						
Component		**LOD/Units**	**Method**					
Total Aliphatics & Aromatics >C5-C44		<100 µg/kg	TM173	1300000	188000	1740000	582000		

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Asbestos Identification - Solid Samples

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Fibrous Actinolite	Fibrous Anthophyllite	Fibrous Tremolite	Non-Asbestos Fibre
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	SA2-1 0.50 - 1.00 SOLID 27/09/2013 00:00:00 130927-147 8178174 TM048	21/10/13	Paul Fenney	Loose fibres in soil	Trace (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	WS1-1 2.75 - 2.75 SOLID 16/09/2013 00:00:00 130927-147 8178210 TM048	21/10/13	Paul Fenney	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	WS1-2 4.50 - 4.50 SOLID 16/09/2013 00:00:00 130927-147 8178215 TM048	02/10/13	Martin Cotterell	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	WS2-1 1.10 - 1.10 SOLID 24/09/2013 00:00:00 130927-147 8178087 TM048	21/10/13	Laura Robbins	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	WS3-1 2.20 - 2.20 SOLID 24/09/2013 00:00:00 130927-147 8178116 TM048	21/10/13	Laura Robbins	Loose fibres in soil	Trace (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Fibrous Actinolite	Fibrous Anthophyllite	Fibrous Tremolite	Non-Asbestos Fibre
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	WS4-1 2.30 - 2.30 SOLID 27/09/2013 00:00:00 130927-147 8178195 TM048	21/10/13	Laura Robbins	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	WS4-2 0.60 - 0.60 SOLID 27/09/2013 00:00:00 130927-147 8178200 TM048	21/10/13	Lauren Sargeant	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	WS7-1 2.20 - 2.20 SOLID 24/09/2013 00:00:00 130927-147 8178098 TM048	21/10/13	Lauren Sargeant	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	WS8-1 3.60 - 3.60 SOLID 24/09/2013 00:00:00 130927-147 8178110 TM048	21/10/13	Lauren Sargeant	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	WS10-1 1.60 - 1.60 SOLID 12/09/2013 00:00:00 130927-147 8178132 TM048	21/10/13	Lauren Sargeant	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	WS11-1 0.25 - 0.25 SOLID 12/09/2013 00:00:00 130927-147 8178071 TM048	21/10/13	Paul Fenney	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Fibrous Actinolite	Fibrous Anthophyllite	Fibrous Tremolite	Non-Asbestos Fibre
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	WS12-1 0.80 - 0.80 SOLID 16/09/2013 00:00:00 130927-147 8178082 TM048	21/10/13	Lauren Sargeant	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	WS13-1 2.25 - 2.25 SOLID 16/09/2013 00:00:00 130927-147 8178076 TM048	21/10/13	Laura Robbins	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	WS14-1 1.50 - 1.50 SOLID 16/09/2013 00:00:00 130927-147 8178225 TM048	21/10/13	Laura Robbins	Loose fibres in soil	Trace (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	WS15-1 1.80 - 1.80 SOLID 16/09/2013 00:00:00 130927-147 8178230 TM048	21/10/13	Paul Fenney	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	WS17-1 2.60 - 2.60 SOLID 27/09/2013 00:00:00 130927-147 8178143 TM048	21/10/13	Paul Fenney	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	WS19-1 2.50 - 2.50 SOLID 27/09/2013 00:00:00 130927-147 8178127 TM048	21/10/13	Paul Fenney	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Fibrous Actinolite	Fibrous Anthophyllite	Fibrous Tremolite	Non-Asbestos Fibre
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	WS20-1 2.10 - 2.10 SOLID 27/09/2013 00:00:00 130927-147 8178163 TM048	21/10/13	Paul Fenney	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Asbestos Quantification - Full

		Additional Asbestos Components (Using TM048)	Analysts Comments	Asbestos Quantification - Gravimetric - %	Asbestos Quantification - PCOM Evaluation - %	Asbestos Quantification - Total - %
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	SA2-1 0.50 - 1.00 SOLID 27/09/2013 00:00:00 130927-147 8178174 TM 304	None (#)	N/C	<0.001 (#)	<0.001 (#)	<0.001 (#)

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

CEN 2:1 STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

Client Reference		**Site Location**	Frodsham
Mass Sample taken (kg)	0.275	**Moisture Content Ratio (%)**	56.8
Mass of dry sample (kg)	0.175	**Dry Matter Content Ratio (%)**	63.8
Particle Size <4mm	>95%		

Case				
SDG	130927-147			
Lab Sample Number(s)	8178122			
Sampled Date	24-Sep-2013			
Customer Sample Ref.	WS3-2			
Depth (m)	3.10 - 3.10			

Solid Waste Analysis

Total Organic Carbon (%)	-	-	-	-
Loss on Ignition (%)	-	-	-	-
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-	-
Mineral Oil (mg/kg)	-	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	7.48	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis

	Concⁿ in 2:1 eluate (mg/l)		2:1 concⁿ leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	0.00319	<0.00012	0.00638	<0.0012	0.5	2	25
Barium	-	-	-	-	20	100	300
Cadmium	<0.0001	<0.0001	<0.0002	<0.001	0.04	1	5
Chromium	0.00121	<0.00022	0.00242	<0.0022	0.5	10	70
Copper	0.00521	<0.00085	0.0104	<0.0085	2	50	100
Mercury Dissolved (CVAF)	<0.00001	<0.00001	<0.00002	<0.0001	0.01	0.2	2
Molybdenum	-	-	-	-	0.5	10	30
Nickel	0.0053	<0.00015	0.0106	<0.0015	0.4	10	40
Lead	0.000151	<0.00002	0.000302	<0.0002	0.5	10	50
Antimony	-	-	-	-	0.06	0.7	5
Selenium	0.00436	<0.00039	0.00872	<0.0039	0.1	0.5	7
Zinc	0.00167	<0.00041	0.00334	<0.0041	4	50	200
Chloride	-	-	-	-	800	15000	25000
Fluoride	-	-	-	-	10	150	500
Sulphate (soluble)	731	<10	1460	<10	1000	20000	50000
Total Dissolved Solids	-	-	-	-	4000	60000	100000
Total Monohydric Phenols (W)	-	-	-	-	1	-	-
Dissolved Organic Carbon	-	-	-	-	500	800	1000

Leach Test Information

Date Prepared	15-Oct-2013
pH (pH Units)	8.32
Conductivity (µS/cm)	2,580.00
Temperature (°C)	20.20
Volume Leachant (Litres)	0.251
Volume of Eluate VE1 (Litres)	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
25/11/2013 08:13:09

08:12:45 25/11/2013

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

CEN 2:1 STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

Client Reference		**Site Location**	Frodsham
Mass Sample taken (kg)	0.275	**Moisture Content Ratio (%)**	56.8
Mass of dry sample (kg)	0.175	**Dry Matter Content Ratio (%)**	63.8
Particle Size <4mm	>95%		

Case				
SDG	130927-147			
Lab Sample Number(s)	8178122			
Sampled Date	24-Sep-2013			
Customer Sample Ref.	WS3-2			
Depth (m)	3.10 - 3.10			

Solid Waste Analysis

Total Organic Carbon (%)	-	-	-	-
Loss on Ignition (%)	-	-	-	-
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-	-
Mineral Oil (mg/kg)	-	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	7.48	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis

	Concⁿ in 2:1 eluate (mg/l)		2:1 concⁿ leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Hexavalent Chromium	<0.03	<0.03	<0.06	<0.03	-	-	-
pH Value of Filtered Water	8.4	<0.001	17	<0.01	-	-	-
Sulphide	<0.01	<0.01	<0.02	<0.01	-	-	-
Sulphur Dissolved	286	<1	572	<1	-	-	-
Naphthalene (diss.filt)	<0.0001	<0.0001	<0.0002	<0.001	-	-	-
Total Cyanide (W)	<0.05	<0.05	<0.1	<0.05	-	-	-
Acenaphthene (diss.filt)	0.000189	<0.000015	0.000378	<0.00015	-	-	-
Free Cyanide (W)	<0.05	<0.05	<0.1	<0.05	-	-	-
Phenol by HPLC (W)	<0.002	<0.002	<0.004	<0.002	-	-	-
Acenaphthylene (diss.filt)	0.000041	<0.000011	0.000082	<0.00011	-	-	-
Fluoranthene (diss.filt)	0.00051	<0.000017	0.00102	<0.00017	-	-	-
Thiocyanate (W)	<0.05	<0.05	<0.1	<0.05	-	-	-
Anthracene (diss.filt)	0.0000552	<0.000015	0.00011	<0.00015	-	-	-
Boron	0.949	<0.0094	1.9	<0.094	-	-	-
Phenanthrene (diss.filt)	<0.000022	<0.000022	<0.000044	<0.00022	-	-	-
Fluorene (diss.filt)	0.0000252	<0.000014	0.0000504	<0.00014	-	-	-
Chrysene (diss.filt)	0.0000201	<0.000013	0.0000402	<0.00013	-	-	-
Pyrene (diss.filt)	0.000311	<0.000015	0.000622	<0.00015	-	-	-
Benzo(a)anthracene (diss.filt)	<0.000017	<0.000017	<0.000034	<0.00017	-	-	-
Benzo(b)fluoranthene (diss.filt)	<0.000023	<0.000023	<0.000046	<0.00023	-	-	-
Benzo(k)fluoranthene (diss.filt)	<0.000027	<0.000027	<0.000054	<0.00027	-	-	-
Benzo(a)pyrene (diss.filt)	<0.000009	<0.000009	<0.000018	<0.00009	-	-	-

Leach Test Information

Date Prepared	15-Oct-2013
pH (pH Units)	8.32
Conductivity (µS/cm)	2,580.00
Temperature (°C)	20.20
Volume Leachant (Litres)	0.251
Volume of Eluate VE1 (Litres)	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
25/11/2013 08:13:09

08:12:45 25/11/2013

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

CEN 2:1 STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

Client Reference		**Site Location**	Frodsham
Mass Sample taken (kg)	0.275	**Moisture Content Ratio (%)**	56.8
Mass of dry sample (kg)	0.175	**Dry Matter Content Ratio (%)**	63.8
Particle Size <4mm	>95%		

Case				
SDG	130927-147			
Lab Sample Number(s)	8178122			
Sampled Date	24-Sep-2013			
Customer Sample Ref.	WS3-2			
Depth (m)	3.10 - 3.10			

Solid Waste Analysis

Total Organic Carbon (%)	-	-	-	-
Loss on Ignition (%)	-	-	-	-
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-	-
Mineral Oil (mg/kg)	-	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	7.48	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis

	Concⁿ in 2:1 eluate (mg/l)		2:1 concⁿ leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Dibenzo(a,h)anthracene (diss.filt)	<0.000016	<0.000016	<0.000032	<0.00016	-	-	-
Benzo(g,h,i)perylene (diss.filt)	<0.000016	<0.000016	<0.000032	<0.00016	-	-	-
Indeno(1,2,3-cd)pyrene (diss.filt)	<0.000014	<0.000014	<0.000028	<0.00014	-	-	-
PAH 16 EPA Total by GCMS (diss.filt)	0.00115	<0.000341	0.0023	<0.00341	-	-	-

Leach Test Information

Date Prepared	15-Oct-2013
pH (pH Units)	8.32
Conductivity (µS/cm)	2,580.00
Temperature (°C)	20.20
Volume Leachant (Litres)	0.251
Volume of Eluate VE1 (Litres)	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
25/11/2013 08:13:09

08:12:45 25/11/2013

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

CEN 2:1 STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

Client Reference		**Site Location**	Frodsham
Mass Sample taken (kg)	0.236	**Moisture Content Ratio (%)**	35.3
Mass of dry sample (kg)	0.175	**Dry Matter Content Ratio (%)**	73.9
Particle Size <4mm	>95%		

Case				
SDG	130927-147			
Lab Sample Number(s)	8178138			
Sampled Date	27-Sep-2013			
Customer Sample Ref.	WS19-2			
Depth (m)	3.50 - 3.50			

Solid Waste Analysis

Total Organic Carbon (%)	-	-	-	-
Loss on Ignition (%)	-	-	-	-
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-	-
Mineral Oil (mg/kg)	-	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis

	Concⁿ in 2:1 eluate (mg/l)		2:1 concⁿ leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	0.0088	<0.00012	0.0176	<0.0012	0.5	2	25
Barium	-	-	-	-	20	100	300
Cadmium	<0.0001	<0.0001	<0.0002	<0.001	0.04	1	5
Chromium	0.00109	<0.00022	0.00218	<0.0022	0.5	10	70
Copper	0.00473	<0.00085	0.00946	<0.0085	2	50	100
Mercury Dissolved (CVAF)	<0.00001	<0.00001	<0.00002	<0.0001	0.01	0.2	2
Molybdenum	-	-	-	-	0.5	10	30
Nickel	0.00649	<0.00015	0.013	<0.0015	0.4	10	40
Lead	0.000131	<0.00002	0.000262	<0.0002	0.5	10	50
Antimony	-	-	-	-	0.06	0.7	5
Selenium	0.01	<0.00039	0.02	<0.0039	0.1	0.5	7
Zinc	0.000847	<0.00041	0.00169	<0.0041	4	50	200
Chloride	-	-	-	-	800	15000	25000
Fluoride	-	-	-	-	10	150	500
Sulphate (soluble)	230	<2	460	<2	1000	20000	50000
Total Dissolved Solids	-	-	-	-	4000	60000	100000
Total Monohydric Phenols (W)	-	-	-	-	1	-	-
Dissolved Organic Carbon	-	-	-	-	500	800	1000

Leach Test Information

Date Prepared	15-Oct-2013
pH (pH Units)	8.16
Conductivity (µS/cm)	1,460.00
Temperature (°C)	20.00
Volume Leachant (Litres)	0.288
Volume of Eluate VE1 (Litres)	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
25/11/2013 08:13:09

08:12:45 25/11/2013

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

CEN 2:1 STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

Client Reference		**Site Location**	Frodsham
Mass Sample taken (kg)	0.236	**Moisture Content Ratio (%)**	35.3
Mass of dry sample (kg)	0.175	**Dry Matter Content Ratio (%)**	73.9
Particle Size <4mm	>95%		

Case				
SDG	130927-147			
Lab Sample Number(s)	8178138			
Sampled Date	27-Sep-2013			
Customer Sample Ref.	WS19-2			
Depth (m)	3.50 - 3.50			

Solid Waste Analysis

Total Organic Carbon (%)	-	-	-	-
Loss on Ignition (%)	-	-	-	-
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-	-
Mineral Oil (mg/kg)	-	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis

	Concⁿ in 2:1 eluate (mg/l)		2:1 concⁿ leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Hexavalent Chromium	<0.03	<0.03	<0.06	<0.03	-	-	-
pH Value of Filtered Water	8.3	<0.001	17	<0.01	-	-	-
Sulphide	<0.01	<0.01	<0.02	<0.01	-	-	-
Sulphur Dissolved	83.7	<1	167	<1	-	-	-
Naphthalene (diss.filt)	<0.0001	<0.0001	<0.0002	<0.001	-	-	-
Total Cyanide (W)	<0.05	<0.05	<0.1	<0.05	-	-	-
Acenaphthene (diss.filt)	0.0000699	<0.000015	0.00014	<0.00015	-	-	-
Free Cyanide (W)	<0.05	<0.05	<0.1	<0.05	-	-	-
Phenol by HPLC (W)	<0.002	<0.002	<0.004	<0.002	-	-	-
Acenaphthylene (diss.filt)	0.0000251	<0.000011	0.0000502	<0.00011	-	-	-
Fluoranthene (diss.filt)	<0.000017	<0.000017	<0.000034	<0.00017	-	-	-
Thiocyanate (W)	<0.05	<0.05	<0.1	<0.05	-	-	-
Anthracene (diss.filt)	<0.000015	<0.000015	<0.00003	<0.00015	-	-	-
Boron	0.544	<0.0094	1.09	<0.094	-	-	-
Phenanthrene (diss.filt)	0.0000235	<0.000022	0.000047	<0.00022	-	-	-
Fluorene (diss.filt)	0.0000343	<0.000014	0.0000686	<0.00014	-	-	-
Chrysene (diss.filt)	<0.000013	<0.000013	<0.000026	<0.00013	-	-	-
Pyrene (diss.filt)	<0.000015	<0.000015	<0.00003	<0.00015	-	-	-
Benzo(a)anthracene (diss.filt)	<0.000017	<0.000017	<0.000034	<0.00017	-	-	-
Benzo(b)fluoranthene (diss.filt)	<0.000023	<0.000023	<0.000046	<0.00023	-	-	-
Benzo(k)fluoranthene (diss.filt)	<0.000027	<0.000027	<0.000054	<0.00027	-	-	-
Benzo(a)pyrene (diss.filt)	<0.000009	<0.000009	<0.000018	<0.00009	-	-	-

Leach Test Information

Date Prepared	15-Oct-2013
pH (pH Units)	8.16
Conductivity (µS/cm)	1,460.00
Temperature (°C)	20.00
Volume Leachant (Litres)	0.288
Volume of Eluate VE1 (Litres)	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
25/11/2013 08:13:09

08:12:45 25/11/2013

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

CEN 2:1 STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

Client Reference		**Site Location**	Frodsham
Mass Sample taken (kg)	0.236	**Moisture Content Ratio (%)**	35.3
Mass of dry sample (kg)	0.175	**Dry Matter Content Ratio (%)**	73.9
Particle Size <4mm	>95%		

Case				
SDG	130927-147			
Lab Sample Number(s)	8178138			
Sampled Date	27-Sep-2013			
Customer Sample Ref.	WS19-2			
Depth (m)	3.50 - 3.50			

Solid Waste Analysis

Total Organic Carbon (%)	-	-	-	-
Loss on Ignition (%)	-	-	-	-
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-	-
Mineral Oil (mg/kg)	-	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis

	Concⁿ in 2:1 eluate (mg/l)		2:1 concⁿ leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Dibenzo(a,h)anthracene (diss.filt)	<0.000016	<0.000016	<0.000032	<0.00016	-	-	-
Benzo(g,h,i)perylene (diss.filt)	<0.000016	<0.000016	<0.000032	<0.00016	-	-	-
Indeno(1,2,3-cd)pyrene (diss.filt)	<0.000014	<0.000014	<0.000028	<0.00014	-	-	-
PAH 16 EPA Total by GCMS (diss.filt)	<0.000341	<0.000341	<0.000682	<0.00341	-	-	-

Leach Test Information

Date Prepared	15-Oct-2013
pH (pH Units)	8.16
Conductivity (µS/cm)	1,460.00
Temperature (°C)	20.00
Volume Leachant (Litres)	0.288
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CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Notification of NDPs (No determination possible)

Date Received : 27/09/2013 16:04:38

Sample No	Customer Sample Ref.	Depth (m)	Test	Comment
8178174	SA2-1	0.50 - 1.00	Total Sulphur	Unsuitable for analysis due to potential Asbestos
8178174	SA2-1	0.50 - 1.00	Total Sulphur	Unsuitable for analysis due to potential Asbestos
8178210	WS1-1	2.75 - 2.75	NO3, NO2 and TON by KONE (s)	Sample unsuitable for extraction
8178210	WS1-1	2.75 - 2.75	Anions by Kone (soil)	Sample unsuitable for extraction

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Table of Results - Appendix

Method No	Reference	Description	Wet/Dry Sample [1]	Surrogate Corrected
ASB_PREP				
PM001		Preparation of Samples for Metals Analysis		
PM023	Leaching test method for the Assessment of Contaminated Land: Interim NRA Guidance. National Rivers Authority R & D note 301. (1994).	Leaching Procedure for NRA Leachates		
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
PM114		Leaching Procedure for CEN Two Stage BatchTest 2:1/8:1 Cumulative		
PM115		Leaching Procedure for CEN One Stage Leach Test 2:1 & 10:1 1 Step		
TM 304				
TM048	HSG 248, Asbestos: The analysts' guide for sampling, analysis and clearance procedures	Identification of Asbestos in Bulk Material		
TM062 (S)	National Grid Property Holdings Methods for the Collection & Analysis of Samples from National Grid Sites version 1 Sec 3.9	Determination of Phenols in Soils by HPLC		
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)		
TM101	Method 4500B & C, AWWA/APHA, 20th Ed., 1999	Determination of Sulphide in soil and water samples using the Kone Analyser		
TM132	In - house Method	ELTRA CS800 Operators Guide		
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter		
TM151	Method 3500D, AWWA/APHA, 20th Ed., 1999	Determination of Hexavalent Chromium using Kone analyser		
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS		
TM153	Method 4500A,B,C, I, M AWWA/APHA, 20th Ed., 1999	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the Skalar SANS+ System Segmented Flow Analyser		
TM168	EPA Method 8082, Polychlorinated Biphenyls by Gas Chromatography	Determination of WHO12 and EC7 Polychlorinated Biphenyl Congeners by GC-MS in Soils		
TM173	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GC-FID		
TM178	Modified: US EPA Method 8100	Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS in Waters		
TM180	Sulphide in waters and waste waters 1991 ISBN 01 175 7186 SCA rec. 2007 (unpublished)'	The Determination Of Easily Liberated Sulphide In Soil Samples by Ion Selective Electrode Technique		
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES		
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry		
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers		
TM218	Microwave extraction – EPA method 3546	Microwave extraction - EPA method 3546		
TM221	Inductively Coupled Plasma - Atomic Emission Spectroscopy. An Atlas of Spectral Information: Winge, Fassel, Peterson and Floyd	Determination of Acid extractable Sulphate in Soils by IRIS Emission Spectrometer		
TM222	In-House Method	Determination of Hot Water Soluble Boron in Soils (10:1 Water:soil) by IRIS Emission Spectrometer		
TM227	Standard methods for the examination of waters and wastewaters 20th Edition, AWWA/APHA Method 4500.	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate		
TM228	US EPA Method 6010B	Determination of Major Cations in Water by iCap 6500 Duo ICP-OES		
TM241	Methods for the Examination of Waters and Associated Materials; Chromium in Raw and Potable Waters and Sewage Effluents 1980.	The Determination of Hexavalent Chromium in Waters and Leachates using the Kone Analyser		
TM243		Mixed Anions In Soils By Kone		
TM248	In-House Method	Determination of Ammonium BRE (2:1 Extract) on solids		
TM256	The measurement of Electrical Conductivity and the Laboratory determination of pH Value of Natural, Treated and Wastewaters. HMSO, 1978. ISBN 011 751428 4.	Determination of pH in Water and Leachate using the GLpH pH Meter		
TM259	by HPLC	Determination of Phenols in Waters and Leachates by HPLC		
TM282		Extraction of Magnesium by BRE Method		

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	8178174	8178184	8178210	8178215	8178087	8178093	8178116	8178122	8178195	8178200
Customer Sample Ref.	SA2-1	SA2-3	WS1-1	WS1-2	WS2-1	WS2-2	WS3-1	WS3-2	WS4-1	WS4-2
AGS Ref.										
Depth	0.50 - 1.00	13.00 - 13.00	2.75 - 2.75	4.50 - 4.50	1.10 - 1.10	2.80 - 2.80	2.20 - 2.20	3.10 - 3.10	2.30 - 2.30	0.60 - 0.60
Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
Ammoniacal N as NH4 in 2:1 extract	21-Oct-2013	21-Oct-2013	07-Oct-2013	07-Oct-2013	07-Oct-2013			07-Oct-2013		
Anions by Kone (soil)	21-Oct-2013	21-Oct-2013		03-Oct-2013	03-Oct-2013	03-Oct-2013	03-Oct-2013	03-Oct-2013		21-Oct-2013
Anions by Kone (w)			21-Oct-2013					21-Oct-2013	22-Oct-2013	
Asbestos ID in Solid Samples	21-Oct-2013		21-Oct-2013	02-Oct-2013	21-Oct-2013		21-Oct-2013		21-Oct-2013	21-Oct-2013
Asbestos Quantification - Full	25-Nov-2013									
Boron Water Soluble	22-Oct-2013	17-Oct-2013		03-Oct-2013		02-Oct-2013	02-Oct-2013			22-Oct-2013
CEN 2:1 Leachate (1 Stage)								15-Oct-2013		
CEN Readings								18-Oct-2013		
Cyanide Comp/Free/Total/Thiocyanate	21-Oct-2013	21-Oct-2013	21-Oct-2013	08-Oct-2013		04-Oct-2013	07-Oct-2013	21-Oct-2013	24-Oct-2013	19-Oct-2013
Dissolved Metals by ICP-MS			21-Oct-2013					21-Oct-2013	22-Oct-2013	
Easily Liberated Sulphide	21-Oct-2013	21-Oct-2013		03-Oct-2013		02-Oct-2013	02-Oct-2013			21-Oct-2013
EPH CWG (Aliphatic) GC (S)				03-Oct-2013						21-Oct-2013
EPH CWG (Aromatic) GC (S)				03-Oct-2013						21-Oct-2013
GRO by GC-FID (S)				02-Oct-2013						18-Oct-2013
Hexavalent Chromium (s)	22-Oct-2013	18-Oct-2013		05-Oct-2013		02-Oct-2013	05-Oct-2013			22-Oct-2013
Hexavalent Chromium (w)			22-Oct-2013					22-Oct-2013	24-Oct-2013	
Magnesium (BRE)	21-Oct-2013	18-Oct-2013	03-Oct-2013	04-Oct-2013	03-Oct-2013			03-Oct-2013		
Mercury Dissolved			21-Oct-2013					22-Oct-2013	24-Oct-2013	
Metals in solid samples by OES	22-Oct-2013	17-Oct-2013		03-Oct-2013		04-Oct-2013	04-Oct-2013			22-Oct-2013
NO3, NO2 and TON by KONE (s)	22-Oct-2013	22-Oct-2013		03-Oct-2013	03-Oct-2013			03-Oct-2013		
NRA Leachate			16-Oct-2013						18-Oct-2013	
PAH by GCMS	19-Oct-2013	19-Oct-2013		02-Oct-2013		03-Oct-2013	03-Oct-2013			18-Oct-2013
PAH in waters by GC-MS (diss.filt)			22-Oct-2013					22-Oct-2013	24-Oct-2013	
PCBs by GCMS				05-Oct-2013						22-Oct-2013
pH	18-Oct-2013	18-Oct-2013	04-Oct-2013	04-Oct-2013	04-Oct-2013	04-Oct-2013	04-Oct-2013	04-Oct-2013		18-Oct-2013
pH Value of Filtered Water			21-Oct-2013					18-Oct-2013	22-Oct-2013	
Phenols by HPLC (S)	18-Oct-2013	21-Oct-2013		02-Oct-2013		02-Oct-2013	02-Oct-2013			21-Oct-2013
Phenols by HPLC (W)			22-Oct-2013					21-Oct-2013	23-Oct-2013	
Sample description	15-Oct-2013	15-Oct-2013	28-Sep-2013	30-Sep-2013	28-Sep-2013	28-Sep-2013	28-Sep-2013	30-Sep-2013	15-Oct-2013	15-Oct-2013
Sulphide			21-Oct-2013					21-Oct-2013	23-Oct-2013	
Sulphur Dissolved by ICP-OES			21-Oct-2013					21-Oct-2013	24-Oct-2013	
Total Organic Carbon		18-Oct-2013		18-Oct-2013		18-Oct-2013				22-Oct-2013
Total Sulphate	22-Oct-2013	16-Oct-2013	01-Oct-2013	04-Oct-2013	02-Oct-2013			02-Oct-2013		
Total Sulphur		17-Oct-2013	02-Oct-2013	07-Oct-2013	02-Oct-2013	02-Oct-2013	02-Oct-2013	02-Oct-2013		23-Oct-2013
TPH CWG GC (S)				03-Oct-2013						21-Oct-2013

Lab Sample No(s)	8178098	8178110	8178132	8178189	8178071	8178205	8178082	8178076	8178225	8178230
Customer Sample Ref.	WS7-1	WS8-1	WS10-1	WS10-2	WS11-1	WS11-2	WS12-1	WS13-1	WS14-1	WS15-1
AGS Ref.										
Depth	2.20 - 2.20	3.60 - 3.60	1.60 - 1.60	2.60 - 2.60	0.25 - 0.25	3.60 - 3.60	0.80 - 0.80	2.25 - 2.25	1.50 - 1.50	1.80 - 1.80
Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
Ammoniacal N as NH4 in 2:1 extract				16-Oct-2013						16-Oct-2013
Anions by Kone (soil)	21-Oct-2013		03-Oct-2013	18-Oct-2013	03-Oct-2013		03-Oct-2013	01-Oct-2013	03-Oct-2013	21-Oct-2013
Asbestos ID in Solid Samples	21-Oct-2013	21-Oct-2013	21-Oct-2013		21-Oct-2013		21-Oct-2013	21-Oct-2013	21-Oct-2013	21-Oct-2013
Boron Water Soluble	21-Oct-2013		02-Oct-2013		30-Sep-2013		01-Oct-2013	01-Oct-2013	01-Oct-2013	21-Oct-2013
Cyanide Comp/Free/Total/Thiocyanate	21-Oct-2013		01-Oct-2013		07-Oct-2013		01-Oct-2013	01-Oct-2013	01-Oct-2013	19-Oct-2013
Easily Liberated Sulphide	18-Oct-2013		02-Oct-2013		02-Oct-2013		02-Oct-2013	02-Oct-2013	02-Oct-2013	21-Oct-2013
EPH CWG (Aliphatic) GC (S)						21-Oct-2013		04-Oct-2013	04-Oct-2013	21-Oct-2013
EPH CWG (Aromatic) GC (S)						21-Oct-2013		04-Oct-2013	04-Oct-2013	21-Oct-2013
GRO by GC-FID (S)						18-Oct-2013		03-Oct-2013	02-Oct-2013	18-Oct-2013
Hexavalent Chromium (s)	22-Oct-2013		05-Oct-2013		30-Sep-2013		30-Sep-2013	30-Sep-2013	30-Sep-2013	22-Oct-2013
Magnesium (BRE)				18-Oct-2013						21-Oct-2013
Metals in solid samples by OES	21-Oct-2013		04-Oct-2013		01-Oct-2013		02-Oct-2013	01-Oct-2013	02-Oct-2013	21-Oct-2013
NO3, NO2 and TON by KONE (s)				18-Oct-2013						22-Oct-2013
PAH by GCMS	18-Oct-2013		03-Oct-2013		03-Oct-2013		03-Oct-2013	03-Oct-2013	03-Oct-2013	21-Oct-2013
PCBs by GCMS						18-Oct-2013		03-Oct-2013		21-Oct-2013
pH	18-Oct-2013		04-Oct-2013	16-Oct-2013	04-Oct-2013		04-Oct-2013	04-Oct-2013	04-Oct-2013	21-Oct-2013
Phenols by HPLC (S)	21-Oct-2013		02-Oct-2013		02-Oct-2013		02-Oct-2013	02-Oct-2013	02-Oct-2013	21-Oct-2013
Sample description	15-Oct-2013	15-Oct-2013	28-Sep-2013	28-Sep-2013	28-Sep-2013	15-Oct-2013	28-Sep-2013	28-Sep-2013	28-Sep-2013	14-Oct-2013
Total Organic Carbon	21-Oct-2013	22-Oct-2013	22-Oct-2013					22-Oct-2013	22-Oct-2013	
Total Sulphate				16-Oct-2013						21-Oct-2013
Total Sulphur	23-Oct-2013		02-Oct-2013	17-Oct-2013	01-Oct-2013		01-Oct-2013	01-Oct-2013	01-Oct-2013	23-Oct-2013
TPH CWG GC (S)						21-Oct-2013		04-Oct-2013	04-Oct-2013	21-Oct-2013

CERTIFICATE OF ANALYSIS

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Lab Sample No(s)	8178143	8178153	8178127	8178138	8178163
Customer Sample Ref.	WS17-1	WS18-1	WS19-1	WS19-2	WS20-1
AGS Ref.					
Depth	2.60 - 2.60	2.20 - 2.20	2.50 - 2.50	3.50 - 3.50	2.10 - 2.10
Type	SOLID	SOLID	SOLID	SOLID	SOLID
Ammoniacal N as NH4 in 2:1 extract					21-Oct-2013
Anions by Kone (soil)	21-Oct-2013	21-Oct-2013	21-Oct-2013		21-Oct-2013
Anions by Kone (w)				21-Oct-2013	
Asbestos ID in Solid Samples	21-Oct-2013		21-Oct-2013		21-Oct-2013
Boron Water Soluble	17-Oct-2013	17-Oct-2013	22-Oct-2013		22-Oct-2013
CEN 2:1 Leachate (1 Stage)				15-Oct-2013	
CEN Readings				18-Oct-2013	
Cyanide Comp/Free/Total/Thiocyanate	21-Oct-2013	21-Oct-2013	21-Oct-2013	21-Oct-2013	19-Oct-2013
Dissolved Metals by ICP-MS				21-Oct-2013	
Easily Liberated Sulphide	21-Oct-2013	22-Oct-2013	21-Oct-2013		21-Oct-2013
EPH CWG (Aliphatic) GC (S)	22-Oct-2013	21-Oct-2013	22-Oct-2013		22-Oct-2013
EPH CWG (Aromatic) GC (S)	22-Oct-2013	21-Oct-2013	22-Oct-2013		22-Oct-2013
GRO by GC-FID (S)	17-Oct-2013	17-Oct-2013	17-Oct-2013		17-Oct-2013
Hexavalent Chromium (s)	18-Oct-2013	22-Oct-2013	18-Oct-2013		22-Oct-2013
Hexavalent Chromium (w)				22-Oct-2013	
Magnesium (BRE)					21-Oct-2013
Mercury Dissolved				21-Oct-2013	
Metals in solid samples by OES	08-Nov-2013	17-Oct-2013	22-Oct-2013		22-Oct-2013
NO3, NO2 and TON by KONE (s)					22-Oct-2013
PAH by GCMS	21-Oct-2013	18-Oct-2013	21-Oct-2013		21-Oct-2013
PAH in waters by GC-MS (diss.filt)				22-Oct-2013	
PCBs by GCMS	18-Oct-2013		22-Oct-2013		22-Oct-2013
pH	18-Oct-2013	16-Oct-2013	18-Oct-2013		21-Oct-2013
pH Value of Filtered Water				18-Oct-2013	
Phenols by HPLC (S)	21-Oct-2013	21-Oct-2013	21-Oct-2013		21-Oct-2013
Phenols by HPLC (W)				21-Oct-2013	
Sample description	15-Oct-2013	15-Oct-2013	15-Oct-2013	14-Oct-2013	15-Oct-2013
Sulphide				21-Oct-2013	
Sulphur Dissolved by ICP-OES				21-Oct-2013	
Total Organic Carbon	17-Oct-2013		22-Oct-2013		
Total Sulphate					22-Oct-2013
Total Sulphur	23-Oct-2013	17-Oct-2013	23-Oct-2013		23-Oct-2013
TPH CWG GC (S)	22-Oct-2013	21-Oct-2013	22-Oct-2013		22-Oct-2013

SDG:	130927-147	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251110
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Appendix
General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICS and SVOC TICS.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as “Not detected”. If no asbestos fibre types are found all will be reported as “Not detected” and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible. The quantity of asbestos present is not determined unless specifically requested.

7. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP -No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals -total metals must be requested separately.

11. Results relate only to the items tested.

12. LODs for wet tests reported on a dry weight basis are not corrected for moisture content.

13. **Surrogate recoveries** -Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 -130 %.

14. **Product analyses** -Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors
employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

Sample Deviations

1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Holding time exceeded before sample received**
§	**Sampled on date not provided**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to sampled on date**
&	**Sample Holding Time exceeded - Late arrival of instructions.**

Asbestos

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: -
Trace -Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

ALcontrol Laboratories

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Wardell Armstrong LLP
Sir Henry Doulton House
Forge Lane
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Stoke on Trent
Staffordshire
ST1 5BD

Attention: Tim Cawood

CERTIFICATE OF ANALYSIS

Date:	22 October 2013
Customer:	H_WARDELL_SKT
Sample Delivery Group (SDG):	130930-9
Your Reference:	ST13418
Location:	Frodsham
Report No:	246781

We received 1 sample on Saturday September 28, 2013 and 1 of these samples were scheduled for analysis which was completed on Tuesday October 22, 2013. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

[redacted]

Operations Manager

CERTIFICATE OF ANALYSIS

SDG:	130930-9	**Location:**	Frodsham	**Order Number:**	
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	246781
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
8186374	WS8		4.40	18/09/2013

Only received samples which have had analysis scheduled will be shown on the following pages.

CERTIFICATE OF ANALYSIS

SDG:	130930-9	**Location:**	Frodsham	**Order Number:**	
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	246781
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

SOLID

Results Legend

X **Test**

N **No Determination Possible**

Lab Sample No(s)			8186374		
Customer Sample Reference			WS8		
AGS Reference					
Depth (m)			4.40		
Container			250g Amber Jar (AL	400g Tub (ALE214)	60g VOC (ALE215)
Anions by Kone (soil)	All	NDPs: 0 Tests: 1	X		
Boron Water Soluble	All	NDPs: 0 Tests: 1	X		
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 1		X	
Easily Liberated Sulphide	All	NDPs: 0 Tests: 1		X	
EPH CWG (Aliphatic) GC (S)	All	NDPs: 0 Tests: 1	X		
EPH CWG (Aromatic) GC (S)	All	NDPs: 0 Tests: 1	X		
GRO by GC-FID (S)	All	NDPs: 0 Tests: 1			X
Hexavalent Chromium (s)	All	NDPs: 0 Tests: 1		X	
Metals in solid samples by OES	All	NDPs: 0 Tests: 1	X		
PAH by GCMS	All	NDPs: 0 Tests: 1	X		
PCBs by GCMS	All	NDPs: 0 Tests: 1	X		
pH	All	NDPs: 0 Tests: 1		X	
Phenols by HPLC (S)	All	NDPs: 0 Tests: 1		X	
Sample description	All	NDPs: 0 Tests: 1	X		
Total Sulphur	All	NDPs: 0 Tests: 1	X		

CERTIFICATE OF ANALYSIS

SDG:	130930-9	**Location:**	Frodsham	**Order Number:**	
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	246781
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

SOLID

Results Legend

X **Test**

N **No Determination Possible**

			Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container		
			8186374	WS8		4.40	250g Amber Jar (AL	400g Tub (ALE214)	60g VOC (ALE215)
TPH CWG GC (S)	All	NDPs: 0 Tests: 1					X		

CERTIFICATE OF ANALYSIS

SDG:	130930-9	**Location:**	Frodsham	**Order Number:**	
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	246781
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Sample Descriptions

Grain Sizes

very fine	<0.063mm	**fine**	0.063mm - 0.1mm	**medium**	0.1mm - 2mm	**coarse**	2mm - 10mm	**very coarse**	>10mm

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions	Inclusions 2
8186374	WS8	4.40	Dark Brown	Silt Loam	0.063 - 0.1 mm	None	None

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

CERTIFICATE OF ANALYSIS

SDG:	130930-9	**Location:**	Frodsham	**Order Number:**	
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	246781
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Customer Sample R	WS8
Depth (m)	4.40
Sample Type	Soil/Solid
Date Sampled	18/09/2013
Sample Time	.
Date Received	28/09/2013
SDG Ref	130930-9
Lab Sample No.(s)	8186374
AGS Reference	

Component	LOD/Units	Method	
Phenol	<0.01 mg/kg	TM062 (S)	<0.01 @ M
Sulphur, Total	<0.02 %	TM132	0.22 @ #
pH	1 pH Units	TM133	8.07 M
Chromium, Hexavalent	<0.6 mg/kg	TM151	<0.6 #
Cyanide, Total	<1 mg/kg	TM153	<1 @ M
Cyanide, Free	<1 mg/kg	TM153	<1 @ M
Thiocyanate	<1 mg/kg	TM153	<1 @ M
PCB congener 118	<3 µg/kg	TM168	<3 @ M
PCB congener 81	<3 µg/kg	TM168	<3 @ M
PCB congener 77	<3 µg/kg	TM168	<3 @ M
PCB congener 123	<3 µg/kg	TM168	<3 @ M
PCB congener 114	<3 µg/kg	TM168	<3 @ M
PCB congener 105	<3 µg/kg	TM168	<3 @ M
PCB congener 126	<3 µg/kg	TM168	<3 @ M
PCB congener 167	<3 µg/kg	TM168	<3 @ M
PCB congener 156	<3 µg/kg	TM168	<3 @ M
PCB congener 157	<3 µg/kg	TM168	<3 @ M
PCB congener 169	<3 µg/kg	TM168	<3 @ M
PCB congener 189	<3 µg/kg	TM168	<3 @ M
Sum of detected WHO 12 PCBs	<36 µg/kg	TM168	<36
Sulphide, Easily liberated	<15 mg/kg	TM180	198 @ #
Arsenic	<0.6 mg/kg	TM181	8.13 M
Cadmium	<0.02 mg/kg	TM181	<0.02 M
Chromium	<0.9 mg/kg	TM181	26 M
Copper	<1.4 mg/kg	TM181	11.2 M
Lead	<0.7 mg/kg	TM181	12.1 M
Mercury	<0.14 mg/kg	TM181	<0.14 M
Nickel	<0.2 mg/kg	TM181	26.9 M
Selenium	<1 mg/kg	TM181	<1 #
Zinc	<1.9 mg/kg	TM181	60.8 M
Boron, water soluble	<1 mg/kg	TM222	3.62 M
Water Soluble Sulphate as SO4 2:1 Extract	<0.004 g/l	TM243	0.323 @ M

CERTIFICATE OF ANALYSIS

SDG:	130930-9	**Location:**	Frodsham	**Order Number:**	
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	246781
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

PAH by GCMS

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Customer Sample R	WS8
Depth (m)	4.40
Sample Type	Soil/Solid
Date Sampled	18/09/2013
Sample Time	.
Date Received	28/09/2013
SDG Ref	130930-9
Lab Sample No.(s)	8186374
AGS Reference	

Component	LOD/Units	Method	
Naphthalene-d8 % recovery**	%	TM218	106
Acenaphthene-d10 % recovery**	%	TM218	99
Phenanthrene-d10 % recovery**	%	TM218	94.1
Chrysene-d12 % recovery**	%	TM218	81.9
Perylene-d12 % recovery**	%	TM218	75.9
Naphthalene	<9 µg/kg	TM218	<9 @ M
Acenaphthylene	<12 µg/kg	TM218	<12 @ M
Acenaphthene	<8 µg/kg	TM218	<8 @ M
Fluorene	<10 µg/kg	TM218	<10 @ M
Phenanthrene	<15 µg/kg	TM218	<15 @ M
Anthracene	<16 µg/kg	TM218	<16 @ M
Fluoranthene	<17 µg/kg	TM218	<17 @ M
Pyrene	<15 µg/kg	TM218	<15 @ M
Benz(a)anthracene	<14 µg/kg	TM218	<14 @ M
Chrysene	<10 µg/kg	TM218	<10 @ M
Benzo(b)fluoranthene	<15 µg/kg	TM218	<15 @ M
Benzo(k)fluoranthene	<14 µg/kg	TM218	<14 @ M
Benzo(a)pyrene	<15 µg/kg	TM218	<15 @ M
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218	<18 @ M
Dibenzo(a,h)anthracene	<23 µg/kg	TM218	<23 @ M
Benzo(g,h,i)perylene	<24 µg/kg	TM218	<24 @ M
PAH, Total Detected USEPA 16	<118 µg/kg	TM218	<118

CERTIFICATE OF ANALYSIS

SDG:	130930-9	**Location:**	Frodsham	**Order Number:**	
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	246781
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

TPH CWG (S)

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Customer Sample R	WS8
Depth (m)	4.40
Sample Type	Soil/Solid
Date Sampled	18/09/2013
Sample Time	.
Date Received	28/09/2013
SDG Ref	130930-9
Lab Sample No.(s)	8186374
AGS Reference	

Component	LOD/Units	Method	
GRO Surrogate % recovery**	%	TM089	121
GRO TOT (Moisture Corrected)	<44 µg/kg	TM089	<44 M
Methyl tertiary butyl ether (MTBE)	<5 µg/kg	TM089	<5 @ M
Benzene	<10 µg/kg	TM089	<10 @ M
Toluene	<2 µg/kg	TM089	5.8 @ M
Ethylbenzene	<3 µg/kg	TM089	<3 @ M
m,p-Xylene	<6 µg/kg	TM089	<6 @ M
o-Xylene	<3 µg/kg	TM089	<3 @ M
sum of detected mpo xylene by GC	<9 µg/kg	TM089	<9
sum of detected BTEX by GC	<24 µg/kg	TM089	<24
Aliphatics >C5-C6	<10 µg/kg	TM089	<10
Aliphatics >C6-C8	<10 µg/kg	TM089	<10
Aliphatics >C8-C10	<10 µg/kg	TM089	<10
Aliphatics >C10-C12	<10 µg/kg	TM089	<10
Aliphatics >C12-C16	<100 µg/kg	TM173	<100
Aliphatics >C16-C21	<100 µg/kg	TM173	1160
Aliphatics >C21-C35	<100 µg/kg	TM173	4140
Aliphatics >C35-C44	<100 µg/kg	TM173	<100
Total Aliphatics >C12-C44	<100 µg/kg	TM173	5300
Aromatics >EC5-EC7	<10 µg/kg	TM089	<10
Aromatics >EC7-EC8	<10 µg/kg	TM089	<10
Aromatics >EC8-EC10	<10 µg/kg	TM089	<10
Aromatics >EC10-EC12	<10 µg/kg	TM089	<10
Aromatics >EC12-EC16	<100 µg/kg	TM173	<100
Aromatics >EC16-EC21	<100 µg/kg	TM173	958
Aromatics >EC21-EC35	<100 µg/kg	TM173	8930
Aromatics >EC35-EC44	<100 µg/kg	TM173	774
Aromatics >EC40-EC44	<100 µg/kg	TM173	<100
Total Aromatics >EC12-EC44	<100 µg/kg	TM173	10800
Total Aliphatics >C5-35	<100 µg/kg	TM173	5300
Total Aromatics >C5-35	<100 µg/kg	TM173	9990
Total Aliphatics & Aromatics >C5-35	<100 µg/kg	TM173	15300

CERTIFICATE OF ANALYSIS

SDG:	130930-9	**Location:**	Frodsham	**Order Number:**	
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	246781
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

TPH CWG (S)

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Customer Sample R			WS8
Depth (m)			4.40
Sample Type			Soil/Solid
Date Sampled			18/09/2013
Sample Time			.
Date Received			28/09/2013
SDG Ref			130930-9
Lab Sample No.(s)			8186374
AGS Reference			
Component	**LOD/Units**	**Method**	
Total Aliphatics & Aromatics >C5-C44	<100 µg/kg	TM173	16100

CERTIFICATE OF ANALYSIS

SDG:	130930-9	**Location:**	Frodsham	**Order Number:**	
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	246781
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Table of Results - Appendix

Method No	Reference	Description	Wet/Dry Sample [1]	Surrogate Corrected
PM001		Preparation of Samples for Metals Analysis		
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
TM062 (S)	National Grid Property Holdings Methods for the Collection & Analysis of Samples from National Grid Sites version 1 Sec 3.9	Determination of Phenols in Soils by HPLC		
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)		
TM132	In - house Method	ELTRA CS800 Operators Guide		
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter		
TM151	Method 3500D, AWWA/APHA, 20th Ed., 1999	Determination of Hexavalent Chromium using Kone analyser		
TM153	Method 4500A,B,C, I, M AWWA/APHA, 20th Ed., 1999	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the Skalar SANS+ System Segmented Flow Analyser		
TM168	EPA Method 8082, Polychlorinated Biphenyls by Gas Chromatography	Determination of WHO12 and EC7 Polychlorinated Biphenyl Congeners by GC-MS in Soils		
TM173	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GC-FID		
TM180	Sulphide in waters and waste waters 1991 ISBN 01 175 7186 SCA rec. 2007 (unpublished)'	The Determination Of Easily Liberated Sulphide In Soil Samples by Ion Selective Electrode Technique		
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES		
TM218	Microwave extraction – EPA method 3546	Microwave extraction - EPA method 3546		
TM222	In-House Method	Determination of Hot Water Soluble Boron in Soils (10:1 Water:soil) by IRIS Emission Spectrometer		
TM243		Mixed Anions In Soils By Kone		

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

CERTIFICATE OF ANALYSIS

SDG:	130930-9	**Location:**	Frodsham	**Order Number:**	
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	246781
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	8186374
Customer Sample Ref.	WS8
AGS Ref.	
Depth	4.40
Type	SOLID
Anions by Kone (soil)	18-Oct-2013
Boron Water Soluble	17-Oct-2013
Cyanide Comp/Free/Total/Thiocyanate	19-Oct-2013
Easily Liberated Sulphide	18-Oct-2013
EPH CWG (Aliphatic) GC (S)	22-Oct-2013
EPH CWG (Aromatic) GC (S)	22-Oct-2013
GRO by GC-FID (S)	17-Oct-2013
Hexavalent Chromium (s)	22-Oct-2013
Metals in solid samples by OES	18-Oct-2013
PAH by GCMS	18-Oct-2013
PCBs by GCMS	18-Oct-2013
pH	16-Oct-2013
Phenols by HPLC (S)	18-Oct-2013
Sample description	15-Oct-2013
Total Sulphur	17-Oct-2013
TPH CWG GC (S)	22-Oct-2013

SDG:	130930-9	**Location:**	Frodsham	**Order Number:**	
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	246781
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Appendix
General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICS and SVOC TICS.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 2 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as “Not detected”. If no asbestos fibre types are found all will be reported as “Not detected” and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible. The quantity of asbestos present is not determined unless specifically requested.

7. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP -No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals -total metals must be requested separately.

11. Results relate only to the items tested.

12. LODs for wet tests reported on a dry weight basis are not corrected for moisture content.

13. **Surrogate recoveries** -Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 -130 %.

14. **Product analyses** -Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors
employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

Sample Deviations

1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Holding time exceeded before sample received**
§	**Sampled on date not provided**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to sampled on date**
&	**Sample Holding Time exceeded - Late arrival of instructions.**

Asbestos

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: -
Trace -Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

ALcontrol Laboratories

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[redacted]

Wardell Armstrong LLP
Sir Henry Doulton House
Forge Lane
Etruria
Stoke on Trent
Staffordshire
ST1 5BD

Attention: Tim Cawood

CERTIFICATE OF ANALYSIS

Date:	25 November 2013
Customer:	H_WARDELL_SKT
Sample Delivery Group (SDG):	131010-73
Your Reference:	ST13418
Location:	Frodsham
Report No:	251111

This report has been revised and directly supersedes 248902 in its entirety.

We received 24 samples on Thursday October 10, 2013 and 20 of these samples were scheduled for analysis which was completed on Monday November 25, 2013. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

[redacted]
Operations Manager

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
8245907	CPT1		0.50	26/09/2013
8245909	CPT2		0.50	26/09/2013
8245911	CPT3		0.50	26/09/2013
8245912	CPT4		0.50	26/09/2013
8245913	CPT5		0.50	26/09/2013
8245915	CPT6		0.50	27/09/2013
8245916	CPT7		0.50	27/09/2013
8245918	CPT8		0.50	27/09/2013
8245919	CPT9		0.50	27/09/2013
8245920	CPT10		0.50	27/09/2013
8245922	CPT11		0.50	30/09/2013
8245923	CPT12		0.50	30/09/2013
8245924	CPT13		0.50	30/09/2013
8245926	CPT14		0.50	27/09/2013
8245929	CPT15		0.50	27/09/2013
8245935	CPT16		0.50	27/09/2013
8245936	CPT17		0.50	27/09/2013
8245937	CPT18		0.50	27/09/2013
8245938	CPT19		0.50	27/09/2013
8245939	CPT20		0.50	27/09/2013
8245943	SA1		1.00	26/09/2013
8245941	SA1		6.00	28/09/2013
8245942	SA1		7.00	28/09/2013
8245944	SA3		4.50	01/10/2013

Only received samples which have had analysis scheduled will be shown on the following pages.

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

SOLID

Results Legend

X Test

N No Determination Possible

Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container		
8245907	CPT1		0.50	250g Amber Jar (AL		
				400g Tub (ALE214)		
				60g VOC (ALE215)		
8245909	CPT2		0.50	250g Amber Jar (AL		
				400g Tub (ALE214)		
8245911	CPT3		0.50	250g Amber Jar (AL		
				400g Tub (ALE214)		
				60g VOC (ALE215)		
8245913	CPT5		0.50	250g Amber Jar (AL		
				400g Tub (ALE214)		
				60g VOC (ALE215)		
8245915	CPT6		0.50	250g Amber Jar (AL		
8245916	CPT7		0.50	250g Amber Jar (AL		
				400g Tub (ALE214)		
				60g VOC (ALE215)		
8245918	CPT8		0.50	250g Amber Jar (AL		
				400g Tub (ALE214)		
8245919	CPT9		0.50	250g Amber Jar (AL		
				400g Tub (ALE214)		
				60g VOC (ALE215)		
8245920	CPT10		0.50	250g Amber Jar (AL		
				400g Tub (ALE214)		
8245922	CPT11		0.50	250g Amber Jar (AL		
				400g Tub (ALE214)		
				60g VOC (ALE215)		
8245923	CPT12		0.50	250g Amber Jar (AL		
				400g Tub (ALE214)		
8245924	CPT13		0.50	250g Amber Jar (AL		
				400g Tub (ALE214)		
				60g VOC (ALE215)		
8245926	CPT14		0.50	250g Amber Jar (AL		
				400g Tub (ALE214)		
8245929	CPT15		0.50	250g Amber Jar (AL		
				400g Tub (ALE214)		
				60g VOC (ALE215)		
8245935	CPT16		0.50	250g Amber Jar (AL		
				400g Tub (ALE214)		
8245936	CPT17		0.50	250g Amber Jar (AL		
				400g Tub (ALE214)		
				60g VOC (ALE215)		

| | | | | |

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

SOLID

Results Legend

X Test

N No Determination Possible

| Lab Sample No(s) | Customer Sample Reference | AGS Reference | Depth (m) | Container | | | | |

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

SOLID

Results Legend

X Test

N No Determination Possible

Lab Sample No(s)	8245907	8245909	8245911	8245913	8245915	8245916	8245918	8245919	8245920	8245922	8245923	8245924	8245926	8245929	8245935	8245936
Customer Sample Reference	CPT1	CPT2	CPT3	CPT5	CPT6	CPT7	CPT8	CPT9	CPT10	CPT11	CPT12	CPT13	CPT14	CPT15	CPT16	CPT17
AGS Reference																
Depth (m)	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Container	250g Amber Jar (AL)	400g Tub (ALE214)	60g VOC (ALE215)	250g Amber Jar (AL)	400g Tub (ALE214)	250g Amber Jar (AL)	400g Tub (ALE214)	60g VOC (ALE215)	250g Amber Jar (AL)	400g Tub (ALE214)	60g VOC (ALE215)	250g Amber Jar (AL)	400g Tub (ALE214)	60g VOC (ALE215)	250g Amber Jar (AL)	400g Tub (ALE214)	60g VOC (ALE215)	250g Amber Jar (AL)	400g Tub (ALE214)	60g VOC (ALE215)	250g Amber Jar (AL)	400g Tub (ALE214)	60g VOC (ALE215)	250g Amber Jar (AL)	400g Tub (ALE214)	60g VOC (ALE215)	250g Amber Jar (AL)	400g Tub (ALE214)	60g VOC (ALE215)	250g Amber Jar (AL)	400g Tub (ALE214)	60g VOC (ALE215)	250g Amber Jar (AL)	400g Tub (ALE214)	60g VOC (ALE215)	250g Amber Jar (AL)	400g Tub (ALE214)	60g VOC (ALE215)
Total Sulphate	All	NDPs: 0 Tests: 6																																						
																			X		X					X											X			
Total Sulphur	All	NDPs: 2 Tests: 13																		N																	N			
			X			X			X			X			X			X					X				X			X			X			X			
TPH CWG GC (S)	All	NDPs: 0 Tests: 12																																						
			X			X			X			X			X			X					X				X			X			X			X			

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

SOLID

Results Legend

X **Test**

N **No Determination Possible**

Lab Sample No(s)			8245938			8245943			8245942			8245944		
Customer Sample Reference			CPT19			SA1			SA1			SA3		
AGS Reference														
Depth (m)			0.50			1.00			7.00			4.50		
Container			250g Amber Jar (AL	400g Tub (ALE214)	60g VOC (ALE215)	250g Amber Jar (AL	400g Tub (ALE214)	60g VOC (ALE215)	250g Amber Jar (AL	400g Tub (ALE214)	250g Amber Jar (AL	400g Tub (ALE214)	60g VOC (ALE215)	
Ammoniacal N as NH4 in 2:1 extract	All	NDPs: 0 Tests: 5								X		X		
Anions by Kone (soil)	All	NDPs: 0 Tests: 15	X			X			X		X			
Asbestos ID in Solid Samples	All	NDPs: 0 Tests: 12		X			X			X				
Boron Water Soluble	All	NDPs: 0 Tests: 13	X			X			X		X			
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 19		X			X			X		X		
Easily Liberated Sulphide	All	NDPs: 0 Tests: 13		X			X			X		X		
EPH CWG (Aliphatic) GC (S)	All	NDPs: 0 Tests: 12	X			X					X			
EPH CWG (Aromatic) GC (S)	All	NDPs: 0 Tests: 12	X			X					X			
GRO by GC-FID (S)	All	NDPs: 0 Tests: 12			X			X						X
Hexavalent Chromium (s)	All	NDPs: 0 Tests: 13		X			X			X		X		
Magnesium (BRE)	All	NDPs: 0 Tests: 5							X		X			
Metals in solid samples by OES	All	NDPs: 0 Tests: 13	X			X			X		X			
NO3, NO2 and TON by KONE (s)	All	NDPs: 0 Tests: 5							X		X			
PAH by GCMS	All	NDPs: 0 Tests: 13	X			X			X		X			
PCBs by GCMS	All	NDPs: 0 Tests: 8	X			X								

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

SOLID

Results Legend

X **Test**

N **No Determination Possible**

Lab Sample No(s)			8245938			8245943			8245942			8245944		
Customer Sample Reference			CPT19			SA1			SA1			SA3		
AGS Reference														
Depth (m)			0.50			1.00			7.00			4.50		
Container			250g Amber Jar (AL	400g Tub (ALE214)	60g VOC (ALE215)	250g Amber Jar (AL	400g Tub (ALE214)	60g VOC (ALE215)	250g Amber Jar (AL	400g Tub (ALE214)	60g VOC (ALE215)	250g Amber Jar (AL	400g Tub (ALE214)	60g VOC (ALE215)
pH	All	NDPs: 0 Tests: 15		X			X			X			X	
Phenols by HPLC (S)	All	NDPs: 0 Tests: 13		X			X			X			X	
Sample description	All	NDPs: 0 Tests: 20	X			X			X			X		
Total Organic Carbon	All	NDPs: 0 Tests: 13	X			X			X			X		
Total Sulphate	All	NDPs: 0 Tests: 6							X			X		
Total Sulphur	All	NDPs: 2 Tests: 13	X			X			X			X		
TPH CWG GC (S)	All	NDPs: 0 Tests: 12	X			X						X		

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions	Inclusions 2
8245907	CPT1	0.50	Dark Brown	Silt Loam	0.063 - 0.1 mm	Vegetation	None
8245909	CPT2	0.50	Dark Brown	Sandy Clay Loam	0.1 - 2 mm	Vegetation	None
8245911	CPT3	0.50	Dark Brown	Sandy Silt Loam	0.1 - 2 mm	Stones	Vegetation
8245913	CPT5	0.50	Light Brown	Sandy Clay	0.1 - 2 mm	Vegetation	None
8245915	CPT6	0.50	Dark Brown	Silt Loam	0.063 - 0.1 mm	Vegetation	Stones
8245916	CPT7	0.50	Dark Brown	Silty Clay Loam	0.063 - 0.1 mm	Vegetation	None
8245918	CPT8	0.50	Black	Sandy Clay Loam	0.1 - 2 mm	None	None
8245919	CPT9	0.50	Dark Brown	Sandy Loam	0.1 - 2 mm	Vegetation	None
8245920	CPT10	0.50	Dark Brown	Sandy Clay Loam	0.1 - 2 mm	Vegetation	None
8245922	CPT11	0.50	Dark Brown	Sandy Loam	0.1 - 2 mm	Vegetation	None
8245923	CPT12	0.50	Black	Sandy Clay	0.1 - 2 mm	Stones	Vegetation
8245924	CPT13	0.50	Dark Brown	Clay	0.063 - 0.1 mm	Vegetation	None
8245926	CPT14	0.50	Black	Loamy Sand	0.1 - 2 mm	None	None
8245929	CPT15	0.50	Dark Brown	Sandy Loam	0.1 - 2 mm	Vegetation	None
8245935	CPT16	0.50	Dark Brown	Sandy Loam	0.1 - 2 mm	Vegetation	None
8245936	CPT17	0.50	Dark Brown	Silty Clay Loam	0.063 - 0.1 mm	Stones	Vegetation
8245938	CPT19	0.50	Dark Brown	Sandy Clay Loam	0.1 - 2 mm	Stones	Vegetation
8245942	SA1	7.00	Dark Brown	Clay	<0.063 mm	N/A	N/A
8245943	SA1	1.00	Dark Brown	Clay	0.063 - 0.1 mm	Vegetation	N/A
8245944	SA3	4.50	Grey	Silt Loam	0.063 - 0.1 mm	Stones	N/A

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	CPT1	CPT3	CPT5	CPT6	CPT7	CPT8
			Depth (m)	0.50	0.50	0.50	0.50	0.50	0.50
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	26/09/2013	26/09/2013	26/09/2013	27/09/2013	27/09/2013	27/09/2013
			Sample Time	.	.	.	.	.	.
			Date Received	10/10/2013	10/10/2013	10/10/2013	10/10/2013	10/10/2013	10/10/2013
			SDG Ref	131010-73	131010-73	131010-73	131010-73	131010-73	131010-73
			Lab Sample No.(s)	8245907	8245911	8245913	8245915	8245916	8245918
			AGS Reference						
Phenol	<0.01 mg/kg	TM062 (S)		<0.01 @ M	<0.01 @ M	<0.01 @ M		<0.01 @ M	
Organic Carbon, Total	<0.2 %	TM132		2.9 #	1.9 #	1.07 #		3.43 #	
Sulphur, Total	<0.02 %	TM132		0.632 #	0.0551 #	0.0299 #		0.107 #	0.127 #
pH	1 pH Units	TM133		7.69 M	8.24 M	8.08 M		7.84 M	7.92 M
Chromium, Hexavalent	<0.6 mg/kg	TM151		<0.6 #	<0.6 #	<0.6 #		<0.6 #	
Cyanide, Total	<1 mg/kg	TM153		1.56 @ M	<1 @ M	<1 @ M		1.21 @ M	
Cyanide, Free	<1 mg/kg	TM153		<1 @ M	<1 @ M	<1 @ M		<1 @ M	
Thiocyanate	<1 mg/kg	TM153		<1 @ M	<1 @ M	<1 @ M		<1 @ M	
PCB congener 118	<3 µg/kg	TM168		15.4 M	3.16 M		8.11 M	6.83 M	
PCB congener 81	<3 µg/kg	TM168		<3 M	<3 M		<3 M	<3 M	
PCB congener 77	<3 µg/kg	TM168		<3 M	<3 M		<3 M	<3 M	
PCB congener 123	<3 µg/kg	TM168		<3 M	<3 M		<3 M	<3 M	
PCB congener 114	<3 µg/kg	TM168		<3 M	<3 M		<3 M	<3 M	
PCB congener 105	<3 µg/kg	TM168		<3 M	<3 M		<3 M	<3 M	
PCB congener 126	<3 µg/kg	TM168		<3 M	<3 M		<3 M	<3 M	
PCB congener 167	<3 µg/kg	TM168		<3 M	<3 M		<3 M	<3 M	
PCB congener 156	<3 µg/kg	TM168		<3 M	<3 M		<3 M	<3 M	
PCB congener 157	<3 µg/kg	TM168		<3 M	<3 M		<3 M	<3 M	
PCB congener 169	<3 µg/kg	TM168		<3 M	<3 M		<3 M	<3 M	
PCB congener 189	<3 µg/kg	TM168		<3 M	<3 M		<3 M	<3 M	
Sum of detected WHO 12 PCBs	<36 µg/kg	TM168		<36	<36		<36	<36	
Sulphide, Easily liberated	<15 mg/kg	TM180		105 @ #	<15 @ #	<15 @ #		<15 @ #	
Arsenic	<0.6 mg/kg	TM181		36.9 M	21.8 M	9.94 M		35 M	
Cadmium	<0.02 mg/kg	TM181		2.73 M	1.19 M	0.307 M		2.27 M	
Chromium	<0.9 mg/kg	TM181		193 M	63 M	12.4 M		159 M	
Copper	<1.4 mg/kg	TM181		162 M	58.5 M	8.9 M		142 M	
Lead	<0.7 mg/kg	TM181		363 M	390 M	56.2 M		844 M	
Mercury	<0.14 mg/kg	TM181		32.3 M	6.43 M	0.482 M		20.9 M	
Nickel	<0.2 mg/kg	TM181		64 M	25.1 M	6.89 M		54.2 M	
Selenium	<1 mg/kg	TM181		1.92 #	1.27 #	<1 #		1.15 #	
Zinc	<1.9 mg/kg	TM181		682 M	334 M	88.3 M		687 M	
Sulphate, acid soluble (total)	<0.02 %	TM221							0.165

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	CPT1	CPT3	CPT5	CPT6	CPT7	CPT8
			Depth (m)	0.50	0.50	0.50	0.50	0.50	0.50
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	26/09/2013	26/09/2013	26/09/2013	27/09/2013	27/09/2013	27/09/2013
			Sample Time	.	.	.	.	.	.
			Date Received	10/10/2013	10/10/2013	10/10/2013	10/10/2013	10/10/2013	10/10/2013
			SDG Ref	131010-73	131010-73	131010-73	131010-73	131010-73	131010-73
			Lab Sample No.(s)	8245907	8245911	8245913	8245915	8245916	8245918
			AGS Reference						
Boron, water soluble	<1 mg/kg	TM222		4.31 M	1.16 M	<1 M		2.01 M	
Water Soluble Sulphate as SO4 2:1 Extract	<0.004 g/l	TM243		2.53 M	0.0716 M	0.135 M		0.639 M	
Soluble Sulphate 2:1 extract as SO4 BRE	<0.004 g/l	TM243							0.297 M
Chloride 2:1 water/soil extract BRE	<0.0025 g/l	TM243							0.184 M
Nitrate as NO3, 2:1 water soluble (BRE)	<0.0003 g/l	TM243							0.0639
Ammoniacal N as NH4 in 2:1 extract BRE	<0.0003 g/l	TM248							<0.0003
Magnesium (BRE)	<0.008 g/l	TM282							<0.008

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	CPT9	CPT11	CPT13	CPT14	CPT15	CPT17
			Depth (m)	0.50	0.50	0.50	0.50	0.50	0.50
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	27/09/2013	30/09/2013	30/09/2013	27/09/2013	27/09/2013	27/09/2013
			Sample Time	.	.	.	.	.	.
			Date Received	10/10/2013	10/10/2013	10/10/2013	10/10/2013	10/10/2013	10/10/2013
			SDG Ref	131010-73	131010-73	131010-73	131010-73	131010-73	131010-73
			Lab Sample No.(s)	8245919	8245922	8245924	8245926	8245929	8245936
			AGS Reference						
Phenol	<0.01 mg/kg	TM062 (S)		<0.01 @ M	<0.01 @ M	<0.01 @ M		<0.01 @ M	<0.01 @ M
Organic Carbon, Total	<0.2 %	TM132		2.14 #	1.67 #	2 #		2.25 #	2.8 #
Sulphur, Total	<0.02 %	TM132			0.0264 #	0.0402 #	0.102 #	0.0587 #	
pH	1 pH Units	TM133		8.09 M	7.39 M	7.99 M	8.39 M	8.3 M	7.99 M
Chromium, Hexavalent	<0.6 mg/kg	TM151		<0.6 #	<1.2 #	<0.6 #		<0.6 #	<0.6 #
Cyanide, Total	<1 mg/kg	TM153		<1 @ M	<1 @ M	<1 @ M		<1 @ M	<1 @ M
Cyanide, Free	<1 mg/kg	TM153		<1 @ M	<1 @ M	<1 @ M		<1 @ M	<1 @ M
Thiocyanate	<1 mg/kg	TM153		<1 @ M	<1 @ M	<1 @ M		<1 @ M	<1 @ M
PCB congener 118	<3 µg/kg	TM168		3.73 M					12.3 M
PCB congener 81	<3 µg/kg	TM168		<3 M					<3 M
PCB congener 77	<3 µg/kg	TM168		<3 M					<3 M
PCB congener 123	<3 µg/kg	TM168		<3 M					<3 M
PCB congener 114	<3 µg/kg	TM168		<3 M					<3 M
PCB congener 105	<3 µg/kg	TM168		<3 M					5.25 M
PCB congener 126	<3 µg/kg	TM168		<3 M					<3 M
PCB congener 167	<3 µg/kg	TM168		<3 M					<3 M
PCB congener 156	<3 µg/kg	TM168		<3 M					5.4 M
PCB congener 157	<3 µg/kg	TM168		<3 M					<3 M
PCB congener 169	<3 µg/kg	TM168		<3 M					<3 M
PCB congener 189	<3 µg/kg	TM168		<3 M					<3 M
Sum of detected WHO 12 PCBs	<36 µg/kg	TM168		<36					<36
Sulphide, Easily liberated	<15 mg/kg	TM180		<15 @ #	<15 @ #	<15 @ #		<15 @ #	<15 @ #
Arsenic	<0.6 mg/kg	TM181		27.7 M	13.2 M	26.5 M		62.8 M	48.3 M
Cadmium	<0.02 mg/kg	TM181		1.87 M	0.779 M	1.35 M		3.28 M	2.21 M
Chromium	<0.9 mg/kg	TM181		78.6 M	37.1 M	57.7 M		119 M	138 M
Copper	<1.4 mg/kg	TM181		74.5 M	23.3 M	62.1 M		184 M	133 M
Lead	<0.7 mg/kg	TM181		245 M	62.1 M	92.1 M		247 M	400 M
Mercury	<0.14 mg/kg	TM181		5.81 M	0.854 M	4.48 M		17.9 M	22.3 M
Nickel	<0.2 mg/kg	TM181		32.4 M	26 M	35.5 M		38 M	39.8 M
Selenium	<1 mg/kg	TM181		1.38 #	<1 #	1.26 #		1.67 #	1.32 #
Zinc	<1.9 mg/kg	TM181		410 M	115 M	270 M		972 M	652 M
Sulphate, acid soluble (total)	<0.02 %	TM221					0.154		0.142

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	CPT9	CPT11	CPT13	CPT14	CPT15	CPT17
			Depth (m)	0.50	0.50	0.50	0.50	0.50	0.50
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	27/09/2013	30/09/2013	30/09/2013	27/09/2013	27/09/2013	27/09/2013
			Sample Time	.	.	.	.	.	.
			Date Received	10/10/2013	10/10/2013	10/10/2013	10/10/2013	10/10/2013	10/10/2013
			SDG Ref	131010-73	131010-73	131010-73	131010-73	131010-73	131010-73
			Lab Sample No.(s)	8245919	8245922	8245924	8245926	8245929	8245936
			AGS Reference						
Total Sulphur (ASB)	<0.0016 %	TM221		0.0315					0.0473
Boron, water soluble	<1 mg/kg	TM222		1.13 M	<1 M	<1 M		<1 M	2.15 M
Water Soluble Sulphate as SO4 2:1 Extract	<0.004 g/l	TM243		0.0829 M	<0.004 M	0.0633 M		0.158 M	0.196 M
Soluble Sulphate 2:1 extract as SO4 BRE	<0.004 g/l	TM243					0.0167 M		0.196 M
Chloride 2:1 water/soil extract BRE	<0.0025 g/l	TM243					0.0101 M		0.307 M
Nitrate as NO3, 2:1 water soluble (BRE)	<0.0003 g/l	TM243					0.205		0.0222
Ammoniacal N as NH4 in 2:1 extract BRE	<0.0003 g/l	TM248					<0.0003		<0.0003
Magnesium (BRE)	<0.008 g/l	TM282					<0.008		<0.008

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	CPT19	SA1	SA1	SA3		
			Depth (m)	0.50	1.00	7.00	4.50		
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid		
			Date Sampled	27/09/2013	26/09/2013	28/09/2013	01/10/2013		
			Sample Time	.	.	.	.		
			Date Received	10/10/2013	10/10/2013	10/10/2013	10/10/2013		
			SDG Ref	131010-73	131010-73	131010-73	131010-73		
			Lab Sample No.(s)	8245938	8245943	8245942	8245944		
			AGS Reference						
Phenol	<0.01 mg/kg	TM062 (S)		<0.01 @ M	<0.01 @ M	<0.01 @ M	<0.01 @ M		
Cresols	<0.01 mg/kg	TM062 (S)					<0.01 @ M		
Xylenols	<0.015 mg/kg	TM062 (S)					<0.015 @ M		
1-Naphthol	<0.01 mg/kg	TM062 (S)					<0.01 @		
2,3,5-Trimethylphenol	<0.01 mg/kg	TM062 (S)					<0.01 @ M		
2-Isopropylphenol	<0.015 mg/kg	TM062 (S)					<0.015 @ M		
Phenols, Total Detected monohydric	<0.035 mg/kg	TM062 (S)					<0.035 @ M		
Phenols, Total Detected 5 speciated	<0.06 mg/kg	TM062 (S)					<0.06 @ M		
Organic Carbon, Total	<0.2 %	TM132		2.5 #	2.61 #	0.501 #	2.04 @ #		
Sulphur, Total	<0.02 %	TM132		0.0509 #	0.362 #	0.0252 #	0.584 @ #		
pH	1 pH Units	TM133		8.16 M	7.52 M	8.09 M	8.67 @ M		
Chromium, Hexavalent	<0.6 mg/kg	TM151		<0.6 #	<0.6 #	<0.6 #	<0.6 @ #		
Cyanide, Total	<1 mg/kg	TM153		<1 @ M	1.95 @ M	<1 @ M	<1 @ M		
Cyanide, Free	<1 mg/kg	TM153		<1 @ M	<1 @ M	<1 @ M	<1 @ M		
Thiocyanate	<1 mg/kg	TM153		<1 @ M	<1 @ M	<1 @ M	<1 @ M		
PCB congener 118	<3 µg/kg	TM168		4.77 M	<3 M				
PCB congener 81	<3 µg/kg	TM168		<3 M	<3 M				
PCB congener 77	<3 µg/kg	TM168		<3 M	<3 M				
PCB congener 123	<3 µg/kg	TM168		<3 M	<3 M				
PCB congener 114	<3 µg/kg	TM168		<3 M	<3 M				
PCB congener 105	<3 µg/kg	TM168		<3 M	<3 M				
PCB congener 126	<3 µg/kg	TM168		<3 M	<3 M				
PCB congener 167	<3 µg/kg	TM168		<3 M	<3 M				
PCB congener 156	<3 µg/kg	TM168		<3 M	<3 M				
PCB congener 157	<3 µg/kg	TM168		<3 M	<3 M				
PCB congener 169	<3 µg/kg	TM168		<3 M	<3 M				
PCB congener 189	<3 µg/kg	TM168		<3 M	<3 M				
Sum of detected WHO 12 PCBs	<36 µg/kg	TM168		<36	<36				
Sulphide, Easily liberated	<15 mg/kg	TM180		<15 @ #	305 @ #	<15 @ #	275 @ #		
Arsenic	<0.6 mg/kg	TM181		36.7 M	27.7 M	11.9 M	8.07 M		
Cadmium	<0.02 mg/kg	TM181		1.91 M	2.06 M	0.49 M	<0.02 M		
Chromium	<0.9 mg/kg	TM181		106 M	137 M	37.6 M	21.3 M		

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	CPT19	SA1	SA1	SA3		
			Depth (m)	0.50	1.00	7.00	4.50		
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid		
			Date Sampled	27/09/2013	26/09/2013	28/09/2013	01/10/2013		
			Sample Time	.	.	.	.		
			Date Received	10/10/2013	10/10/2013	10/10/2013	10/10/2013		
			SDG Ref	131010-73	131010-73	131010-73	131010-73		
			Lab Sample No.(s)	8245938	8245943	8245942	8245944		
			AGS Reference						
Copper	<1.4 mg/kg	TM181		109 M	119 M	13.6 M	7.21 M		
Lead	<0.7 mg/kg	TM181		225 M	327 M	26 M	9.09 M		
Mercury	<0.14 mg/kg	TM181		9.37 M	18.7 M	0.245 M	<0.14 @ M		
Nickel	<0.2 mg/kg	TM181		34.2 M	46.5 M	34.6 M	21 M		
Selenium	<1 mg/kg	TM181		1.11 #	1.57 #	<1 #	<1 #		
Zinc	<1.9 mg/kg	TM181		574 M	646 M	85.9 M	47.7 M		
Sulphate, Total	<48 mg/kg	TM221					578 @ M		
Sulphate, acid soluble (total)	<0.02 %	TM221				<0.02	0.0578		
Boron, water soluble	<1 mg/kg	TM222		2.31 M	2.69 M	2.04 M	2.34 @ M		
Water Soluble Sulphate as SO4 2:1 Extract	<0.004 g/l	TM243		0.115 M	0.881 M	0.0239 M	0.142 @ M		
Soluble Sulphate 2:1 extract as SO4 BRE	<0.004 g/l	TM243				0.0368 M	0.142 @ M		
Chloride 2:1 water/soil extract BRE	<0.0025 g/l	TM243				0.846 M	0.639 @ M		
Nitrate as NO3, 2:1 water soluble (BRE)	<0.0003 g/l	TM243				0.000772	<0.0003		
Ammoniacal N as NH4 in 2:1 extract BRE	<0.0003 g/l	TM248				0.0278	0.00233		
Magnesium (BRE)	<0.008 g/l	TM282				<0.008	<0.008		

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

PAH by GCMS

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	CPT1	CPT3	CPT5	CPT7	CPT9	CPT11
			Depth (m)	0.50	0.50	0.50	0.50	0.50	0.50
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	26/09/2013	26/09/2013	26/09/2013	27/09/2013	27/09/2013	30/09/2013
			Sample Time	.	.	.	.	.	.
			Date Received	10/10/2013	10/10/2013	10/10/2013	10/10/2013	10/10/2013	10/10/2013
			SDG Ref	131010-73	131010-73	131010-73	131010-73	131010-73	131010-73
			Lab Sample No.(s)	8245907	8245911	8245913	8245916	8245919	8245922
			AGS Reference						
Naphthalene-d8 % recovery**	%	TM218		122	103	101	106	96.8	93.8
Acenaphthene-d10 % recovery**	%	TM218		115	106	102	96.8	95.2	91.5
Phenanthrene-d10 % recovery**	%	TM218		113	102	102	90.5	92	88.7
Chrysene-d12 % recovery**	%	TM218		124	101	95.2	78.5	102	95.4
Perylene-d12 % recovery**	%	TM218		121	105	96.4	79.9	102	94.2
Naphthalene	<9 µg/kg	TM218		637 @ M	110 @ M	<9 @ M	281 @ M	68.2 @ M	<9 @ M
Acenaphthylene	<12 µg/kg	TM218		285 @ M	71.9 @ M	<12 @ M	96.9 @ M	63.9 @ M	<12 @ M
Acenaphthene	<8 µg/kg	TM218		154 @ M	88 @ M	<8 @ M	44.4 @ M	25.9 @ M	<8 @ M
Fluorene	<10 µg/kg	TM218		360 @ M	76.3 @ M	<10 @ M	72.8 @ M	31.9 @ M	<10 @ M
Phenanthrene	<15 µg/kg	TM218		1010 @ M	465 @ M	27.6 @ M	323 @ M	236 @ M	27.3 @ M
Anthracene	<16 µg/kg	TM218		1100 @ M	156 @ M	<16 @ M	194 @ M	116 @ M	<16 @ M
Fluoranthene	<17 µg/kg	TM218		2670 @ M	981 @ M	44.2 @ M	391 @ M	456 @ M	36 @ M
Pyrene	<15 µg/kg	TM218		3580 @ M	1060 @ M	51.8 @ M	386 @ M	448 @ M	30.8 @ M
Benz(a)anthracene	<14 µg/kg	TM218		1670 @ M	912 @ M	22.5 @ M	257 @ M	190 @ M	<14 @ M
Chrysene	<10 µg/kg	TM218		1660 @ M	695 @ M	23.7 @ M	203 @ M	226 @ M	23.7 @ M
Benzo(b)fluoranthene	<15 µg/kg	TM218		2040 @ M	847 @ M	53.3 @ M	696 @ M	405 @ M	31.7 @ M
Benzo(k)fluoranthene	<14 µg/kg	TM218		899 @ M	409 @ M	17.5 @ M	234 @ M	239 @ M	<14 @ M
Benzo(a)pyrene	<15 µg/kg	TM218		2190 @ M	884 @ M	39.2 @ M	545 @ M	478 @ M	26 @ M
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218		1130 @ M	451 @ M	31.3 @ M	467 @ M	404 @ M	<18 @ M
Dibenzo(a,h)anthracene	<23 µg/kg	TM218		337 @ M	144 @ M	<23 @ M	132 @ M	100 @ M	<23 @ M
Benzo(g,h,i)perylene	<24 µg/kg	TM218		1410 @ M	545 @ M	39.3 @ M	593 @ M	448 @ M	<24 @ M
PAH, Total Detected USEPA 16	<118 µg/kg	TM218		21100	7900	350	4920	3930	176

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

PAH by GCMS

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	CPT13	CPT15	CPT17	CPT19	SA1	SA1
			Depth (m)	0.50	0.50	0.50	0.50	1.00	7.00
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	30/09/2013	27/09/2013	27/09/2013	27/09/2013	26/09/2013	28/09/2013
			Sample Time	.	.	.	.	.	.
			Date Received	10/10/2013	10/10/2013	10/10/2013	10/10/2013	10/10/2013	10/10/2013
			SDG Ref	131010-73	131010-73	131010-73	131010-73	131010-73	131010-73
			Lab Sample No.(s)	8245924	8245929	8245936	8245938	8245943	8245942
			AGS Reference						
Naphthalene-d8 % recovery**	%	TM218		96.7	95	108	90.9	106	96.1
Acenaphthene-d10 % recovery**	%	TM218		93.7	92.7	111	88	101	93.2
Phenanthrene-d10 % recovery**	%	TM218		91.1	92.2	104	86.6	97.7	90.7
Chrysene-d12 % recovery**	%	TM218		97.8	107	104	98.4	108	95.8
Perylene-d12 % recovery**	%	TM218		98.1	110	106	101	108	94.7
Naphthalene	<9 µg/kg	TM218		<9 @ M	251 @ M	224 @ M	165 @ M	86.1 @ M	<9 @ M
Acenaphthylene	<12 µg/kg	TM218		<12 @ M	416 @ M	169 @ M	144 @ M	32.1 @ M	<12 @ M
Acenaphthene	<8 µg/kg	TM218		<8 @ M	41.3 @ M	41 @ M	59 @ M	20.5 @ M	<8 @ M
Fluorene	<10 µg/kg	TM218		<10 @ M	85 @ M	85.4 @ M	73.6 @ M	48.5 @ M	<10 @ M
Phenanthrene	<15 µg/kg	TM218		41.3 @ M	457 @ M	374 @ M	491 @ M	155 @ M	<15 @ M
Anthracene	<16 µg/kg	TM218		<16 @ M	274 @ M	241 @ M	211 @ M	141 @ M	<16 @ M
Fluoranthene	<17 µg/kg	TM218		55 @ M	905 @ M	588 @ M	926 @ M	329 @ M	<17 @ M
Pyrene	<15 µg/kg	TM218		52.4 @ M	842 @ M	570 @ M	869 @ M	542 @ M	<15 @ M
Benz(a)anthracene	<14 µg/kg	TM218		16.5 @ M	787 @ M	471 @ M	662 @ M	212 @ M	<14 @ M
Chrysene	<10 µg/kg	TM218		38.2 @ M	747 @ M	399 @ M	595 @ M	122 @ M	<10 @ M
Benzo(b)fluoranthene	<15 µg/kg	TM218		50.9 @ M	1440 @ M	959 @ M	1050 @ M	202 @ M	<15 @ M
Benzo(k)fluoranthene	<14 µg/kg	TM218		19.3 @ M	555 @ M	405 @ M	495 @ M	126 @ M	<14 @ M
Benzo(a)pyrene	<15 µg/kg	TM218		39.3 @ M	1540 @ M	787 @ M	971 @ M	314 @ M	<15 @ M
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218		22.6 @ M	1360 @ M	719 @ M	771 @ M	163 @ M	<18 @ M
Dibenzo(a,h)anthracene	<23 µg/kg	TM218		<23 @ M	348 @ M	210 @ M	202 @ M	46.8 @ M	<23 @ M
Benzo(g,h,i)perylene	<24 µg/kg	TM218		32 @ M	1770 @ M	860 @ M	894 @ M	194 @ M	<24 @ M
PAH, Total Detected USEPA 16	<118 µg/kg	TM218		367	11800	7100	8580	2730	<118

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

PAH by GCMS

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

		Customer Sample R	SA3
		Depth (m)	4.50
		Sample Type	Soil/Solid
		Date Sampled	01/10/2013
		Sample Time	.
		Date Received	10/10/2013
		SDG Ref	131010-73
		Lab Sample No.(s)	8245944
		AGS Reference	
Component	**LOD/Units**	**Method**	
Naphthalene	<9 µg/kg	TM218	<9 @ M
Acenaphthylene	<12 µg/kg	TM218	<12 @ M
Acenaphthene	<8 µg/kg	TM218	<8 @ M
Fluorene	<10 µg/kg	TM218	<10 @ M
Phenanthrene	<15 µg/kg	TM218	<15 @ M
Anthracene	<16 µg/kg	TM218	<16 @ M
Fluoranthene	<17 µg/kg	TM218	<17 @ M
Pyrene	<15 µg/kg	TM218	<15 @ M
Benz(a)anthracene	<14 µg/kg	TM218	<14 @ M
Chrysene	<10 µg/kg	TM218	<10 @ M
Benzo(b)fluoranthene	<15 µg/kg	TM218	<15 @ M
Benzo(k)fluoranthene	<14 µg/kg	TM218	<14 @ M
Benzo(a)pyrene	<15 µg/kg	TM218	<15 @ M
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218	<18 @ M
Dibenzo(a,h)anthracene	<23 µg/kg	TM218	<23 @ M
Benzo(g,h,i)perylene	<24 µg/kg	TM218	<24 @ M
PAH, Total Detected USEPA 16	<118 µg/kg	TM218	<118

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

TPH CWG (S)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	CPT1	CPT3	CPT5	CPT7	CPT9	CPT11
			Depth (m)	0.50	0.50	0.50	0.50	0.50	0.50
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	26/09/2013	26/09/2013	26/09/2013	27/09/2013	27/09/2013	30/09/2013
			Sample Time	.	.	.	.	.	.
			Date Received	10/10/2013	10/10/2013	10/10/2013	10/10/2013	10/10/2013	10/10/2013
			SDG Ref	131010-73	131010-73	131010-73	131010-73	131010-73	131010-73
			Lab Sample No.(s)	8245907	8245911	8245913	8245916	8245919	8245922
			AGS Reference						
GRO Surrogate % recovery**	%	TM089		47	71	139	43	91	93
GRO TOT (Moisture Corrected)	<44 µg/kg	TM089		12600 M	<44 M	<44 M	<44 M	<44 M	<44 M
Methyl tertiary butyl ether (MTBE)	<5 µg/kg	TM089		<5 @ M	<5 @ M	<5 @ M	<5 @ M	<5 @ M	<5 @ M
Benzene	<10 µg/kg	TM089		<10 @ M	<10 @ M	<10 @ M	<10 @ M	<10 @ M	<10 @ M
Toluene	<2 µg/kg	TM089		<2 @ M	2.58 @ M	<2 @ M	<2 @ M	2.84 @ M	<2 @ M
Ethylbenzene	<3 µg/kg	TM089		<3 @ M	<3 @ M	<3 @ M	<3 @ M	<3 @ M	<3 @ M
m,p-Xylene	<6 µg/kg	TM089		<6 @ M	<6 @ M	<6 @ M	<6 @ M	<6 @ M	<6 @ M
o-Xylene	<3 µg/kg	TM089		<3 @ M	<3 @ M	<3 @ M	<3 @ M	<3 @ M	<3 @ M
sum of detected mpo xylene by GC	<9 µg/kg	TM089		<9	<9	<9	<9	<9	<9
sum of detected BTEX by GC	<24 µg/kg	TM089		<24	<24	<24	<24	<24	<24
Aliphatics >C5-C6	<10 µg/kg	TM089		18	<10	<10	<10	<10	<10
Aliphatics >C6-C8	<10 µg/kg	TM089		280	<10	<10	<10	<10	<10
Aliphatics >C8-C10	<10 µg/kg	TM089		2770	10.3	<10	<10	<10	<10
Aliphatics >C10-C12	<10 µg/kg	TM089		4620	10.3	<10	<10	<10	<10
Aliphatics >C12-C16	<100 µg/kg	TM173		547000	11200	140	46000	6670	207
Aliphatics >C16-C21	<100 µg/kg	TM173		818000	73200	3850	186000	50200	420
Aliphatics >C21-C35	<100 µg/kg	TM173		1720000	266000	19200	631000	234000	2350
Aliphatics >C35-C44	<100 µg/kg	TM173		411000	63500	3300	160000	56900	322
Total Aliphatics >C12-C44	<100 µg/kg	TM173		3500000	414000	26500	1020000	348000	3300
Aromatics >EC5-EC7	<10 µg/kg	TM089		<10	<10	<10	<10	<10	<10
Aromatics >EC7-EC8	<10 µg/kg	TM089		<10	<10	<10	<10	<10	<10
Aromatics >EC8-EC10	<10 µg/kg	TM089		1850	<10	<10	<10	<10	<10
Aromatics >EC10-EC12	<10 µg/kg	TM089		3080	<10	<10	<10	<10	<10
Aromatics >EC12-EC16	<100 µg/kg	TM173		88600	1770	277	5530	398	<100
Aromatics >EC16-EC21	<100 µg/kg	TM173		441000	21500	2370	64000	14400	433
Aromatics >EC21-EC35	<100 µg/kg	TM173		931000	155000	17700	413000	136000	8840
Aromatics >EC35-EC44	<100 µg/kg	TM173		246000	56600	6690	148000	55100	3600
Aromatics >EC40-EC44	<100 µg/kg	TM173		87300	19800	2020	53400	20000	1140
Total Aromatics >EC12-EC44	<100 µg/kg	TM173		1710000	235000	27100	631000	206000	12900
Total Aliphatics >C5-35	<100 µg/kg	TM173		3100000	351000	23200	863000	291000	2980
Total Aromatics >C5-35	<100 µg/kg	TM173		1460000	178000	20400	482000	151000	9280
Total Aliphatics & Aromatics >C5-35	<100 µg/kg	TM173		4560000	529000	43500	1340000	442000	12300

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

TPH CWG (S)

Results Legend		Customer Sample R	CPT1	CPT3	CPT5	CPT7	CPT9	CPT11
#	ISO17025 accredited.							
M	*m*CERTS accredited.							
aq	Aqueous / settled sample.							
diss.filt	Dissolved / filtered sample.	Depth (m)	0.50	0.50	0.50	0.50	0.50	0.50
tot.unfilt	Total / unfiltered sample.	Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
*	Subcontracted test.	Date Sampled	26/09/2013	26/09/2013	26/09/2013	27/09/2013	27/09/2013	30/09/2013
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery	Sample Time	.	.	.	.	.	.
		Date Received	10/10/2013	10/10/2013	10/10/2013	10/10/2013	10/10/2013	10/10/2013
		SDG Ref	131010-73	131010-73	131010-73	131010-73	131010-73	131010-73
(F)	Trigger breach confirmed	Lab Sample No.(s)	8245907	8245911	8245913	8245916	8245919	8245922
1-4&+§@	Sample deviation (see appendix)	AGS Reference						
Component	**LOD/Units**	**Method**						
Total Aliphatics & Aromatics >C5-C44	<100 µg/kg	TM173	5220000	649000	53500	1650000	554000	16200

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

TPH CWG (S)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	CPT13	CPT15	CPT17	CPT19	SA1	SA3
			Depth (m)	0.50	0.50	0.50	0.50	1.00	4.50
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	30/09/2013	27/09/2013	27/09/2013	27/09/2013	26/09/2013	01/10/2013
			Sample Time	.	.	.	.	.	.
			Date Received	10/10/2013	10/10/2013	10/10/2013	10/10/2013	10/10/2013	10/10/2013
			SDG Ref	131010-73	131010-73	131010-73	131010-73	131010-73	131010-73
			Lab Sample No.(s)	8245924	8245929	8245936	8245938	8245943	8245944
			AGS Reference						
GRO Surrogate % recovery**	%	TM089		70	51	48	57	60	87
GRO TOT (Moisture Corrected)	<44 µg/kg	TM089		<44 M	<44 M	<44 M	<44 M	21300 M	<44 M
Methyl tertiary butyl ether (MTBE)	<5 µg/kg	TM089		<5 @ M	<5 @ M	<5 @ M	<5 @ M	<5 @ M	<5 @ M
Benzene	<10 µg/kg	TM089		<10 @ M	<10 @ M	<10 @ M	<10 @ M	<10 @ M	<10 @ M
Toluene	<2 µg/kg	TM089		<2 @ M	<2 @ M	2.96 @ M	3.96 @ M	<2 @ M	<2 @ M
Ethylbenzene	<3 µg/kg	TM089		<3 @ M	<3 @ M	<3 @ M	<3 @ M	<3 @ M	<3 @ M
m,p-Xylene	<6 µg/kg	TM089		<6 @ M	<6 @ M	<6 @ M	<6 @ M	<6 @ M	<6 @ M
o-Xylene	<3 µg/kg	TM089		<3 @ M	<3 @ M	<3 @ M	<3 @ M	<3 @ M	<3 @ M
sum of detected mpo xylene by GC	<9 µg/kg	TM089		<9	<9	<9	<9	<9	<9
sum of detected BTEX by GC	<24 µg/kg	TM089		<24	<24	<24	<24	<24	<24
Aliphatics >C5-C6	<10 µg/kg	TM089		<10	<10	<10	<10	29.9	<10
Aliphatics >C6-C8	<10 µg/kg	TM089		<10	<10	<10	<10	647	<10
Aliphatics >C8-C10	<10 µg/kg	TM089		<10	<10	<10	<10	5120	<10
Aliphatics >C10-C12	<10 µg/kg	TM089		<10	<10	<10	<10	7250	<10
Aliphatics >C12-C16	<100 µg/kg	TM173		<100	24300	21700	3970	197000	<100
Aliphatics >C16-C21	<100 µg/kg	TM173		204	167000	122000	55700	313000	1300
Aliphatics >C21-C35	<100 µg/kg	TM173		643	473000	468000	259000	754000	6530
Aliphatics >C35-C44	<100 µg/kg	TM173		<100	86000	114000	56200	136000	312
Total Aliphatics >C12-C44	<100 µg/kg	TM173		847	751000	726000	375000	1400000	8150
Aromatics >EC5-EC7	<10 µg/kg	TM089		<10	<10	<10	<10	<10	<10
Aromatics >EC7-EC8	<10 µg/kg	TM089		<10	<10	<10	<10	<10	<10
Aromatics >EC8-EC10	<10 µg/kg	TM089		<10	<10	<10	<10	3410	<10
Aromatics >EC10-EC12	<10 µg/kg	TM089		<10	<10	<10	<10	4830	<10
Aromatics >EC12-EC16	<100 µg/kg	TM173		<100	2930	2510	2340	52700	<100
Aromatics >EC16-EC21	<100 µg/kg	TM173		219	37500	25100	15600	235000	<100
Aromatics >EC21-EC35	<100 µg/kg	TM173		8840	292000	241000	159000	596000	1810
Aromatics >EC35-EC44	<100 µg/kg	TM173		4490	102000	90600	58600	169000	1310
Aromatics >EC40-EC44	<100 µg/kg	TM173		1960	35600	31500	19600	61400	505
Total Aromatics >EC12-EC44	<100 µg/kg	TM173		12400	435000	359000	235000	1050000	1680
Total Aliphatics >C5-35	<100 µg/kg	TM173		847	665000	613000	318000	1280000	
Total Aromatics >C5-35	<100 µg/kg	TM173		7890	333000	268000	177000	892000	
Total Aliphatics & Aromatics >C5-35	<100 µg/kg	TM173		8730	997000	881000	495000	2170000	

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

TPH CWG (S)

Results Legend									
#	ISO17025 accredited.	**Customer Sample R**	CPT13	CPT15	CPT17	CPT19	SA1	SA3	
M	*m*CERTS accredited.								
aq	Aqueous / settled sample.	**Depth (m)**	0.50	0.50	0.50	0.50	1.00	4.50	
diss.filt	Dissolved / filtered sample.	**Sample Type**	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	
tot.unfilt	Total / unfiltered sample.	**Date Sampled**	30/09/2013	27/09/2013	27/09/2013	27/09/2013	26/09/2013	01/10/2013	
*	Subcontracted test.	**Sample Time**	.	.	.	.	.	.	
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery	**Date Received**	10/10/2013	10/10/2013	10/10/2013	10/10/2013	10/10/2013	10/10/2013	
		SDG Ref	131010-73	131010-73	131010-73	131010-73	131010-73	131010-73	
(F)	Trigger breach confirmed	**Lab Sample No.(s)**	8245924	8245929	8245936	8245938	8245943	8245944	
1-4&+§@	Sample deviation (see appendix)	**AGS Reference**							
Component		**LOD/Units**	**Method**						
Total Aliphatics & Aromatics >C5-C44		<100 µg/kg	TM173	13200	1190000	1090000	610000	2470000	9840

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

Asbestos Identification - Solid Samples

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Fibrous Actinolite	Fibrous Anthophyllite	Fibrous Tremolite	Non-Asbestos Fibre
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	CPT1 0.50 SOLID 26/09/2013 00:00:00 131010-73 8245907 TM048	21/10/13	Lauren Sargeant	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	CPT3 0.50 SOLID 26/09/2013 00:00:00 131010-73 8245911 TM048	21/10/13	Paul Fenney	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	CPT5 0.50 SOLID 26/09/2013 00:00:00 131010-73 8245913 TM048	21/10/13	Paul Fenney	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	CPT7 0.50 SOLID 27/09/2013 00:00:00 131010-73 8245916 TM048	21/10/13	Paul Fenney	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	CPT9 0.50 SOLID 27/09/2013 00:00:00 131010-73 8245919 TM048	21/10/13	Lauren Sargeant	Loose fibres in soil	Not Detected (#)	Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Fibrous Actinolite	Fibrous Anthophyllite	Fibrous Tremolite	Non-Asbestos Fibre
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	CPT11 0.50 SOLID 30/09/2013 00:00:00 131010-73 8245922 TM048	21/10/13	Lauren Sargeant	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	CPT13 0.50 SOLID 30/09/2013 00:00:00 131010-73 8245924 TM048	21/10/13	Lauren Sargeant	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	CPT15 0.50 SOLID 27/09/2013 00:00:00 131010-73 8245929 TM048	21/10/13	Paul Fenney	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	CPT17 0.50 SOLID 27/09/2013 00:00:00 131010-73 8245936 TM048	21/10/13	Lauren Sargeant	Loose fibres in soil	Not Detected (#)	Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	CPT19 0.50 SOLID 27/09/2013 00:00:00 131010-73 8245938 TM048	21/10/13	Paul Fenney	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	SA1 1.00 SOLID 26/09/2013 00:00:00 131010-73 8245943 TM048	21/10/13	Paul Fenney	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Fibrous Actinolite	Fibrous Anthophyllite	Fibrous Tremolite	Non-Asbestos Fibre
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	SA1 7.00 SOLID 28/09/2013 00:00:00 131010-73 8245942 TM048	21/10/13	Lauren Sargeant	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

Asbestos Quantification - Full

		Additional Asbestos Components (Using TM048)	Analysts Comments	Asbestos Quantification - Gravimetric - %	Asbestos Quantification - PCOM Evaluation - %	Asbestos Quantification - Total - %
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	CPT9 0.50 SOLID 27/09/2013 00:00:00 131010-73 8245919 TM 304	None (#)	N/C	<0.001 (#)	<0.001 (#)	<0.001 (#)
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	CPT17 0.50 SOLID 27/09/2013 00:00:00 131010-73 8245936 TM 304	None (#)	N/C	<0.001 (#)	<0.001 (#)	<0.001 (#)

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

CEN 2:1 STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

Client Reference		**Site Location**	Frodsham
Mass Sample taken (kg)	0.287	**Moisture Content Ratio (%)**	64.3
Mass of dry sample (kg)	0.175	**Dry Matter Content Ratio (%)**	60.9
Particle Size <4mm	>95%		

Case				
SDG	131010-73			
Lab Sample Number(s)	8245909			
Sampled Date	26-Sep-2013			
Customer Sample Ref.	CPT2			
Depth (m)	0.50			

Solid Waste Analysis

Total Organic Carbon (%)	-	-	-	-
Loss on Ignition (%)	-	-	-	-
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-	-
Mineral Oil (mg/kg)	-	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis

	Concⁿ in 2:1 eluate (mg/l)		2:1 concⁿ leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	0.0177	<0.00012	0.0354	<0.0012	0.5	2	25
Barium	-	-	-	-	20	100	300
Cadmium	0.000178	<0.0001	0.000356	<0.001	0.04	1	5
Chromium	0.0397	<0.00022	0.0794	<0.0022	0.5	10	70
Copper	0.0913	<0.00085	0.183	<0.0085	2	50	100
Mercury Dissolved (CVAF)	0.000481	<0.00001	0.000962	<0.0001	0.01	0.2	2
Molybdenum	-	-	-	-	0.5	10	30
Nickel	0.0129	<0.00015	0.0258	<0.0015	0.4	10	40
Lead	0.00329	<0.00002	0.00658	<0.0002	0.5	10	50
Antimony	-	-	-	-	0.06	0.7	5
Selenium	0.006	<0.00039	0.012	<0.0039	0.1	0.5	7
Zinc	0.0114	<0.00041	0.0228	<0.0041	4	50	200
Chloride	-	-	-	-	800	15000	25000
Fluoride	-	-	-	-	10	150	500
Sulphate (soluble)	325	<2	650	<2	1000	20000	50000
Total Dissolved Solids	-	-	-	-	4000	60000	100000
Total Monohydric Phenols (W)	-	-	-	-	1	-	-
Dissolved Organic Carbon	-	-	-	-	500	800	1000

Leach Test Information

Date Prepared	15-Oct-2013
pH (pH Units)	8.55
Conductivity (µS/cm)	1,780.00
Temperature (°C)	20.50
Volume Leachant (Litres)	0.237
Volume of Eluate VE1 (Litres)	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
25/11/2013 08:20:40

08:20:27 25/11/2013

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

CEN 2:1 STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

Client Reference		**Site Location**	Frodsham
Mass Sample taken (kg)	0.287	**Moisture Content Ratio (%)**	64.3
Mass of dry sample (kg)	0.175	**Dry Matter Content Ratio (%)**	60.9
Particle Size <4mm	>95%		

Case				
SDG	131010-73			
Lab Sample Number(s)	8245909			
Sampled Date	26-Sep-2013			
Customer Sample Ref.	CPT2			
Depth (m)	0.50			

Solid Waste Analysis

Total Organic Carbon (%)	-	-	-	-
Loss on Ignition (%)	-	-	-	-
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-	-
Mineral Oil (mg/kg)	-	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis

	Concⁿ in 2:1 eluate (mg/l)		2:1 concⁿ leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Hexavalent Chromium	0.044	<0.03	0.088	<0.03	-	-	-
pH Value of Filtered Water	8.6	<0.001	17	<0.01	-	-	-
Sulphide	<0.01	<0.01	<0.02	<0.01	-	-	-
Sulphur Dissolved	116	<1	232	<1	-	-	-
Naphthalene (diss.filt)	<0.0001	<0.0001	<0.0002	<0.001	-	-	-
Total Cyanide (W)	<0.05	<0.05	<0.1	<0.05	-	-	-
Acenaphthene (diss.filt)	<0.000015	<0.000015	<0.00003	<0.00015	-	-	-
Free Cyanide (W)	<0.05	<0.05	<0.1	<0.05	-	-	-
Phenol by HPLC (W)	<0.002	<0.002	<0.004	<0.002	-	-	-
Acenaphthylene (diss.filt)	0.0000121	<0.000011	0.0000242	<0.00011	-	-	-
Fluoranthene (diss.filt)	<0.000017	<0.000017	<0.000034	<0.00017	-	-	-
Thiocyanate (W)	<0.05	<0.05	<0.1	<0.05	-	-	-
Anthracene (diss.filt)	<0.000015	<0.000015	<0.00003	<0.00015	-	-	-
Boron	0.731	<0.0094	1.46	<0.094	-	-	-
Phenanthrene (diss.filt)	<0.000022	<0.000022	<0.000044	<0.00022	-	-	-
Fluorene (diss.filt)	<0.000014	<0.000014	<0.000028	<0.00014	-	-	-
Chrysene (diss.filt)	<0.000013	<0.000013	<0.000026	<0.00013	-	-	-
Pyrene (diss.filt)	<0.000015	<0.000015	<0.00003	<0.00015	-	-	-
Benzo(a)anthracene (diss.filt)	<0.000017	<0.000017	<0.000034	<0.00017	-	-	-
Benzo(b)fluoranthene (diss.filt)	<0.000023	<0.000023	<0.000046	<0.00023	-	-	-
Benzo(k)fluoranthene (diss.filt)	<0.000027	<0.000027	<0.000054	<0.00027	-	-	-
Benzo(a)pyrene (diss.filt)	<0.000009	<0.000009	<0.000018	<0.00009	-	-	-

Leach Test Information

Date Prepared	15-Oct-2013
pH (pH Units)	8.55
Conductivity (µS/cm)	1,780.00
Temperature (°C)	20.50
Volume Leachant (Litres)	0.237
Volume of Eluate VE1 (Litres)	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
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Mcerts Certification does not apply to leachates
25/11/2013 08:20:40

08:20:27 25/11/2013

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

CEN 2:1 STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

Client Reference		**Site Location**	Frodsham
Mass Sample taken (kg)	0.287	**Moisture Content Ratio (%)**	64.3
Mass of dry sample (kg)	0.175	**Dry Matter Content Ratio (%)**	60.9
Particle Size <4mm	>95%		

Case				
SDG	131010-73			
Lab Sample Number(s)	8245909			
Sampled Date	26-Sep-2013			
Customer Sample Ref.	CPT2			
Depth (m)	0.50			

Solid Waste Analysis

Total Organic Carbon (%)	-	-	-	-
Loss on Ignition (%)	-	-	-	-
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-	-
Mineral Oil (mg/kg)	-	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis

	Concⁿ in 2:1 eluate (mg/l)		2:1 concⁿ leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Dibenzo(a,h)anthracene (diss.filt)	<0.000016	<0.000016	<0.000032	<0.00016	-	-	-
Benzo(g,h,i)perylene (diss.filt)	<0.000016	<0.000016	<0.000032	<0.00016	-	-	-
Indeno(1,2,3-cd)pyrene (diss.filt)	<0.000014	<0.000014	<0.000028	<0.00014	-	-	-
PAH 16 EPA Total by GCMS (diss.filt)	<0.000341	<0.000341	<0.000682	<0.00341	-	-	-

Leach Test Information

Date Prepared	15-Oct-2013
pH (pH Units)	8.55
Conductivity (µS/cm)	1,780.00
Temperature (°C)	20.50
Volume Leachant (Litres)	0.237
Volume of Eluate VE1 (Litres)	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
25/11/2013 08:20:40

08:20:27 25/11/2013

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

CEN 2:1 STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

Client Reference		**Site Location**	Frodsham
Mass Sample taken (kg)	0.302	**Moisture Content Ratio (%)**	72.5
Mass of dry sample (kg)	0.175	**Dry Matter Content Ratio (%)**	58
Particle Size <4mm	>95%		

Case				
SDG	131010-73			
Lab Sample Number(s)	8245918			
Sampled Date	27-Sep-2013			
Customer Sample Ref.	CPT8			
Depth (m)	0.50			

Solid Waste Analysis

Total Organic Carbon (%)	-	-	-	-
Loss on Ignition (%)	-	-	-	-
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-	-
Mineral Oil (mg/kg)	-	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	7.92	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis

	Concⁿ in 2:1 eluate (mg/l)		2:1 concⁿ leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	0.0142	<0.00012	0.0284	<0.0012	0.5	2	25
Barium	-	-	-	-	20	100	300
Cadmium	0.000352	<0.0001	0.000704	<0.001	0.04	1	5
Chromium	0.0167	<0.00022	0.0334	<0.0022	0.5	10	70
Copper	0.071	<0.00085	0.142	<0.0085	2	50	100
Mercury Dissolved (CVAF)	0.00045	<0.00001	0.0009	<0.0001	0.01	0.2	2
Molybdenum	-	-	-	-	0.5	10	30
Nickel	0.0122	<0.00015	0.0244	<0.0015	0.4	10	40
Lead	0.00646	<0.00002	0.0129	<0.0002	0.5	10	50
Antimony	-	-	-	-	0.06	0.7	5
Selenium	0.00592	<0.00039	0.0118	<0.0039	0.1	0.5	7
Zinc	0.0238	<0.00041	0.0476	<0.0041	4	50	200
Chloride	-	-	-	-	800	15000	25000
Fluoride	-	-	-	-	10	150	500
Sulphate (soluble)	485	<2	970	<2	1000	20000	50000
Total Dissolved Solids	-	-	-	-	4000	60000	100000
Total Monohydric Phenols (W)	-	-	-	-	1	-	-
Dissolved Organic Carbon	-	-	-	-	500	800	1000

Leach Test Information

Date Prepared	15-Oct-2013
pH (pH Units)	8.38
Conductivity (µS/cm)	2,000.00
Temperature (°C)	20.40
Volume Leachant (Litres)	0.223
Volume of Eluate VE1 (Litres)	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
25/11/2013 08:20:40

08:20:27 25/11/2013

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

CEN 2:1 STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

Client Reference		**Site Location**	Frodsham
Mass Sample taken (kg)	0.302	**Moisture Content Ratio (%)**	72.5
Mass of dry sample (kg)	0.175	**Dry Matter Content Ratio (%)**	58
Particle Size <4mm	>95%		

Case				
SDG	131010-73			
Lab Sample Number(s)	8245918			
Sampled Date	27-Sep-2013			
Customer Sample Ref.	CPT8			
Depth (m)	0.50			

Solid Waste Analysis

Total Organic Carbon (%)	-	-	-	-
Loss on Ignition (%)	-	-	-	-
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-	-
Mineral Oil (mg/kg)	-	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	7.92	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis

	Concⁿ in 2:1 eluate (mg/l)		2:1 concⁿ leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Hexavalent Chromium	<0.03	<0.03	<0.06	<0.03	-	-	-
pH Value of Filtered Water	8.5	<0.001	17	<0.01	-	-	-
Sulphide	<0.01	<0.01	<0.02	<0.01	-	-	-
Sulphur Dissolved	177	<1	354	<1	-	-	-
Naphthalene (diss.filt)	0.000134	<0.0001	0.000268	<0.001	-	-	-
Total Cyanide (W)	<0.05	<0.05	<0.1	<0.05	-	-	-
Acenaphthene (diss.filt)	0.0000978	<0.000015	0.000196	<0.00015	-	-	-
Free Cyanide (W)	<0.05	<0.05	<0.1	<0.05	-	-	-
Phenol by HPLC (W)	<0.002	<0.002	<0.004	<0.002	-	-	-
Acenaphthylene (diss.filt)	0.0000199	<0.000011	0.0000398	<0.00011	-	-	-
Fluoranthene (diss.filt)	0.0000459	<0.000017	0.0000918	<0.00017	-	-	-
Thiocyanate (W)	<0.05	<0.05	<0.1	<0.05	-	-	-
Anthracene (diss.filt)	<0.000015	<0.000015	<0.00003	<0.00015	-	-	-
Boron	0.902	<0.0094	1.8	<0.094	-	-	-
Phenanthrene (diss.filt)	0.0000472	<0.000022	0.0000944	<0.00022	-	-	-
Fluorene (diss.filt)	0.0000571	<0.000014	0.000114	<0.00014	-	-	-
Chrysene (diss.filt)	0.0000314	<0.000013	0.0000628	<0.00013	-	-	-
Pyrene (diss.filt)	0.0000466	<0.000015	0.0000932	<0.00015	-	-	-
Benzo(a)anthracene (diss.filt)	0.0000213	<0.000017	0.0000426	<0.00017	-	-	-
Benzo(b)fluoranthene (diss.filt)	<0.000023	<0.000023	<0.000046	<0.00023	-	-	-
Benzo(k)fluoranthene (diss.filt)	0.0000302	<0.000027	0.0000604	<0.00027	-	-	-
Benzo(a)pyrene (diss.filt)	<0.000009	<0.000009	<0.000018	<0.00009	-	-	-

Leach Test Information

Date Prepared	15-Oct-2013
pH (pH Units)	8.38
Conductivity (µS/cm)	2,000.00
Temperature (°C)	20.40
Volume Leachant (Litres)	0.223
Volume of Eluate VE1 (Litres)	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
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CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

CEN 2:1 STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

Client Reference		**Site Location**	Frodsham
Mass Sample taken (kg)	0.302	**Moisture Content Ratio (%)**	72.5
Mass of dry sample (kg)	0.175	**Dry Matter Content Ratio (%)**	58
Particle Size <4mm	>95%		

Case				
SDG	131010-73			
Lab Sample Number(s)	8245918			
Sampled Date	27-Sep-2013			
Customer Sample Ref.	CPT8			
Depth (m)	0.50			

Solid Waste Analysis

Total Organic Carbon (%)	-	-	-	-
Loss on Ignition (%)	-	-	-	-
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-	-
Mineral Oil (mg/kg)	-	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	7.92	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis

	Concⁿ in 2:1 eluate (mg/l)		2:1 concⁿ leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Dibenzo(a,h)anthracene (diss.filt)	<0.000016	<0.000016	<0.000032	<0.00016	-	-	-
Benzo(g,h,i)perylene (diss.filt)	<0.000016	<0.000016	<0.000032	<0.00016	-	-	-
Indeno(1,2,3-cd)pyrene (diss.filt)	<0.000014	<0.000014	<0.000028	<0.00014	-	-	-
PAH 16 EPA Total by GCMS (diss.filt)	0.000531	<0.000341	0.00106	<0.00341	-	-	-

Leach Test Information

Date Prepared	15-Oct-2013
pH (pH Units)	8.38
Conductivity (µS/cm)	2,000.00
Temperature (°C)	20.40
Volume Leachant (Litres)	0.223
Volume of Eluate VE1 (Litres)	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
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CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

CEN 2:1 STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

Client Reference		**Site Location**	Frodsham
Mass Sample taken (kg)	0.237	**Moisture Content Ratio (%)**	35.4
Mass of dry sample (kg)	0.175	**Dry Matter Content Ratio (%)**	73.9
Particle Size <4mm	>95%		

Case				
SDG	131010-73			
Lab Sample Number(s)	8245920			
Sampled Date	27-Sep-2013			
Customer Sample Ref.	CPT10			
Depth (m)	0.50			

Solid Waste Analysis

Total Organic Carbon (%)	-	-	-	-
Loss on Ignition (%)	-	-	-	-
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-	-
Mineral Oil (mg/kg)	-	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis

	Concⁿ in 2:1 eluate (mg/l)		2:1 concⁿ leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	0.00806	<0.00012	0.0161	<0.0012	0.5	2	25
Barium	-	-	-	-	20	100	300
Cadmium	<0.0001	<0.0001	<0.0002	<0.001	0.04	1	5
Chromium	0.0124	<0.00022	0.0248	<0.0022	0.5	10	70
Copper	0.0423	<0.00085	0.0846	<0.0085	2	50	100
Mercury Dissolved (CVAF)	0.000243	<0.00001	0.000486	<0.0001	0.01	0.2	2
Molybdenum	-	-	-	-	0.5	10	30
Nickel	0.00654	<0.00015	0.0131	<0.0015	0.4	10	40
Lead	0.00118	<0.00002	0.00236	<0.0002	0.5	10	50
Antimony	-	-	-	-	0.06	0.7	5
Selenium	0.00209	<0.00039	0.00418	<0.0039	0.1	0.5	7
Zinc	0.00723	<0.00041	0.0145	<0.0041	4	50	200
Chloride	-	-	-	-	800	15000	25000
Fluoride	-	-	-	-	10	150	500
Sulphate (soluble)	123	<2	246	<2	1000	20000	50000
Total Dissolved Solids	-	-	-	-	4000	60000	100000
Total Monohydric Phenols (W)	-	-	-	-	1	-	-
Dissolved Organic Carbon	-	-	-	-	500	800	1000

Leach Test Information

Date Prepared	15-Oct-2013
pH (pH Units)	8.21
Conductivity (µS/cm)	841.00
Temperature (°C)	20.20
Volume Leachant (Litres)	0.288
Volume of Eluate VE1 (Litres)	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation
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CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

CEN 2:1 STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

Client Reference		**Site Location**	Frodsham
Mass Sample taken (kg)	0.237	**Moisture Content Ratio (%)**	35.4
Mass of dry sample (kg)	0.175	**Dry Matter Content Ratio (%)**	73.9
Particle Size <4mm	>95%		

Case				
SDG	131010-73			
Lab Sample Number(s)	8245920			
Sampled Date	27-Sep-2013			
Customer Sample Ref.	CPT10			
Depth (m)	0.50			

Solid Waste Analysis

Total Organic Carbon (%)	-	-	-	-
Loss on Ignition (%)	-	-	-	-
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-	-
Mineral Oil (mg/kg)	-	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis

	Concⁿ in 2:1 eluate (mg/l)		2:1 concⁿ leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Hexavalent Chromium	<0.03	<0.03	<0.06	<0.03	-	-	-
pH Value of Filtered Water	8.4	<0.001	17	<0.01	-	-	-
Sulphide	<0.01	<0.01	<0.02	<0.01	-	-	-
Sulphur Dissolved	43	<1	86	<1	-	-	-
Naphthalene (diss.filt)	<0.0001	<0.0001	<0.0002	<0.001	-	-	-
Total Cyanide (W)	<0.05	<0.05	<0.1	<0.05	-	-	-
Acenaphthene (diss.filt)	0.0000683	<0.000015	0.000137	<0.00015	-	-	-
Free Cyanide (W)	<0.05	<0.05	<0.1	<0.05	-	-	-
Phenol by HPLC (W)	<0.002	<0.002	<0.004	<0.002	-	-	-
Acenaphthylene (diss.filt)	0.0000123	<0.000011	0.0000246	<0.00011	-	-	-
Fluoranthene (diss.filt)	0.00013	<0.000017	0.00026	<0.00017	-	-	-
Thiocyanate (W)	<0.05	<0.05	<0.1	<0.05	-	-	-
Anthracene (diss.filt)	<0.000015	<0.000015	<0.00003	<0.00015	-	-	-
Boron	0.201	<0.0094	0.402	<0.094	-	-	-
Phenanthrene (diss.filt)	0.0000238	<0.000022	0.0000476	<0.00022	-	-	-
Fluorene (diss.filt)	0.0000223	<0.000014	0.0000446	<0.00014	-	-	-
Chrysene (diss.filt)	0.0000245	<0.000013	0.000049	<0.00013	-	-	-
Pyrene (diss.filt)	0.0001	<0.000015	0.0002	<0.00015	-	-	-
Benzo(a)anthracene (diss.filt)	<0.000017	<0.000017	<0.000034	<0.00017	-	-	-
Benzo(b)fluoranthene (diss.filt)	<0.000023	<0.000023	<0.000046	<0.00023	-	-	-
Benzo(k)fluoranthene (diss.filt)	<0.000027	<0.000027	<0.000054	<0.00027	-	-	-
Benzo(a)pyrene (diss.filt)	<0.000009	<0.000009	<0.000018	<0.00009	-	-	-

Leach Test Information

Date Prepared	15-Oct-2013
pH (pH Units)	8.21
Conductivity (µS/cm)	841.00
Temperature (°C)	20.20
Volume Leachant (Litres)	0.288
Volume of Eluate VE1 (Litres)	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
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CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

CEN 2:1 STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

Client Reference		**Site Location**	Frodsham
Mass Sample taken (kg)	0.237	**Moisture Content Ratio (%)**	35.4
Mass of dry sample (kg)	0.175	**Dry Matter Content Ratio (%)**	73.9
Particle Size <4mm	>95%		

Case				
SDG	131010-73			
Lab Sample Number(s)	8245920			
Sampled Date	27-Sep-2013			
Customer Sample Ref.	CPT10			
Depth (m)	0.50			

Solid Waste Analysis

Total Organic Carbon (%)	-	-	-	-
Loss on Ignition (%)	-	-	-	-
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-	-
Mineral Oil (mg/kg)	-	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis

	Conc^{n} in 2:1 eluate (mg/l)		2:1 conc^{n} leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Dibenzo(a,h)anthracene (diss.filt)	<0.000016	<0.000016	<0.000032	<0.00016	-	-	-
Benzo(g,h,i)perylene (diss.filt)	<0.000016	<0.000016	<0.000032	<0.00016	-	-	-
Indeno(1,2,3-cd)pyrene (diss.filt)	<0.000014	<0.000014	<0.000028	<0.00014	-	-	-
PAH 16 EPA Total by GCMS (diss.filt)	0.000381	<0.000341	0.000762	<0.00341	-	-	-

Leach Test Information

Date Prepared	15-Oct-2013
pH (pH Units)	8.21
Conductivity (µS/cm)	841.00
Temperature (°C)	20.20
Volume Leachant (Litres)	0.288
Volume of Eluate VE1 (Litres)	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
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CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

CEN 2:1 STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

Client Reference		**Site Location**	Frodsham
Mass Sample taken (kg)	0.216	**Moisture Content Ratio (%)**	23.6
Mass of dry sample (kg)	0.175	**Dry Matter Content Ratio (%)**	80.9
Particle Size <4mm	>95%		

Case				
SDG	131010-73			
Lab Sample Number(s)	8245923			
Sampled Date	30-Sep-2013			
Customer Sample Ref.	CPT12			
Depth (m)	0.50			

Solid Waste Analysis

Total Organic Carbon (%)	-	-	-	-
Loss on Ignition (%)	-	-	-	-
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-	-
Mineral Oil (mg/kg)	-	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis

	Concⁿ in 2:1 eluate (mg/l)		2:1 concⁿ leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	0.000929	<0.00012	0.00186	<0.0012	0.5	2	25
Barium	-	-	-	-	20	100	300
Cadmium	<0.0001	<0.0001	<0.0002	<0.001	0.04	1	5
Chromium	0.00126	<0.00022	0.00252	<0.0022	0.5	10	70
Copper	0.0129	<0.00085	0.0258	<0.0085	2	50	100
Mercury Dissolved (CVAF)	0.000117	<0.00001	0.000234	<0.0001	0.01	0.2	2
Molybdenum	-	-	-	-	0.5	10	30
Nickel	0.00362	<0.00015	0.00724	<0.0015	0.4	10	40
Lead	0.0286	<0.00002	0.0572	<0.0002	0.5	10	50
Antimony	-	-	-	-	0.06	0.7	5
Selenium	0.000692	<0.00039	0.00138	<0.0039	0.1	0.5	7
Zinc	0.0156	<0.00041	0.0312	<0.0041	4	50	200
Chloride	-	-	-	-	800	15000	25000
Fluoride	-	-	-	-	10	150	500
Sulphate (soluble)	<2	<2	<4	<2	1000	20000	50000
Total Dissolved Solids	-	-	-	-	4000	60000	100000
Total Monohydric Phenols (W)	-	-	-	-	1	-	-
Dissolved Organic Carbon	-	-	-	-	500	800	1000

Leach Test Information

Date Prepared	16-Oct-2013
pH (pH Units)	8.48
Conductivity (µS/cm)	308.00
Temperature (°C)	20.50
Volume Leachant (Litres)	0.309
Volume of Eluate VE1 (Litres)	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
25/11/2013 08:20:40

08:20:27 25/11/2013

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

CEN 2:1 STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

Client Reference		**Site Location**	Frodsham
Mass Sample taken (kg)	0.216	**Moisture Content Ratio (%)**	23.6
Mass of dry sample (kg)	0.175	**Dry Matter Content Ratio (%)**	80.9
Particle Size <4mm	>95%		

Case				
SDG	131010-73			
Lab Sample Number(s)	8245923			
Sampled Date	30-Sep-2013			
Customer Sample Ref.	CPT12			
Depth (m)	0.50			

Solid Waste Analysis

Total Organic Carbon (%)	-	-	-	-
Loss on Ignition (%)	-	-	-	-
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-	-
Mineral Oil (mg/kg)	-	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis

	Concⁿ in 2:1 eluate (mg/l)		2:1 concⁿ leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Hexavalent Chromium	<0.03	<0.03	<0.06	<0.03	-	-	-
pH Value of Filtered Water	8.5	<0.001	17	<0.01	-	-	-
Sulphide	<0.01	<0.01	<0.02	<0.01	-	-	-
Sulphur Dissolved	2.08	<1	4.16	<1	-	-	-
Naphthalene (diss.filt)	<0.0001	<0.0001	<0.0002	<0.001	-	-	-
Total Cyanide (W)	<0.05	<0.05	<0.1	<0.05	-	-	-
Acenaphthene (diss.filt)	0.0000332	<0.000015	0.0000664	<0.00015	-	-	-
Free Cyanide (W)	<0.05	<0.05	<0.1	<0.05	-	-	-
Phenol by HPLC (W)	<0.002	<0.002	<0.004	<0.002	-	-	-
Acenaphthylene (diss.filt)	<0.000011	<0.000011	<0.000022	<0.00011	-	-	-
Fluoranthene (diss.filt)	<0.000017	<0.000017	<0.000034	<0.00017	-	-	-
Thiocyanate (W)	<0.05	<0.05	<0.1	<0.05	-	-	-
Anthracene (diss.filt)	<0.000015	<0.000015	<0.00003	<0.00015	-	-	-
Boron	0.0849	<0.0094	0.17	<0.094	-	-	-
Phenanthrene (diss.filt)	0.0000537	<0.000022	0.000107	<0.00022	-	-	-
Fluorene (diss.filt)	0.0000349	<0.000014	0.0000698	<0.00014	-	-	-
Chrysene (diss.filt)	<0.000013	<0.000013	<0.000026	<0.00013	-	-	-
Pyrene (diss.filt)	<0.000015	<0.000015	<0.00003	<0.00015	-	-	-
Benzo(a)anthracene (diss.filt)	<0.000017	<0.000017	<0.000034	<0.00017	-	-	-
Benzo(b)fluoranthene (diss.filt)	<0.000023	<0.000023	<0.000046	<0.00023	-	-	-
Benzo(k)fluoranthene (diss.filt)	<0.000027	<0.000027	<0.000054	<0.00027	-	-	-
Benzo(a)pyrene (diss.filt)	<0.000009	<0.000009	<0.000018	<0.00009	-	-	-

Leach Test Information

Date Prepared	16-Oct-2013
pH (pH Units)	8.48
Conductivity (µS/cm)	308.00
Temperature (°C)	20.50
Volume Leachant (Litres)	0.309
Volume of Eluate VE1 (Litres)	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
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CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

CEN 2:1 STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

Client Reference		**Site Location**	Frodsham
Mass Sample taken (kg)	0.216	**Moisture Content Ratio (%)**	23.6
Mass of dry sample (kg)	0.175	**Dry Matter Content Ratio (%)**	80.9
Particle Size <4mm	>95%		

Case				
SDG	131010-73			
Lab Sample Number(s)	8245923			
Sampled Date	30-Sep-2013			
Customer Sample Ref.	CPT12			
Depth (m)	0.50			

Solid Waste Analysis

Total Organic Carbon (%)	-	-	-	-
Loss on Ignition (%)	-	-	-	-
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-	-
Mineral Oil (mg/kg)	-	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis

	Concⁿ in 2:1 eluate (mg/l)		2:1 concⁿ leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Dibenzo(a,h)anthracene (diss.filt)	<0.000016	<0.000016	<0.000032	<0.00016	-	-	-
Benzo(g,h,i)perylene (diss.filt)	<0.000016	<0.000016	<0.000032	<0.00016	-	-	-
Indeno(1,2,3-cd)pyrene (diss.filt)	<0.000014	<0.000014	<0.000028	<0.00014	-	-	-
PAH 16 EPA Total by GCMS (diss.filt)	<0.000341	<0.000341	<0.000682	<0.00341	-	-	-

Leach Test Information

Date Prepared	16-Oct-2013
pH (pH Units)	8.48
Conductivity (µS/cm)	308.00
Temperature (°C)	20.50
Volume Leachant (Litres)	0.309
Volume of Eluate VE1 (Litres)	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
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Mcerts Certification does not apply to leachates
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CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

CEN 2:1 STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

Client Reference		**Site Location**	Frodsham
Mass Sample taken (kg)	0.244	**Moisture Content Ratio (%)**	39.2
Mass of dry sample (kg)	0.175	**Dry Matter Content Ratio (%)**	71.8
Particle Size <4mm	>95%		

Case				
SDG	131010-73			
Lab Sample Number(s)	8245926			
Sampled Date	27-Sep-2013			
Customer Sample Ref.	CPT14			
Depth (m)	0.50			

Solid Waste Analysis

Total Organic Carbon (%)	-	-	-	-
Loss on Ignition (%)	-	-	-	-
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-	-
Mineral Oil (mg/kg)	-	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	8.39	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis

	Concⁿ in 2:1 eluate (mg/l)		2:1 concⁿ leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	0.0261	<0.00012	0.0522	<0.0012	0.5	2	25
Barium	-	-	-	-	20	100	300
Cadmium	0.000421	<0.0001	0.000842	<0.001	0.04	1	5
Chromium	0.0179	<0.00022	0.0358	<0.0022	0.5	10	70
Copper	0.0881	<0.00085	0.176	<0.0085	2	50	100
Mercury Dissolved (CVAF)	0.000576	<0.00001	0.00115	<0.0001	0.01	0.2	2
Molybdenum	-	-	-	-	0.5	10	30
Nickel	0.00318	<0.00015	0.00636	<0.0015	0.4	10	40
Lead	0.00136	<0.00002	0.00272	<0.0002	0.5	10	50
Antimony	-	-	-	-	0.06	0.7	5
Selenium	0.0104	<0.00039	0.0208	<0.0039	0.1	0.5	7
Zinc	0.0137	<0.00041	0.0274	<0.0041	4	50	200
Chloride	-	-	-	-	800	15000	25000
Fluoride	-	-	-	-	10	150	500
Sulphate (soluble)	38.4	<2	76.8	<2	1000	20000	50000
Total Dissolved Solids	-	-	-	-	4000	60000	100000
Total Monohydric Phenols (W)	-	-	-	-	1	-	-
Dissolved Organic Carbon	-	-	-	-	500	800	1000

Leach Test Information

Date Prepared	16-Oct-2013
pH (pH Units)	8.36
Conductivity (µS/cm)	497.00
Temperature (°C)	20.50
Volume Leachant (Litres)	0.281
Volume of Eluate VE1 (Litres)	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
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CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

CEN 2:1 STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

Client Reference		**Site Location**	Frodsham
Mass Sample taken (kg)	0.244	**Moisture Content Ratio (%)**	39.2
Mass of dry sample (kg)	0.175	**Dry Matter Content Ratio (%)**	71.8
Particle Size <4mm	>95%		

Case				
SDG	131010-73			
Lab Sample Number(s)	8245926			
Sampled Date	27-Sep-2013			
Customer Sample Ref.	CPT14			
Depth (m)	0.50			

Solid Waste Analysis

Total Organic Carbon (%)	-	-	-	-
Loss on Ignition (%)	-	-	-	-
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-	-
Mineral Oil (mg/kg)	-	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	8.39	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis

	Concⁿ in 2:1 eluate (mg/l)		2:1 concⁿ leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Hexavalent Chromium	<0.03	<0.03	<0.06	<0.03	-	-	-
pH Value of Filtered Water	8.4	<0.001	17	<0.01	-	-	-
Sulphide	<0.01	<0.01	<0.02	<0.01	-	-	-
Sulphur Dissolved	12.7	<1	25.4	<1	-	-	-
Naphthalene (diss.filt)	<0.0001	<0.0001	<0.0002	<0.001	-	-	-
Total Cyanide (W)	<0.05	<0.05	<0.1	<0.05	-	-	-
Acenaphthene (diss.filt)	<0.000015	<0.000015	<0.00003	<0.00015	-	-	-
Free Cyanide (W)	<0.05	<0.05	<0.1	<0.05	-	-	-
Phenol by HPLC (W)	<0.002	<0.002	<0.004	<0.002	-	-	-
Acenaphthylene (diss.filt)	0.0000141	<0.000011	0.0000282	<0.00011	-	-	-
Fluoranthene (diss.filt)	<0.000017	<0.000017	<0.000034	<0.00017	-	-	-
Thiocyanate (W)	<0.05	<0.05	<0.1	<0.05	-	-	-
Anthracene (diss.filt)	0.0000197	<0.000015	0.0000394	<0.00015	-	-	-
Boron	0.177	<0.0094	0.354	<0.094	-	-	-
Phenanthrene (diss.filt)	<0.000022	<0.000022	<0.000044	<0.00022	-	-	-
Fluorene (diss.filt)	<0.000014	<0.000014	<0.000028	<0.00014	-	-	-
Chrysene (diss.filt)	<0.000013	<0.000013	<0.000026	<0.00013	-	-	-
Pyrene (diss.filt)	<0.000015	<0.000015	<0.00003	<0.00015	-	-	-
Benzo(a)anthracene (diss.filt)	<0.000017	<0.000017	<0.000034	<0.00017	-	-	-
Benzo(b)fluoranthene (diss.filt)	<0.000023	<0.000023	<0.000046	<0.00023	-	-	-
Benzo(k)fluoranthene (diss.filt)	<0.000027	<0.000027	<0.000054	<0.00027	-	-	-
Benzo(a)pyrene (diss.filt)	<0.000009	<0.000009	<0.000018	<0.00009	-	-	-

Leach Test Information

Date Prepared	16-Oct-2013
pH (pH Units)	8.36
Conductivity (µS/cm)	497.00
Temperature (°C)	20.50
Volume Leachant (Litres)	0.281
Volume of Eluate VE1 (Litres)	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
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CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

CEN 2:1 STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

Client Reference		**Site Location**	Frodsham
Mass Sample taken (kg)	0.244	**Moisture Content Ratio (%)**	39.2
Mass of dry sample (kg)	0.175	**Dry Matter Content Ratio (%)**	71.8
Particle Size <4mm	>95%		

Case				
SDG	131010-73			
Lab Sample Number(s)	8245926			
Sampled Date	27-Sep-2013			
Customer Sample Ref.	CPT14			
Depth (m)	0.50			

Solid Waste Analysis

Total Organic Carbon (%)	-	-	-	-
Loss on Ignition (%)	-	-	-	-
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-	-
Mineral Oil (mg/kg)	-	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	8.39	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis

	Concⁿ in 2:1 eluate (mg/l)		2:1 concⁿ leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Dibenzo(a,h)anthracene (diss.filt)	<0.000016	<0.000016	<0.000032	<0.00016	-	-	-
Benzo(g,h,i)perylene (diss.filt)	<0.000016	<0.000016	<0.000032	<0.00016	-	-	-
Indeno(1,2,3-cd)pyrene (diss.filt)	<0.000014	<0.000014	<0.000028	<0.00014	-	-	-
PAH 16 EPA Total by GCMS (diss.filt)	<0.000341	<0.000341	<0.000682	<0.00341	-	-	-

Leach Test Information

Date Prepared	16-Oct-2013
pH (pH Units)	8.36
Conductivity (µS/cm)	497.00
Temperature (°C)	20.50
Volume Leachant (Litres)	0.281
Volume of Eluate VE1 (Litres)	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
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CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

CEN 2:1 STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

Client Reference		**Site Location**	Frodsham
Mass Sample taken (kg)	0.242	**Moisture Content Ratio (%)**	38
Mass of dry sample (kg)	0.175	**Dry Matter Content Ratio (%)**	72.5
Particle Size <4mm	>95%		

Case				
SDG	131010-73			
Lab Sample Number(s)	8245935			
Sampled Date	27-Sep-2013			
Customer Sample Ref.	CPT16			
Depth (m)	0.50			

Solid Waste Analysis

Total Organic Carbon (%)	-	-	-	-
Loss on Ignition (%)	-	-	-	-
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-	-
Mineral Oil (mg/kg)	-	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis

	Concⁿ in 2:1 eluate (mg/l)		2:1 concⁿ leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	0.0351	<0.00012	0.0702	<0.0012	0.5	2	25
Barium	-	-	-	-	20	100	300
Cadmium	0.000197	<0.0001	0.000394	<0.001	0.04	1	5
Chromium	0.0104	<0.00022	0.0208	<0.0022	0.5	10	70
Copper	0.103	<0.00085	0.206	<0.0085	2	50	100
Mercury Dissolved (CVAF)	0.000683	<0.00001	0.00137	<0.0001	0.01	0.2	2
Molybdenum	-	-	-	-	0.5	10	30
Nickel	0.00481	<0.00015	0.00962	<0.0015	0.4	10	40
Lead	0.00236	<0.00002	0.00472	<0.0002	0.5	10	50
Antimony	-	-	-	-	0.06	0.7	5
Selenium	0.00395	<0.00039	0.0079	<0.0039	0.1	0.5	7
Zinc	0.0117	<0.00041	0.0234	<0.0041	4	50	200
Chloride	-	-	-	-	800	15000	25000
Fluoride	-	-	-	-	10	150	500
Sulphate (soluble)	26.6	<2	53.2	<2	1000	20000	50000
Total Dissolved Solids	-	-	-	-	4000	60000	100000
Total Monohydric Phenols (W)	-	-	-	-	1	-	-
Dissolved Organic Carbon	-	-	-	-	500	800	1000

Leach Test Information

Date Prepared	15-Oct-2013
pH (pH Units)	8.50
Conductivity (µS/cm)	336.00
Temperature (°C)	20.20
Volume Leachant (Litres)	0.284
Volume of Eluate VE1 (Litres)	

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CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

CEN 2:1 STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

Client Reference		**Site Location**	Frodsham
Mass Sample taken (kg)	0.242	**Moisture Content Ratio (%)**	38
Mass of dry sample (kg)	0.175	**Dry Matter Content Ratio (%)**	72.5
Particle Size <4mm	>95%		

Case				
SDG	131010-73			
Lab Sample Number(s)	8245935			
Sampled Date	27-Sep-2013			
Customer Sample Ref.	CPT16			
Depth (m)	0.50			

Solid Waste Analysis

Total Organic Carbon (%)	-	-	-	-
Loss on Ignition (%)	-	-	-	-
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-	-
Mineral Oil (mg/kg)	-	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis

	Concⁿ in 2:1 eluate (mg/l)		2:1 concⁿ leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Hexavalent Chromium	<0.03	<0.03	<0.06	<0.03	-	-	-
pH Value of Filtered Water	8.6	<0.001	17	<0.01	-	-	-
Sulphide	<0.01	<0.01	<0.02	<0.01	-	-	-
Sulphur Dissolved	8.79	<1	17.6	<1	-	-	-
Naphthalene (diss.filt)	<0.0001	<0.0001	<0.0002	<0.001	-	-	-
Total Cyanide (W)	<0.05	<0.05	<0.1	<0.05	-	-	-
Acenaphthene (diss.filt)	0.0000573	<0.000015	0.000115	<0.00015	-	-	-
Free Cyanide (W)	<0.05	<0.05	<0.1	<0.05	-	-	-
Phenol by HPLC (W)	<0.002	<0.002	<0.004	<0.002	-	-	-
Acenaphthylene (diss.filt)	0.0000295	<0.000011	0.000059	<0.00011	-	-	-
Fluoranthene (diss.filt)	0.000125	<0.000017	0.00025	<0.00017	-	-	-
Thiocyanate (W)	<0.05	<0.05	<0.1	<0.05	-	-	-
Anthracene (diss.filt)	0.0000492	<0.000015	0.0000984	<0.00015	-	-	-
Boron	0.102	<0.0094	0.204	<0.094	-	-	-
Phenanthrene (diss.filt)	0.0001	<0.000022	0.0002	<0.00022	-	-	-
Fluorene (diss.filt)	0.000106	<0.000014	0.000212	<0.00014	-	-	-
Chrysene (diss.filt)	0.0000268	<0.000013	0.0000536	<0.00013	-	-	-
Pyrene (diss.filt)	0.0000887	<0.000015	0.000177	<0.00015	-	-	-
Benzo(a)anthracene (diss.filt)	<0.000017	<0.000017	<0.000034	<0.00017	-	-	-
Benzo(b)fluoranthene (diss.filt)	<0.000023	<0.000023	<0.000046	<0.00023	-	-	-
Benzo(k)fluoranthene (diss.filt)	<0.000027	<0.000027	<0.000054	<0.00027	-	-	-
Benzo(a)pyrene (diss.filt)	<0.000009	<0.000009	<0.000018	<0.00009	-	-	-

Leach Test Information

Date Prepared	15-Oct-2013
pH (pH Units)	8.50
Conductivity (µS/cm)	336.00
Temperature (°C)	20.20
Volume Leachant (Litres)	0.284
Volume of Eluate VE1 (Litres)	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
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CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

CEN 2:1 STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/1

Client Reference		**Site Location**	Frodsham
Mass Sample taken (kg)	0.242	**Moisture Content Ratio (%)**	38
Mass of dry sample (kg)	0.175	**Dry Matter Content Ratio (%)**	72.5
Particle Size <4mm	>95%		

Case				
SDG	131010-73			
Lab Sample Number(s)	8245935			
Sampled Date	27-Sep-2013			
Customer Sample Ref.	CPT16			
Depth (m)	0.50			

Solid Waste Analysis

Total Organic Carbon (%)	-	-	-	-
Loss on Ignition (%)	-	-	-	-
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	-	-	-	-
Mineral Oil (mg/kg)	-	-	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis

	Concⁿ in 2:1 eluate (mg/l)		2:1 concⁿ leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Dibenzo(a,h)anthracene (diss.filt)	<0.000016	<0.000016	<0.000032	<0.00016	-	-	-
Benzo(g,h,i)perylene (diss.filt)	<0.000016	<0.000016	<0.000032	<0.00016	-	-	-
Indeno(1,2,3-cd)pyrene (diss.filt)	<0.000014	<0.000014	<0.000028	<0.00014	-	-	-
PAH 16 EPA Total by GCMS (diss.filt)	0.000583	<0.000341	0.00117	<0.00341	-	-	-

Leach Test Information

Date Prepared	15-Oct-2013
pH (pH Units)	8.50
Conductivity (µS/cm)	336.00
Temperature (°C)	20.20
Volume Leachant (Litres)	0.284
Volume of Eluate VE1 (Litres)	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
25/11/2013 08:20:40

08:20:27 25/11/2013

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

Notification of NDPs (No determination possible)

Date Received : 10/10/2013 12:20:59

Sample No	Customer Sample Ref.	Depth (m)	Test	Comment
8245919	CPT9	0.50	Total Sulphur	Unsuitable for analysis due to potential Asbestos
8245936	CPT17	0.50	Total Sulphur	Unsuitable for analysis due to potential Asbestos
8245936	CPT17	0.50	Total Sulphur	Unsuitable for analysis due to potential Asbestos

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
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Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

Table of Results - Appendix

Method No	Reference	Description	Wet/Dry Sample [1]	Surrogate Corrected
ASB_PREP				
PM001		Preparation of Samples for Metals Analysis		
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
PM114		Leaching Procedure for CEN Two Stage BatchTest 2:1/8:1 Cumulative		
PM115		Leaching Procedure for CEN One Stage Leach Test 2:1 & 10:1 1 Step		
TM 304				
TM048	HSG 248, Asbestos: The analysts' guide for sampling, analysis and clearance procedures	Identification of Asbestos in Bulk Material		
TM062 (S)	National Grid Property Holdings Methods for the Collection & Analysis of Samples from National Grid Sites version 1 Sec 3.9	Determination of Phenols in Soils by HPLC		
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)		
TM101	Method 4500B & C, AWWA/APHA, 20th Ed., 1999	Determination of Sulphide in soil and water samples using the Kone Analyser		
TM132	In - house Method	ELTRA CS800 Operators Guide		
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter		
TM151	Method 3500D, AWWA/APHA, 20th Ed., 1999	Determination of Hexavalent Chromium using Kone analyser		
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS		
TM153	Method 4500A,B,C, I, M AWWA/APHA, 20th Ed., 1999	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the Skalar SANS+ System Segmented Flow Analyser		
TM168	EPA Method 8082, Polychlorinated Biphenyls by Gas Chromatography	Determination of WHO12 and EC7 Polychlorinated Biphenyl Congeners by GC-MS in Soils		
TM173	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GC-FID		
TM178	Modified: US EPA Method 8100	Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS in Waters		
TM180	Sulphide in waters and waste waters 1991 ISBN 01 175 7186 SCA rec. 2007 (unpublished)'	The Determination Of Easily Liberated Sulphide In Soil Samples by Ion Selective Electrode Technique		
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES		
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry		
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers		
TM218	Microwave extraction – EPA method 3546	Microwave extraction - EPA method 3546		
TM221	Inductively Coupled Plasma - Atomic Emission Spectroscopy. An Atlas of Spectral Information: Winge, Fassel, Peterson and Floyd	Determination of Acid extractable Sulphate in Soils by IRIS Emission Spectrometer		
TM222	In-House Method	Determination of Hot Water Soluble Boron in Soils (10:1 Water:soil) by IRIS Emission Spectrometer		
TM227	Standard methods for the examination of waters and wastewaters 20th Edition, AWWA/APHA Method 4500.	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate		
TM228	US EPA Method 6010B	Determination of Major Cations in Water by iCap 6500 Duo ICP-OES		
TM241	Methods for the Examination of Waters and Associated Materials; Chromium in Raw and Potable Waters and Sewage Effluents 1980.	The Determination of Hexavalent Chromium in Waters and Leachates using the Kone Analyser		
TM243		Mixed Anions In Soils By Kone		
TM248	In-House Method	Determination of Ammonium BRE (2:1 Extract) on solids		
TM256	The measurement of Electrical Conductivity and the Laboratory determination of pH Value of Natural, Treated and Wastewaters. HMSO, 1978. ISBN 011 751428 4.	Determination of pH in Water and Leachate using the GLpH pH Meter		
TM259	by HPLC	Determination of Phenols in Waters and Leachates by HPLC		
TM282		Extraction of Magnesium by BRE Method		

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

Test Completion Dates

Lab Sample No(s)	8245907	8245909	8245911	8245913	8245915	8245916	8245918	8245919	8245920	8245922
Customer Sample Ref.	CPT1	CPT2	CPT3	CPT5	CPT6	CPT7	CPT8	CPT9	CPT10	CPT11
AGS Ref.										
Depth	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
Ammoniacal N as NH4 in 2:1 extract							16-Oct-2013			
Anions by Kone (soil)	21-Oct-2013		21-Oct-2013	21-Oct-2013		21-Oct-2013	18-Oct-2013	21-Oct-2013		21-Oct-2013
Anions by Kone (w)		21-Oct-2013					21-Oct-2013		21-Oct-2013	
Asbestos ID in Solid Samples	21-Oct-2013		21-Oct-2013	21-Oct-2013		21-Oct-2013		21-Oct-2013		21-Oct-2013
Asbestos Quantification - Full								25-Nov-2013		
Boron Water Soluble	21-Oct-2013		21-Oct-2013	21-Oct-2013		21-Oct-2013		22-Oct-2013		22-Oct-2013
CEN 2:1 Leachate (1 Stage)		15-Oct-2013					15-Oct-2013		15-Oct-2013	
CEN Readings		18-Oct-2013					18-Oct-2013		18-Oct-2013	
Cyanide Comp/Free/Total/Thiocyanate	21-Oct-2013	21-Oct-2013	21-Oct-2013	21-Oct-2013		21-Oct-2013	21-Oct-2013	21-Oct-2013	21-Oct-2013	21-Oct-2013
Dissolved Metals by ICP-MS		21-Oct-2013					21-Oct-2013		21-Oct-2013	
Easily Liberated Sulphide	21-Oct-2013		21-Oct-2013	21-Oct-2013		21-Oct-2013		21-Oct-2013		21-Oct-2013
EPH CWG (Aliphatic) GC (S)	21-Oct-2013		21-Oct-2013	21-Oct-2013		21-Oct-2013		21-Oct-2013		21-Oct-2013
EPH CWG (Aromatic) GC (S)	21-Oct-2013		21-Oct-2013	21-Oct-2013		21-Oct-2013		21-Oct-2013		21-Oct-2013
GRO by GC-FID (S)	21-Oct-2013		21-Oct-2013	21-Oct-2013		21-Oct-2013		16-Oct-2013		16-Oct-2013
Hexavalent Chromium (s)	22-Oct-2013		22-Oct-2013	22-Oct-2013		22-Oct-2013		22-Oct-2013		22-Oct-2013
Hexavalent Chromium (w)		22-Oct-2013					22-Oct-2013		22-Oct-2013	
Magnesium (BRE)							18-Oct-2013			
Mercury Dissolved		21-Oct-2013					21-Oct-2013		21-Oct-2013	
Metals in solid samples by OES	22-Oct-2013		22-Oct-2013	22-Oct-2013		22-Oct-2013		22-Oct-2013		22-Oct-2013
NO3, NO2 and TON by KONE (s)							18-Oct-2013			
PAH by GCMS	21-Oct-2013		21-Oct-2013	21-Oct-2013		21-Oct-2013		21-Oct-2013		21-Oct-2013
PAH in waters by GC-MS (diss.filt)		22-Oct-2013					22-Oct-2013		22-Oct-2013	
PCBs by GCMS	22-Oct-2013		22-Oct-2013		18-Oct-2013	22-Oct-2013		22-Oct-2013		
pH	18-Oct-2013		18-Oct-2013	18-Oct-2013		18-Oct-2013	16-Oct-2013	21-Oct-2013		21-Oct-2013
pH Value of Filtered Water		18-Oct-2013					18-Oct-2013		18-Oct-2013	
Phenols by HPLC (S)	21-Oct-2013		21-Oct-2013	21-Oct-2013		21-Oct-2013		18-Oct-2013		18-Oct-2013
Phenols by HPLC (W)		21-Oct-2013					21-Oct-2013		21-Oct-2013	
Sample description	16-Oct-2013	16-Oct-2013	16-Oct-2013	16-Oct-2013	15-Oct-2013	16-Oct-2013	14-Oct-2013	14-Oct-2013	14-Oct-2013	14-Oct-2013
Sulphide		21-Oct-2013					21-Oct-2013		21-Oct-2013	
Sulphur Dissolved by ICP-OES		21-Oct-2013					21-Oct-2013		21-Oct-2013	
Total Organic Carbon	22-Oct-2013		22-Oct-2013	22-Oct-2013		22-Oct-2013		22-Oct-2013		22-Oct-2013
Total Sulphate							16-Oct-2013	22-Oct-2013		
Total Sulphur	23-Oct-2013		23-Oct-2013	23-Oct-2013		23-Oct-2013	17-Oct-2013			23-Oct-2013
TPH CWG GC (S)	21-Oct-2013		21-Oct-2013	21-Oct-2013		21-Oct-2013		21-Oct-2013		21-Oct-2013

CERTIFICATE OF ANALYSIS

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

Lab Sample No(s)	8245923	8245924	8245926	8245929	8245935	8245936	8245938	8245942	8245943	8245944
Customer Sample Ref.	CPT12	CPT13	CPT14	CPT15	CPT16	CPT17	CPT19	SA1	SA1	SA3
AGS Ref.										
Depth	0.50	0.50	0.50	0.50	0.50	0.50	0.50	7.00	1.00	4.50
Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
Ammoniacal N as NH4 in 2:1 extract			21-Oct-2013			21-Oct-2013		21-Oct-2013		06-Nov-2013
Anions by Kone (soil)		21-Oct-2013	18-Oct-2013	21-Oct-2013		21-Oct-2013	21-Oct-2013	21-Oct-2013	21-Oct-2013	04-Nov-2013
Anions by Kone (w)	21-Oct-2013		21-Oct-2013		21-Oct-2013					
Asbestos ID in Solid Samples		21-Oct-2013		21-Oct-2013		21-Oct-2013	21-Oct-2013	21-Oct-2013	21-Oct-2013	
Asbestos Quantification - Full						22-Nov-2013				
Boron Water Soluble		22-Oct-2013		22-Oct-2013		21-Oct-2013	21-Oct-2013	22-Oct-2013	22-Oct-2013	02-Nov-2013
CEN 2:1 Leachate (1 Stage)	16-Oct-2013		16-Oct-2013		15-Oct-2013					
CEN Readings	18-Oct-2013		18-Oct-2013		18-Oct-2013					
Cyanide Comp/Free/Total/Thiocyanate	21-Oct-2013	19-Oct-2013	21-Oct-2013	21-Oct-2013	21-Oct-2013	21-Oct-2013	21-Oct-2013	21-Oct-2013	21-Oct-2013	04-Nov-2013
Dissolved Metals by ICP-MS	21-Oct-2013		21-Oct-2013		21-Oct-2013					
Easily Liberated Sulphide		21-Oct-2013		21-Oct-2013		21-Oct-2013	21-Oct-2013	21-Oct-2013	21-Oct-2013	30-Oct-2013
EPH CWG (Aliphatic) GC (S)		21-Oct-2013		21-Oct-2013		21-Oct-2013	21-Oct-2013		21-Oct-2013	01-Nov-2013
EPH CWG (Aromatic) GC (S)		21-Oct-2013		21-Oct-2013		21-Oct-2013	21-Oct-2013		21-Oct-2013	01-Nov-2013
GRO by GC-FID (S)		16-Oct-2013		17-Oct-2013		21-Oct-2013	21-Oct-2013		17-Oct-2013	31-Oct-2013
Hexavalent Chromium (s)		18-Oct-2013		22-Oct-2013		22-Oct-2013	22-Oct-2013	22-Oct-2013	22-Oct-2013	06-Nov-2013
Hexavalent Chromium (w)	22-Oct-2013		22-Oct-2013		22-Oct-2013					
Magnesium (BRE)			18-Oct-2013			21-Oct-2013		21-Oct-2013		02-Nov-2013
Mercury Dissolved	22-Oct-2013		22-Oct-2013		22-Oct-2013					
Metals in solid samples by OES		22-Oct-2013		22-Oct-2013		22-Oct-2013	22-Oct-2013	22-Oct-2013	22-Oct-2013	05-Nov-2013
NO3, NO2 and TON by KONE (s)			18-Oct-2013			22-Oct-2013		22-Oct-2013		05-Nov-2013
PAH by GCMS		21-Oct-2013		21-Oct-2013		21-Oct-2013	21-Oct-2013	21-Oct-2013	21-Oct-2013	01-Nov-2013
PAH in waters by GC-MS (diss.filt)	22-Oct-2013		22-Oct-2013		22-Oct-2013					
PCBs by GCMS						22-Oct-2013	22-Oct-2013		22-Oct-2013	
pH		21-Oct-2013	16-Oct-2013	21-Oct-2013		18-Oct-2013	18-Oct-2013	21-Oct-2013	21-Oct-2013	04-Nov-2013
pH Value of Filtered Water	18-Oct-2013		18-Oct-2013		18-Oct-2013					
Phenols by HPLC (S)		21-Oct-2013		18-Oct-2013		21-Oct-2013	21-Oct-2013	21-Oct-2013	21-Oct-2013	01-Nov-2013
Phenols by HPLC (W)	21-Oct-2013		21-Oct-2013		21-Oct-2013					
Sample description	14-Oct-2013	14-Oct-2013	14-Oct-2013	14-Oct-2013	16-Oct-2013	16-Oct-2013	16-Oct-2013	14-Oct-2013	14-Oct-2013	29-Oct-2013
Sulphide	21-Oct-2013		21-Oct-2013		21-Oct-2013					
Sulphur Dissolved by ICP-OES	21-Oct-2013		21-Oct-2013		21-Oct-2013					
Total Organic Carbon		22-Oct-2013		22-Oct-2013		22-Oct-2013	22-Oct-2013	22-Oct-2013	22-Oct-2013	05-Nov-2013
Total Sulphate			17-Oct-2013			21-Oct-2013		22-Oct-2013		04-Nov-2013
Total Sulphur		23-Oct-2013	17-Oct-2013	23-Oct-2013			23-Oct-2013	23-Oct-2013	23-Oct-2013	06-Nov-2013
TPH CWG GC (S)		21-Oct-2013		21-Oct-2013		21-Oct-2013	21-Oct-2013		21-Oct-2013	01-Nov-2013

SDG:	131010-73	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251111
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	248902

Appendix
General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICS and SVOC TICS.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as “Not detected”. If no asbestos fibre types are found all will be reported as “Not detected” and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible. The quantity of asbestos present is not determined unless specifically requested.

7. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP -No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals -total metals must be requested separately.

11. Results relate only to the items tested.

12. LODs for wet tests reported on a dry weight basis are not corrected for moisture content.

13. **Surrogate recoveries** -Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 -130 %.

14. **Product analyses** -Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors
employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

Sample Deviations

1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Holding time exceeded before sample received**
§	**Sampled on date not provided**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to sampled on date**
&	**Sample Holding Time exceeded - Late arrival of instructions.**

Asbestos

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: -
Trace -Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

ALcontrol Laboratories

Attention:

CERTIFICATE OF ANALYSIS

Date:
Customer:
Sample Delivery Group (SDG):
Your Reference:
Location:
Report No:

This report has been revised and directly supersedes 251091 in its entirety.

[redacted]

CERTIFICATE OF ANALYSIS

SDG:	131015-33	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251092
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	251091

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date

Only received samples which have had analysis scheduled will be shown on the following pages.

CERTIFICATE OF ANALYSIS

SDG:	131015-33	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251092
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	251091

SOLID

Results Legend

X Test

N No Determination Possible

Lab Sample No(s)					
Customer Sample Reference			SA4-2		
AGS Reference					
Depth (m)			0.60 - 1.00		
Container			250g Amber Jar	400g Tub (ALE214)	60g VOC (ALE215)
Anions by Kone (soil)	All	NDPs: 0 Tests: 1	X		
Asbestos ID in Solid Samples	All	NDPs: 0 Tests: 1		X	
Asbestos Quantification - Full	All	NDPs: 0 Tests: 1		X	
Boron Water Soluble	All	NDPs: 0 Tests: 1	X		
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 1		X	
Easily Liberated Sulphide	All	NDPs: 0 Tests: 1		X	
EPH CWG (Aliphatic) GC (S)	All	NDPs: 0 Tests: 1	X		
EPH CWG (Aromatic) GC (S)	All	NDPs: 0 Tests: 1	X		
GRO by GC-FID (S)	All	NDPs: 0 Tests: 1			X
Hexavalent Chromium (s)	All	NDPs: 0 Tests: 1		X	
Metals in solid samples by OES	All	NDPs: 0 Tests: 1	X		
PAH by GCMS	All	NDPs: 0 Tests: 1	X		
PCBs by GCMS	All	NDPs: 0 Tests: 1	X		
pH	All	NDPs: 0 Tests: 1		X	
Phenols by HPLC (S)	All	NDPs: 0 Tests: 1		X	

CERTIFICATE OF ANALYSIS

SDG:	131015-33	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251092
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	251091

SOLID

Results Legend

X **Test**

N **No Determination Possible**

Lab Sample No(s)					
Customer Sample Reference			SA4-2		
AGS Reference					
Depth (m)			0.60 - 1.00		
Container			250g Amber Jar	400g Tub (ALE214)	60g VOC (ALE215)
Sample description	All	NDPs: 0 Tests: 1	X		
Total Organic Carbon	All	NDPs: 0 Tests: 1	X		
Total Sulphate	All	NDPs: 0 Tests: 1	X		
Total Sulphur	All	NDPs: 1 Tests: 0	N		
TPH CWG GC (S)	All	NDPs: 0 Tests: 1	X		

SDG:	131015-33	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251092
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	251091

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions	Inclusions 2
8269840	SA4-2	0.60 - 1.00	Grey	Silty Clay Loam	0.063 - 0.1 mm	None	None

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

CERTIFICATE OF ANALYSIS

SDG:	131015-33	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251092
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	251091

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Customer Sample Ref.	SA4-2
Depth (m)	0.60 - 1.00
Sample Type	Soil/Solid
Date Sampled	11/10/2013
Sample Time	.
Date Received	15/10/2013
SDG Ref	131015-33
Lab Sample No.(s)	8269840
AGS Reference	

Component	LOD/Units	Method	
Phenol	<0.01 mg/kg	TM062 (S)	<0.01 @ M
Cresols	<0.01 mg/kg	TM062 (S)	<0.01 @ M
Xylenols	<0.015 mg/kg	TM062 (S)	<0.015 @ M
1-Naphthol	<0.01 mg/kg	TM062 (S)	<0.01 @
2,3,5-Trimethylphenol	<0.01 mg/kg	TM062 (S)	<0.01 @ M
2-Isopropylphenol	<0.015 mg/kg	TM062 (S)	<0.015 @ M
Phenols, Total Detected monohydric	<0.035 mg/kg	TM062 (S)	<0.035 @ M
Phenols, Total Detected 5 speciated	<0.06 mg/kg	TM062 (S)	<0.06 @ M
Organic Carbon, Total	<0.2 %	TM132	3.1 #
pH	1 pH Units	TM133	7.86 M
Chromium, Hexavalent	<0.6 mg/kg	TM151	<0.6 #
Cyanide, Total	<1 mg/kg	TM153	1.62 @ M
Cyanide, Free	<1 mg/kg	TM153	<1 @ M
Thiocyanate	<1 mg/kg	TM153	<1 @ M
PCB congener 118	<3 µg/kg	TM168	84.6 M
PCB congener 81	<3 µg/kg	TM168	<3 M
PCB congener 77	<3 µg/kg	TM168	<3 M
PCB congener 123	<3 µg/kg	TM168	<3 M
PCB congener 114	<3 µg/kg	TM168	<3 M
PCB congener 105	<3 µg/kg	TM168	<3 M
PCB congener 126	<3 µg/kg	TM168	<3 M
PCB congener 167	<3 µg/kg	TM168	12 M
PCB congener 156	<3 µg/kg	TM168	19 M
PCB congener 157	<3 µg/kg	TM168	<3 M
PCB congener 169	<3 µg/kg	TM168	<3 M
PCB congener 189	<3 µg/kg	TM168	<3 M
Sum of detected WHO 12 PCBs	<36 µg/kg	TM168	116
Sulphide, Easily liberated	<15 mg/kg	TM180	791 @ #
Arsenic	<0.6 mg/kg	TM181	35.1 M
Cadmium	<0.02 mg/kg	TM181	1.55 M
Chromium	<0.9 mg/kg	TM181	105 M
Copper	<1.4 mg/kg	TM181	117 M

CERTIFICATE OF ANALYSIS

SDG:	131015-33	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251092
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	251091

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Customer Sample Ref.	SA4-2
Depth (m)	0.60 - 1.00
Sample Type	Soil/Solid
Date Sampled	11/10/2013
Sample Time	.
Date Received	15/10/2013
SDG Ref	131015-33
Lab Sample No.(s)	8269840
AGS Reference	

Component	LOD/Units	Method	
Lead	<0.7 mg/kg	TM181	6410 M
Mercury	<0.14 mg/kg	TM181	22.1 M
Nickel	<0.2 mg/kg	TM181	37.9 M
Selenium	<1 mg/kg	TM181	1.26 #
Zinc	<1.9 mg/kg	TM181	631 M
Sulphate, Total	<48 mg/kg	TM221	4270 M
Total Sulphur (ASB)	<0.0016 %	TM221	0.142
Boron, water soluble	<1 mg/kg	TM222	10.3 M
Water Soluble Sulphate as SO4 2:1 Extract	<0.004 g/l	TM243	0.416 M

CERTIFICATE OF ANALYSIS

SDG:	131015-33	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251092
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	251091

PAH by GCMS

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Customer Sample Ref.	SA4-2
Depth (m)	0.60 - 1.00
Sample Type	Soil/Solid
Date Sampled	11/10/2013
Sample Time	.
Date Received	15/10/2013
SDG Ref	131015-33
Lab Sample No.(s)	8269840
AGS Reference	

Component	LOD/Units	Method	
Naphthalene	<9 µg/kg	TM218	221 @ M
Acenaphthylene	<12 µg/kg	TM218	101 @ M
Acenaphthene	<8 µg/kg	TM218	98.3 @ M
Fluorene	<10 µg/kg	TM218	278 @ M
Phenanthrene	<15 µg/kg	TM218	1050 @ M
Anthracene	<16 µg/kg	TM218	4080 @ M
Fluoranthene	<17 µg/kg	TM218	1530 @ M
Pyrene	<15 µg/kg	TM218	1980 @ M
Benz(a)anthracene	<14 µg/kg	TM218	812 @ M
Chrysene	<10 µg/kg	TM218	796 @ M
Benzo(b)fluoranthene	<15 µg/kg	TM218	960 @ M
Benzo(k)fluoranthene	<14 µg/kg	TM218	313 @ M
Benzo(a)pyrene	<15 µg/kg	TM218	907 @ M
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218	491 @ M
Dibenzo(a,h)anthracene	<23 µg/kg	TM218	126 @ M
Benzo(g,h,i)perylene	<24 µg/kg	TM218	662 @ M
PAH, Total Detected USEPA 16	<118 µg/kg	TM218	14400

CERTIFICATE OF ANALYSIS

SDG:	131015-33	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251092
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	251091

TPH CWG (S)

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Customer Sample Ref.	SA4-2
Depth (m)	0.60 - 1.00
Sample Type	Soil/Solid
Date Sampled	11/10/2013
Sample Time	.
Date Received	15/10/2013
SDG Ref	131015-33
Lab Sample No.(s)	8269840
AGS Reference	

Component	LOD/Units	Method	
GRO Surrogate % recovery**	%	TM089	88
GRO TOT (Moisture Corrected)	<44 µg/kg	TM089	89400 M
Methyl tertiary butyl ether (MTBE)	<5 µg/kg	TM089	<5 @ M
Benzene	<10 µg/kg	TM089	38.4 @ M
Toluene	<2 µg/kg	TM089	<2 @ M
Ethylbenzene	<3 µg/kg	TM089	<3 @ M
m,p-Xylene	<6 µg/kg	TM089	<6 @ M
o-Xylene	<3 µg/kg	TM089	<3 @ M
sum of detected mpo xylene by GC	<9 µg/kg	TM089	<9
sum of detected BTEX by GC	<24 µg/kg	TM089	38.4
Aliphatics >C5-C6	<10 µg/kg	TM089	97.9
Aliphatics >C6-C8	<10 µg/kg	TM089	6470
Aliphatics >C8-C10	<10 µg/kg	TM089	30800
Aliphatics >C10-C12	<10 µg/kg	TM089	18900
Aliphatics >C12-C16	<100 µg/kg	TM173	314000
Aliphatics >C16-C21	<100 µg/kg	TM173	313000
Aliphatics >C21-C35	<100 µg/kg	TM173	701000
Aliphatics >C35-C44	<100 µg/kg	TM173	145000
Total Aliphatics >C12-C44	<100 µg/kg	TM173	1470000
Aromatics >EC5-EC7	<10 µg/kg	TM089	38.4
Aromatics >EC7-EC8	<10 µg/kg	TM089	<10
Aromatics >EC8-EC10	<10 µg/kg	TM089	20600
Aromatics >EC10-EC12	<10 µg/kg	TM089	12600
Aromatics >EC12-EC16	<100 µg/kg	TM173	116000
Aromatics >EC16-EC21	<100 µg/kg	TM173	438000
Aromatics >EC21-EC35	<100 µg/kg	TM173	909000
Aromatics >EC35-EC44	<100 µg/kg	TM173	249000
Aromatics >EC40-EC44	<100 µg/kg	TM173	88000
Total Aromatics >EC12-EC44	<100 µg/kg	TM173	1710000
Total Aliphatics & Aromatics >C5-C44	<100 µg/kg	TM173	3270000

CERTIFICATE OF ANALYSIS

SDG:	131015-33	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251092
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	251091

Asbestos Identification - Solid Samples

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Fibrous Actinolite	Fibrous Anthophyllite	Fibrous Tremolite	Non-Asbestos Fibre
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	SA4-2 0.60 - 1.00 SOLID 11/10/2013 00:00:00 131015-33 8269840 TM048	05/11/13	Laura Robbins	Loose fibres in soil	Trace (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected

CERTIFICATE OF ANALYSIS

SDG:	131015-33	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251092
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	251091

Asbestos Quantification - Full

		Additional Asbestos Components (Using TM048)	Analysts Comments	Asbestos Quantification - Gravimetric - %	Asbestos Quantification - PCOM Evaluation - %	Asbestos Quantification - Total - %
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	SA4-2 0.60 - 1.00 SOLID 11/10/2013 00:00:00 131015-33 8269840 TM 304	None (#)	N/C	<0.001 (#)	<0.001 (#)	<0.001 (#)

CERTIFICATE OF ANALYSIS

SDG:	131015-33	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251092
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	251091

Notification of NDPs (No determination possible)

Date Received :

Sample No	Customer Sample Ref.	Depth (m)	Test	Comment

SDG:	131015-33	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251092
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	251091

Table of Results - Appendix

Method No	Reference	Description	Wet/Dry Sample [1]	Surrogate Corrected
		Preparation of Samples for Metals Analysis		
	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
	HSG 248, Asbestos: The analysts' guide for sampling, analysis and clearance procedures	Identification of Asbestos in Bulk Material		
	National Grid Property Holdings Methods for the Collection & Analysis of Samples from National Grid Sites version 1 Sec 3.9	Determination of Phenols in Soils by HPLC		
	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)		
	In - house Method	ELTRA CS800 Operators Guide		
	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter		
	Method 3500D, AWWA/APHA, 20th Ed., 1999	Determination of Hexavalent Chromium using Kone analyser		
	Method 4500A,B,C, I, M AWWA/APHA, 20th Ed., 1999	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the Skalar SANS+ System Segmented Flow Analyser		
	EPA Method 8082, Polychlorinated Biphenyls by Gas Chromatography	Determination of WHO12 and EC7 Polychlorinated Biphenyl Congeners by GC-MS in Soils		
	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GC-FID		
	Sulphide in waters and waste waters 1991 ISBN 01 175 7186 SCA rec. 2007 (unpublished)'	The Determination Of Easily Liberated Sulphide In Soil Samples by Ion Selective Electrode Technique		
	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES		
	Microwave extraction – EPA method 3546	Microwave extraction - EPA method 3546		
	Inductively Coupled Plasma - Atomic Emission Spectroscopy. An Atlas of Spectral Information: Winge, Fassel, Peterson and Floyd	Determination of Acid extractable Sulphate in Soils by IRIS Emission Spectrometer		
	In-House Method	Determination of Hot Water Soluble Boron in Soils (10:1 Water:soil) by IRIS Emission Spectrometer		
		Mixed Anions In Soils By Kone		

SDG:	131015-33	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251092
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	251091

Test Completion Dates

Lab Sample No(s)	8269840
Customer Sample Ref.	SA4-2
AGS Ref.	
Depth	0.60 - 1.00
Type	SOLID
Anions by Kone (soil)	06-Nov-2013
Asbestos ID in Solid Samples	05-Nov-2013
Asbestos Quantification - Full	22-Nov-2013
Boron Water Soluble	05-Nov-2013
Cyanide Comp/Free/Total/Thiocyanate	04-Nov-2013
Easily Liberated Sulphide	01-Nov-2013
EPH CWG (Aliphatic) GC (S)	01-Nov-2013
EPH CWG (Aromatic) GC (S)	01-Nov-2013
GRO by GC-FID (S)	04-Nov-2013
Hexavalent Chromium (s)	06-Nov-2013
Metals in solid samples by OES	06-Nov-2013
PAH by GCMS	04-Nov-2013
PCBs by GCMS	06-Nov-2013
pH	04-Nov-2013
Phenols by HPLC (S)	05-Nov-2013
Sample description	29-Oct-2013
Total Organic Carbon	05-Nov-2013
Total Sulphate	05-Nov-2013
TPH CWG GC (S)	04-Nov-2013

SDG:	131015-33	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251092
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	251091

1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
4	Holding time exceeded before sample received
§	Sampled on date not provided
♦	Sample holding time exceeded in laboratory
@	Sample holding time exceeded due to sampled on date
&	Sample Holding Time exceeded - Late arrival of instructions.

Surrogate recoveries

Product analyses

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

ALcontrol Laboratories

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Wardell Armstrong LLP
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Staffordshire
ST1 5BD

Attention: Tim Cawood

CERTIFICATE OF ANALYSIS

Date:	07 November 2013
Customer:	H_WARDELL_SKT
Sample Delivery Group (SDG):	131028-28
Your Reference:	ST13418
Location:	Frodsham
Report No:	249045

We received 2 samples on Monday October 28, 2013 and 1 of these samples were scheduled for analysis which was completed on Thursday November 07, 2013. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

[redacted]
Operations Manager

CERTIFICATE OF ANALYSIS

SDG:	131028-28	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	249045
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
8340737	SAS B2		0.20 - 0.60	11/10/2013
8340736	SAS B30		10.00	14/10/2013

Only received samples which have had analysis scheduled will be shown on the following pages.

CERTIFICATE OF ANALYSIS

SDG:	131028-28	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	249045
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

SOLID

Results Legend

X **Test**

N **No Determination Possible**

Lab Sample No(s)			8340737
Customer Sample Reference			SAS B2
AGS Reference			
Depth (m)			0.20 - 0.60
Container			BAG
Ammoniacal N as NH4 in 2:1 extract	All	NDPs: 0 Tests: 1	X
Anions by Kone (soil)	All	NDPs: 0 Tests: 1	X
Asbestos ID in Solid Samples	All	NDPs: 0 Tests: 1	X
Boron Water Soluble	All	NDPs: 0 Tests: 1	X
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 1	X
Easily Liberated Sulphide	All	NDPs: 0 Tests: 1	X
EPH CWG (Aliphatic) GC (S)	All	NDPs: 0 Tests: 1	X
EPH CWG (Aromatic) GC (S)	All	NDPs: 0 Tests: 1	X
GRO by GC-FID (S)	All	NDPs: 0 Tests: 1	X
Hexavalent Chromium (s)	All	NDPs: 0 Tests: 1	X
Magnesium (BRE)	All	NDPs: 0 Tests: 1	X
Metals in solid samples by OES	All	NDPs: 0 Tests: 1	X
NO3, NO2 and TON by KONE (s)	All	NDPs: 0 Tests: 1	X
PAH by GCMS	All	NDPs: 0 Tests: 1	X
pH	All	NDPs: 0 Tests: 1	X

CERTIFICATE OF ANALYSIS

SDG:	131028-28	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	249045
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

SOLID

Results Legend

X **Test**

N **No Determination Possible**

	Lab Sample No(s)		8340737		
	Customer Sample Reference		SAS B2		
	AGS Reference				
	Depth (m)		0.20 - 0.60		
	Container		BAG		
Phenols by HPLC (S)	All	NDPs: 0 Tests: 1	X		
Sample description	All	NDPs: 0 Tests: 1	X		
Total Organic Carbon	All	NDPs: 0 Tests: 1	X		
Total Sulphate	All	NDPs: 0 Tests: 1	X		
Total Sulphur	All	NDPs: 0 Tests: 1	X		
TPH CWG GC (S)	All	NDPs: 0 Tests: 1	X		

CERTIFICATE OF ANALYSIS

SDG:	131028-28	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	249045
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Sample Descriptions

Grain Sizes

very fine	<0.063mm	**fine**	0.063mm - 0.1mm	**medium**	0.1mm - 2mm	**coarse**	2mm - 10mm	**very coarse**	>10mm

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions	Inclusions 2
8340737	SAS B2	0.20 - 0.60	Dark Brown	Sandy Silt Loam	0.1 - 2 mm	N/A	Stones

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

CERTIFICATE OF ANALYSIS

SDG:	131028-28	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	249045
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R					
			SAS B2					
Depth (m)			0.20 - 0.60					
Sample Type			Soil/Solid					
Date Sampled			11/10/2013					
Sample Time			.					
Date Received			28/10/2013					
SDG Ref			131028-28					
Lab Sample No.(s)			8340737					
AGS Reference								
Phenol	<0.01 mg/kg	TM062 (S)	<0.01 @ M					
Cresols	<0.01 mg/kg	TM062 (S)	<0.01 @ M					
Xylenols	<0.015 mg/kg	TM062 (S)	<0.015 @ M					
1-Naphthol	<0.01 mg/kg	TM062 (S)	<0.01 @					
2,3,5-Trimethylphenol	<0.01 mg/kg	TM062 (S)	<0.01 @ M					
2-Isopropylphenol	<0.015 mg/kg	TM062 (S)	<0.015 @ M					
Phenols, Total Detected monohydric	<0.035 mg/kg	TM062 (S)	<0.035 @ M					
Phenols, Total Detected 5 speciated	<0.06 mg/kg	TM062 (S)	<0.06 @ M					
Organic Carbon, Total	<0.2 %	TM132	3.04 #					
Sulphur, Total	<0.02 %	TM132	0.0892 #					
pH	1 pH Units	TM133	7.89 M					
Chromium, Hexavalent	<0.6 mg/kg	TM151	<0.6 #					
Cyanide, Total	<1 mg/kg	TM153	1.06 @ M					
Cyanide, Free	<1 mg/kg	TM153	<1 @ M					
Thiocyanate	<1 mg/kg	TM153	<1 @ M					
Sulphide, Easily liberated	<15 mg/kg	TM180	<15 @ #					
Arsenic	<0.6 mg/kg	TM181	44.1 M					
Cadmium	<0.02 mg/kg	TM181	1.89 M					
Chromium	<0.9 mg/kg	TM181	68.6 M					
Copper	<1.4 mg/kg	TM181	111 M					
Lead	<0.7 mg/kg	TM181	155 M					
Mercury	<0.14 mg/kg	TM181	9.25 M					
Nickel	<0.2 mg/kg	TM181	27.8 M					
Selenium	<1 mg/kg	TM181	1.69 #					
Zinc	<1.9 mg/kg	TM181	539 M					
Sulphate, Total	<48 mg/kg	TM221	950 M					
Sulphate, acid soluble (total)	<0.02 %	TM221	0.095					
Total Sulphur (ASB)	<0.0016 %	TM221	0.0317					
Boron, water soluble	<1 mg/kg	TM222	<1 M					
Water Soluble Sulphate as SO4 2:1 Extract	<0.004 g/l	TM243	0.0363 M					
Soluble Sulphate 2:1 extract as SO4 BRE	<0.004 g/l	TM243	0.0363 M					
Chloride 2:1 water/soil extract BRE	<0.0025 g/l	TM243	0.0132 M					

CERTIFICATE OF ANALYSIS

SDG:	131028-28	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	249045
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	
			Depth (m)	0.20 - 0.60
			Sample Type	Soil/Solid
			Date Sampled	11/10/2013
			Sample Time	.
			Date Received	28/10/2013
			SDG Ref	131028-28
			Lab Sample No.(s)	8340737
			AGS Reference	SAS B2
Nitrate as NO3, 2:1 water soluble (BRE)	<0.0003 g/l	TM243		0.122
Ammoniacal N as NH4 in 2:1 extract BRE	<0.0003 g/l	TM248		<0.0003
Magnesium (BRE)	<0.008 g/l	TM282		<0.008

CERTIFICATE OF ANALYSIS

SDG:	131028-28	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	249045
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

PAH by GCMS

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

	Customer Sample R	LOD/Units	Method
	SAS B2		
Depth (m)	0.20 - 0.60		
Sample Type	Soil/Solid		
Date Sampled	11/10/2013		
Sample Time	.		
Date Received	28/10/2013		
SDG Ref	131028-28		
Lab Sample No.(s)	8340737		
AGS Reference			
Component			
Naphthalene	133 @ M	<9 µg/kg	TM218
Acenaphthylene	186 @ M	<12 µg/kg	TM218
Acenaphthene	24 @ M	<8 µg/kg	TM218
Fluorene	26.9 @ M	<10 µg/kg	TM218
Phenanthrene	293 @ M	<15 µg/kg	TM218
Anthracene	117 @ M	<16 µg/kg	TM218
Fluoranthene	515 @ M	<17 µg/kg	TM218
Pyrene	453 @ M	<15 µg/kg	TM218
Benz(a)anthracene	329 @ M	<14 µg/kg	TM218
Chrysene	312 @ M	<10 µg/kg	TM218
Benzo(b)fluoranthene	644 @ M	<15 µg/kg	TM218
Benzo(k)fluoranthene	218 @ M	<14 µg/kg	TM218
Benzo(a)pyrene	557 @ M	<15 µg/kg	TM218
Indeno(1,2,3-cd)pyrene	494 @ M	<18 µg/kg	TM218
Dibenzo(a,h)anthracene	136 @ M	<23 µg/kg	TM218
Benzo(g,h,i)perylene	664 @ M	<24 µg/kg	TM218
PAH, Total Detected USEPA 16	5100	<118 µg/kg	TM218

CERTIFICATE OF ANALYSIS

SDG:	131028-28	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	249045
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

TPH CWG (S)

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

	Customer Sample R	Depth (m)	Sample Type	Date Sampled	Sample Time	Date Received	SDG Ref	Lab Sample No.(s)	AGS Reference
	SAS B2	0.20 - 0.60	Soil/Solid	11/10/2013	.	28/10/2013	131028-28	8340737	

Component	LOD/Units	Method					
GRO Surrogate % recovery**	%	TM089	71 2				
GRO TOT (Moisture Corrected)	<44 µg/kg	TM089	<44 2 M				
Methyl tertiary butyl ether (MTBE)	<5 µg/kg	TM089	<5 2 M				
Benzene	<10 µg/kg	TM089	<10 2 M				
Toluene	<2 µg/kg	TM089	<2 2 M				
Ethylbenzene	<3 µg/kg	TM089	<3 2 M				
m,p-Xylene	<6 µg/kg	TM089	<6 2 M				
o-Xylene	<3 µg/kg	TM089	<3 2 M				
sum of detected mpo xylene by GC	<9 µg/kg	TM089	<9 2				
sum of detected BTEX by GC	<24 µg/kg	TM089	<24 2				
Aliphatics >C5-C6	<10 µg/kg	TM089	<10 2				
Aliphatics >C6-C8	<10 µg/kg	TM089	<10 2				
Aliphatics >C8-C10	<10 µg/kg	TM089	<10 2				
Aliphatics >C10-C12	<10 µg/kg	TM089	<10 2				
Aliphatics >C12-C16	<100 µg/kg	TM173	3050				
Aliphatics >C16-C21	<100 µg/kg	TM173	20300				
Aliphatics >C21-C35	<100 µg/kg	TM173	119000				
Aliphatics >C35-C44	<100 µg/kg	TM173	22000				
Total Aliphatics >C12-C44	<100 µg/kg	TM173	164000				
Aromatics >EC5-EC7	<10 µg/kg	TM089	<10 2				
Aromatics >EC7-EC8	<10 µg/kg	TM089	<10 2				
Aromatics >EC8-EC10	<10 µg/kg	TM089	<10 2				
Aromatics >EC10-EC12	<10 µg/kg	TM089	<10 2				
Aromatics >EC12-EC16	<100 µg/kg	TM173	5100				
Aromatics >EC16-EC21	<100 µg/kg	TM173	12200				
Aromatics >EC21-EC35	<100 µg/kg	TM173	93500				
Aromatics >EC35-EC44	<100 µg/kg	TM173	38300				
Aromatics >EC40-EC44	<100 µg/kg	TM173	12700				
Total Aromatics >EC12-EC44	<100 µg/kg	TM173	149000				
Total Aliphatics & Aromatics >C5-C44	<100 µg/kg	TM173	313000				

CERTIFICATE OF ANALYSIS

SDG:	131028-28	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	249045
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Asbestos Identification - Solid Samples

		Date of Analysis	Analysed By	Comments	Amosite (Brown) Asbestos	Chrysotile (White) Asbestos	Crocidolite (Blue) Asbestos	Fibrous Actinolite	Fibrous Anthophyllite	Fibrous Tremolite	Non-Asbestos Fibre
Cust. Sample Ref. Depth (m) Sample Type Date Sampled Date Receieved SDG Original Sample Method Number	SAS B2 0.20 - 0.60 SOLID 11/10/2013 00:00:00 131028-28 8340737 TM048	05/11/13	Kevin Bowron	-	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected (#)	Not Detected

CERTIFICATE OF ANALYSIS

SDG:	131028-28	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	249045
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Table of Results - Appendix

Method No	Reference	Description	Wet/Dry Sample [1]	Surrogate Corrected
ASB_PREP				
PM001		Preparation of Samples for Metals Analysis		
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
TM048	HSG 248, Asbestos: The analysts' guide for sampling, analysis and clearance procedures	Identification of Asbestos in Bulk Material		
TM062 (S)	National Grid Property Holdings Methods for the Collection & Analysis of Samples from National Grid Sites version 1 Sec 3.9	Determination of Phenols in Soils by HPLC		
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)		
TM132	In - house Method	ELTRA CS800 Operators Guide		
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter		
TM151	Method 3500D, AWWA/APHA, 20th Ed., 1999	Determination of Hexavalent Chromium using Kone analyser		
TM153	Method 4500A,B,C, I, M AWWA/APHA, 20th Ed., 1999	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the Skalar SANS+ System Segmented Flow Analyser		
TM173	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GC-FID		
TM180	Sulphide in waters and waste waters 1991 ISBN 01 175 7186 SCA rec. 2007 (unpublished)'	The Determination Of Easily Liberated Sulphide In Soil Samples by Ion Selective Electrode Technique		
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES		
TM218	Microwave extraction – EPA method 3546	Microwave extraction - EPA method 3546		
TM221	Inductively Coupled Plasma - Atomic Emission Spectroscopy. An Atlas of Spectral Information: Winge, Fassel, Peterson and Floyd	Determination of Acid extractable Sulphate in Soils by IRIS Emission Spectrometer		
TM222	In-House Method	Determination of Hot Water Soluble Boron in Soils (10:1 Water:soil) by IRIS Emission Spectrometer		
TM243		Mixed Anions In Soils By Kone		
TM248	In-House Method	Determination of Ammonium BRE (2:1 Extract) on solids		
TM282		Extraction of Magnesium by BRE Method		

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

CERTIFICATE OF ANALYSIS

SDG:	131028-28	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	249045
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	8340737
Customer Sample Ref.	SAS B2
AGS Ref.	
Depth	0.20 - 0.60
Type	SOLID
Ammoniacal N as NH4 in 2:1 extract	06-Nov-2013
Anions by Kone (soil)	06-Nov-2013
Asbestos ID in Solid Samples	05-Nov-2013
Boron Water Soluble	05-Nov-2013
Cyanide Comp/Free/Total/Thiocyanate	06-Nov-2013
Easily Liberated Sulphide	04-Nov-2013
EPH CWG (Aliphatic) GC (S)	04-Nov-2013
EPH CWG (Aromatic) GC (S)	04-Nov-2013
GRO by GC-FID (S)	02-Nov-2013
Hexavalent Chromium (s)	06-Nov-2013
Magnesium (BRE)	07-Nov-2013
Metals in solid samples by OES	06-Nov-2013
NO3, NO2 and TON by KONE (s)	07-Nov-2013
PAH by GCMS	02-Nov-2013
pH	04-Nov-2013
Phenols by HPLC (S)	04-Nov-2013
Sample description	31-Oct-2013
Total Organic Carbon	05-Nov-2013
Total Sulphate	05-Nov-2013
Total Sulphur	06-Nov-2013
TPH CWG GC (S)	04-Nov-2013

SDG:	131028-28	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	249045
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Appendix
General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICS and SVOC TICS.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as “Not detected”. If no asbestos fibre types are found all will be reported as “Not detected” and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible. The quantity of asbestos present is not determined unless specifically requested.

7. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP -No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals -total metals must be requested separately.

11. Results relate only to the items tested.

12. LODs for wet tests reported on a dry weight basis are not corrected for moisture content.

13. **Surrogate recoveries** -Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 -130 %.

14. **Product analyses** -Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors
employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

Sample Deviations

1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Holding time exceeded before sample received**
§	**Sampled on date not provided**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to sampled on date**
&	**Sample Holding Time exceeded - Late arrival of instructions.**

Asbestos

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: -
Trace -Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

ALcontrol Laboratories

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Wardell Armstrong LLP
Sir Henry Doulton House
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Etruria
Stoke on Trent
Staffordshire
ST1 5BD

Attention: Tim Cawood

CERTIFICATE OF ANALYSIS

Date:	14 November 2013
Customer:	H_WARDELL_SKT
Sample Delivery Group (SDG):	131101-111
Your Reference:	ST13418
Location:	Frodsham
Report No:	249757

We received 4 samples on Friday November 01, 2013 and 4 of these samples were scheduled for analysis which was completed on Thursday November 14, 2013. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

[redacted]

Operations Manager

CERTIFICATE OF ANALYSIS

SDG:	131101-111	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	249757
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
8363890	SA1 B9			24/09/2013
8363894	SA2 B6			19/09/2013
8363896	SA4 B13			07/10/2013
8363899	SA5 B22			14/10/2013

Only received samples which have had analysis scheduled will be shown on the following pages.

CERTIFICATE OF ANALYSIS

SDG:	131101-111	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	249757
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

SOLID

Results Legend

X **Test**

N **No Determination Possible**

Lab Sample No(s)			8363890			8363894			8363896			8363899		
Customer Sample Reference			SA1 B9			SA2 B6			SA4 B13			SA5 B22		
AGS Reference														
Depth (m)														
Container			1kg TUB	250g Amber Jar (AL	60g VOC (ALE215)	1kg TUB	250g Amber Jar (AL	60g VOC (ALE215)	1kg TUB	250g Amber Jar (AL	60g VOC (ALE215)	1kg TUB	250g Amber Jar (AL	60g VOC (ALE215)
ANC at pH4 and ANC at pH 6	All	NDPs: 0 Tests: 4		X			X			X			X	
Anions by Kone (w)	All	NDPs: 0 Tests: 4	X			X			X			X		
CEN 2:1 Readings	All	NDPs: 0 Tests: 2				X						X		
CEN 8:1 Readings	All	NDPs: 0 Tests: 2				X						X		
CEN Readings	All	NDPs: 0 Tests: 2	X						X					
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 4	X			X			X			X		
Dissolved Organic/Inorganic Carbon	All	NDPs: 0 Tests: 4	X			X			X			X		
Fluoride	All	NDPs: 0 Tests: 4	X			X			X			X		
GRO by GC-FID (S)	All	NDPs: 0 Tests: 4			X			X			X			X
Loss on Ignition in soils	All	NDPs: 0 Tests: 4		X			X			X			X	
Mercury Dissolved	All	NDPs: 0 Tests: 4	X			X			X			X		
Mineral Oil	All	NDPs: 0 Tests: 4		X			X			X			X	
PAH Value of soil	All	NDPs: 0 Tests: 4		X			X			X			X	
PCBs by GCMS	All	NDPs: 0 Tests: 4		X			X			X			X	
pH	All	NDPs: 0 Tests: 4	X			X			X			X		

CERTIFICATE OF ANALYSIS

SDG:	131101-111	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	249757
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

SOLID

Results Legend

X **Test**

N **No Determination Possible**

			Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container
			8363890	SA1 B9			1kg TUB
							250g Amber Jar (AL
							60g VOC (ALE215)
			8363894	SA2 B6			1kg TUB
							250g Amber Jar (AL
							60g VOC (ALE215)
			8363896	SA4 B13			1kg TUB
							250g Amber Jar (AL
							60g VOC (ALE215)
			8363899	SA5 B22			1kg TUB
							250g Amber Jar (AL
							60g VOC (ALE215)
Phenols by HPLC (W)	All	NDPs: 0 Tests: 4	X		X		X			X		
Sample description	All	NDPs: 0 Tests: 4		X		X		X			X	
Total Dissolved Solids	All	NDPs: 0 Tests: 4	X		X		X			X		
Total Organic Carbon	All	NDPs: 0 Tests: 4		X		X		X			X	

CERTIFICATE OF ANALYSIS

SDG:	131101-111	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	249757
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions	Inclusions 2
8363890	SA1 B9		Dark Brown	Silt Loam	<0.063 mm	Oil/Petroleum	Vegetation
8363894	SA2 B6		Dark Brown	Silt Loam	<0.063 mm	Vegetation	Oil/Petroleum
8363896	SA4 B13		Dark Brown	Silt Loam	<0.063 mm	Oil/Petroleum	Vegetation
8363899	SA5 B22		Dark Brown	Silty Clay Loam	<0.063 mm	Vegetation	None

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

CERTIFICATE OF ANALYSIS

SDG:	131101-111	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	249757
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	Depth (m)	Sample Type	Date Sampled	Sample Time	Date Received	SDG Ref	Lab Sample No.(s)	AGS Reference
			SA1 B9	.	Soil/Solid	24/09/2013	.	01/11/2013	131101-111	8363890	
			SA2 B6	.	Soil/Solid	19/09/2013	.	01/11/2013	131101-111	8363894	
			SA4 B13	.	Soil/Solid	07/10/2013	.	01/11/2013	131101-111	8363896	
			SA5 B22	.	Soil/Solid	14/10/2013	.	01/11/2013	131101-111	8363899	
Loss on ignition	<0.7 %	TM018	15.8 M	8.39 M	14.1 M	7.53 M					
Mineral oil >C10-C40	<1 mg/kg	TM061	8300 @ #	2600 @ #	6310 @ #	108 @ #					
Organic Carbon, Total	<0.2 %	TM132	3.24 @ #	2.13 @ #	3.38 @ #	2.26 #					
pH	1 pH Units	TM133	7.97 @ M	8.08 @ M	7.95 @ M	8.15 M					
PCB congener 28	<3 µg/kg	TM168	258 @ M	68.7 @ M	159 @ M	<3 M					
PCB congener 52	<3 µg/kg	TM168	197 @ M	72.6 @ M	137 @ M	<3 M					
PCB congener 101	<3 µg/kg	TM168	130 @ M	74.5 @ M	107 @ M	<3 M					
PCB congener 118	<3 µg/kg	TM168	133 @ M	66.6 @ M	119 @ M	<3 M					
PCB congener 138	<3 µg/kg	TM168	128 @ M	82 @ M	128 @ M	<3 M					
PCB congener 153	<3 µg/kg	TM168	135 @ M	82.4 @ M	131 @ M	<3 M					
PCB congener 180	<3 µg/kg	TM168	140 @ M	82.2 @ M	128 @ M	<3 M					
Sum of detected PCB 7 Congeners	<21 µg/kg	TM168	1120	529	910	<21					
ANC @ pH 4	<0.03 mol/kg	TM182	2.18	0.994	1.41	0.312					
ANC @ pH 6	<0.03 mol/kg	TM182	0.404	0.298	0.409	0.143					
Polyaromatic hydrocarbons, Total 17	<10 mg/kg	TM213	41.2	<10	27.9	<10					

CERTIFICATE OF ANALYSIS

SDG:	131101-111	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	249757
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

GRO by GC-FID (S)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	SA1 B9	SA2 B6	SA4 B13	SA5 B22		
			Depth (m)	.	.	.	.		
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid		
			Date Sampled	24/09/2013	19/09/2013	07/10/2013	14/10/2013		
			Sample Time	.	.	.	.		
			Date Received	01/11/2013	01/11/2013	01/11/2013	01/11/2013		
			SDG Ref	131101-111	131101-111	131101-111	131101-111		
			Lab Sample No.(s)	8363890	8363894	8363896	8363899		
			AGS Reference						
GRO Surrogate % recovery**	%	TM089		87	62	21	43		
Methyl tertiary butyl ether (MTBE)	<5 µg/kg	TM089		<25 @ M	<5 @ M	<5 @ M	<5 @ M		
Benzene	<10 µg/kg	TM089		147 @ M	<10 @ M	<10 @ M	<10 @ M		
Toluene	<2 µg/kg	TM089		<10 @ M	<2 @ M	<2 @ M	4.32 @ M		
Ethylbenzene	<3 µg/kg	TM089		<15 @ M	<3 @ M	<3 @ M	<3 @ M		
m,p-Xylene	<6 µg/kg	TM089		<30 @ M	<6 @ M	<6 @ M	<6 @ M		
o-Xylene	<3 µg/kg	TM089		<15 @ M	<3 @ M	<3 @ M	<3 @ M		
sum of detected mpo xylene by GC	<9 µg/kg	TM089		<9	<9	<9	<9		
sum of detected BTEX by GC	<24 µg/kg	TM089		147	<24	<24	<24		

CERTIFICATE OF ANALYSIS

SDG:	131101-111	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	249757
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

CEN 10:1 STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		**Site Location**	Frodsham
Mass Sample taken (kg)	0.192	**Moisture Content Ratio (%)**	113
Mass of dry sample (kg)	0.175	**Dry Matter Content Ratio (%)**	46.9
Particle Size <4mm	>95%		

Case				
SDG	131101-111			
Lab Sample Number(s)	8363890			
Sampled Date	24-Sep-2013			
Customer Sample Ref.	SA1 B9			
Depth (m)				

Solid Waste Analysis	**Result**			
Total Organic Carbon (%)	3.24	-	-	-
Loss on Ignition (%)	15.8	-	-	-
Sum of BTEX (mg/kg)	0.147	-	-	-
Sum of 7 PCBs (mg/kg)	1.12	-	-	-
Mineral Oil (mg/kg)	8300	-	-	-
PAH Sum of 17 (mg/kg)	41.2	-	-	-
pH (pH Units)	7.97	-	-	-
ANC to pH 6 (mol/kg)	0.404	-	-	-
ANC to pH 4 (mol/kg)	2.18	-	-	-

Eluate Analysis	**C_2 Conc^n in 10:1 eluate (mg/l)**		**A_2 10:1 conc^n leached (mg/kg)**		**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg**		
	Result	**Limit of Detection**	**Result**	**Limit of Detection**			
Arsenic	0.0793	<0.00012	0.793	<0.0012	-	-	-
Barium	0.0715	<0.00003	0.715	<0.0003	-	-	-
Cadmium	<0.0001	<0.0001	<0.001	<0.001	-	-	-
Chromium	0.00457	<0.00022	0.0457	<0.0022	-	-	-
Copper	0.00152	<0.00085	0.0152	<0.0085	-	-	-
Mercury Dissolved (CVAF)	0.0000303	<0.00001	0.000303	<0.0001	-	-	-
Molybdenum	0.0136	<0.00024	0.136	<0.0024	-	-	-
Nickel	0.00415	<0.00015	0.0415	<0.0015	-	-	-
Lead	0.00419	<0.00002	0.0419	<0.0002	-	-	-
Antimony	0.0077	<0.00016	0.077	<0.0016	-	-	-
Selenium	0.00532	<0.00039	0.0532	<0.0039	-	-	-
Zinc	0.00194	<0.00041	0.0194	<0.0041	-	-	-
Chloride	635	<10	6350	<100	-	-	-
Fluoride	0.799	<0.5	7.99	<5	-	-	-
Sulphate (soluble)	210	<2	2100	<20	-	-	-
Total Dissolved Solids	1840	<5	18400	<50	-	-	-
Total Monohydric Phenols (W)	<0.016	<0.016	<0.16	<0.16	-	-	-
Dissolved Organic Carbon	29.4	<3	294	<30	-	-	-

Leach Test Information

Date Prepared	07-Nov-2013
pH (pH Units)	7.72
Conductivity (µS/cm)	24,300.00
Temperature (°C)	20.30
Volume Leachant (Litres)	0.798
Volume of Eluate VE1 (Litres)	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
14/11/2013 08:07:42

08:07:22 14/11/2013

CERTIFICATE OF ANALYSIS

SDG:	131101-111	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	249757
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

CEN 10:1 STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		**Site Location**	Frodsham
Mass Sample taken (kg)	0.215	**Moisture Content Ratio (%)**	139
Mass of dry sample (kg)	0.175	**Dry Matter Content Ratio (%)**	41.8
Particle Size <4mm	>95%		

Case				
SDG	131101-111			
Lab Sample Number(s)	8363896			
Sampled Date	07-Oct-2013			
Customer Sample Ref.	SA4 B13			
Depth (m)				

Solid Waste Analysis	**Result**			
Total Organic Carbon (%)	3.38	-	-	-
Loss on Ignition (%)	14.1	-	-	-
Sum of BTEX (mg/kg)	<0.024	-	-	-
Sum of 7 PCBs (mg/kg)	0.91	-	-	-
Mineral Oil (mg/kg)	6310	-	-	-
PAH Sum of 17 (mg/kg)	27.9	-	-	-
pH (pH Units)	7.95	-	-	-
ANC to pH 6 (mol/kg)	0.409	-	-	-
ANC to pH 4 (mol/kg)	1.41	-	-	-

Eluate Analysis	**C_2 Conc^n in 10:1 eluate (mg/l)**		**A_2 10:1 conc^n leached (mg/kg)**		**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg**		
	Result	**Limit of Detection**	**Result**	**Limit of Detection**			
Arsenic	0.0825	<0.00012	0.825	<0.0012	-	-	-
Barium	0.0646	<0.00003	0.646	<0.0003	-	-	-
Cadmium	<0.0001	<0.0001	<0.001	<0.001	-	-	-
Chromium	0.00591	<0.00022	0.0591	<0.0022	-	-	-
Copper	0.00151	<0.00085	0.0151	<0.0085	-	-	-
Mercury Dissolved (CVAF)	0.0000268	<0.00001	0.000268	<0.0001	-	-	-
Molybdenum	0.0127	<0.00024	0.127	<0.0024	-	-	-
Nickel	0.00425	<0.00015	0.0425	<0.0015	-	-	-
Lead	0.00228	<0.00002	0.0228	<0.0002	-	-	-
Antimony	0.0126	<0.00016	0.126	<0.0016	-	-	-
Selenium	0.00708	<0.00039	0.0708	<0.0039	-	-	-
Zinc	0.00207	<0.00041	0.0207	<0.0041	-	-	-
Chloride	1230	<20	12300	<200	-	-	-
Fluoride	0.95	<0.5	9.5	<5	-	-	-
Sulphate (soluble)	262	<2	2620	<20	-	-	-
Total Dissolved Solids	3340	<10	33400	<100	-	-	-
Total Monohydric Phenols (W)	<0.016	<0.016	<0.16	<0.16	-	-	-
Dissolved Organic Carbon	25.4	<3	254	<30	-	-	-

Leach Test Information

Date Prepared	07-Nov-2013
pH (pH Units)	7.67
Conductivity (µS/cm)	42,300.00
Temperature (°C)	20.50
Volume Leachant (Litres)	0.775
Volume of Eluate VE1 (Litres)	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
14/11/2013 08:07:42

08:07:22 14/11/2013

CERTIFICATE OF ANALYSIS

SDG:	131101-111	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	249757
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

CEN 10:1 CUMULATIVE TWO STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/3

Client Reference		**Site Location**	Frodsham
Mass Sample taken (kg)	0.287	**Moisture Content Ratio (%)**	64.2
Mass of dry sample (kg)	0.175	**Dry Matter Content Ratio (%)**	60.9
Particle Size <4mm	>95%		

		Landfill Waste Acceptance Criteria Limits		
Case				
SDG	131101-111			
Lab Sample Number(s)	8363894			
Sampled Date	19-Sep-2013			
Customer Sample Ref.	SA2 B6			
Depth (m)				
Solid Waste Analysis		Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon (%)	2.13	3	5	6
Loss on Ignition (%)	8.39	-	-	10
Sum of BTEX (mg/kg)	<0.024	6	-	-
Sum of 7 PCBs (mg/kg)	0.529	1	-	-
Mineral Oil (mg/kg)	2600	500	-	-
PAH Sum of 17 (mg/kg)	<10	100	-	-
pH (pH Units)	8.08	-	<6 or >9	-
ANC to pH 6 (mol/kg)	0.298	-	-	-
ANC to pH 4 (mol/kg)	0.994	-	-	-

Eluate Analysis	C_2 Concⁿ in 2:1 eluate	C_8 Concⁿ in 8:1 eluate	A_2 2:1 concⁿ leached	$A_{2\text{-}10}$ Cumulative concⁿ leached	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	mg/l		mg/kg				
Arsenic	0.0191	0.0144	0.0382	0.149	0.5	2	25
Barium	0.149	0.116	0.297	1.2	20	100	300
Cadmium	<0.0001	<0.0001	<0.0002	<0.001	0.04	1	5
Chromium	0.0028	0.00184	0.00561	0.0194	0.5	10	70
Copper	0.0137	0.00191	0.0274	0.0319	2	50	100
Mercury Dissolved (CVAF)	<0.00001	0.0000106	<0.00002	<0.0001	0.01	0.2	2
Molybdenum	0.0341	0.0128	0.0683	0.151	0.5	10	30
Nickel	0.0201	0.00892	0.0402	0.101	0.4	10	40
Lead	0.0524	0.0539	0.105	0.537	0.5	10	50
Antimony	0.00502	0.00766	0.01	0.0738	0.06	0.7	5
Selenium	0.0243	0.00375	0.0487	0.0598	0.1	0.5	7
Zinc	0.278	0.00412	0.557	0.339	4	50	200
Chloride	2980	197	5960	4990	800	15000	25000
Fluoride	1.02	0.837	2.05	8.58	10	150	500
Sulphate (soluble)	910	292	1820	3590	1000	20000	50000
Total Dissolved Solids	8220	1070	16400	18500	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.032	<0.16	1	-	-
Dissolved Organic Carbon	54.4	17.2	109	213	500	800	1000

Leach Test Information	**2:1**	**8:1**
Date Prepared	05-Nov-2013	06-Nov-2013
pH (pH Units)	8.066	7.947
Conductivity (µS/cm)	9,540.00	1,426.00
Temperature (°C)	20.30	16.40
Volume Leachant (Litres)	0.238	1.400
Volume of Eluate VE1 (Litres)	0.190	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
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Mcerts Certification does not apply to leachates
14/11/2013 08:07:46

08:07:22 14/11/2013

CERTIFICATE OF ANALYSIS

SDG:	131101-111	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	249757
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

CEN 10:1 CUMULATIVE TWO STAGE BATCH TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/3

Client Reference		**Site Location**	Frodsham
Mass Sample taken (kg)	0.282	**Moisture Content Ratio (%)**	61.3
Mass of dry sample (kg)	0.175	**Dry Matter Content Ratio (%)**	62
Particle Size <4mm	>95%		

		Landfill Waste Acceptance Criteria Limits		
Case				
SDG	131101-111			
Lab Sample Number(s)	8363899			
Sampled Date	14-Oct-2013			
Customer Sample Ref.	SA5 B22			
Depth (m)				
Solid Waste Analysis		**Inert Waste Landfill**	**Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon (%)	2.26	3	5	6
Loss on Ignition (%)	7.53	-	-	10
Sum of BTEX (mg/kg)	<0.024	6	-	-
Sum of 7 PCBs (mg/kg)	<0.021	1	-	-
Mineral Oil (mg/kg)	108	500	-	-
PAH Sum of 17 (mg/kg)	<10	100	-	-
pH (pH Units)	8.15	-	<6 or >9	-
ANC to pH 6 (mol/kg)	0.143	-	-	-
ANC to pH 4 (mol/kg)	0.312	-	-	-

Eluate Analysis	C_2 Concⁿ in 2:1 eluate	C_8 Concⁿ in 8:1 eluate	A_2 2:1 concⁿ leached	$A_{2\text{-}10}$ Cumulative concⁿ leached	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	mg/l		mg/kg				
Arsenic	0.0722	0.0499	0.144	0.52	0.5	2	25
Barium	0.224	0.0247	0.447	0.429	20	100	300
Cadmium	0.000195	0.000105	0.00039	0.00113	0.04	1	5
Chromium	0.00569	0.0052	0.0114	0.0524	0.5	10	70
Copper	0.0366	0.0289	0.0732	0.296	2	50	100
Mercury Dissolved (CVAF)	<0.00001	0.0000691	<0.00002	0.000628	0.01	0.2	2
Molybdenum	0.0835	0.0266	0.167	0.318	0.5	10	30
Nickel	0.00746	0.00388	0.0149	0.0421	0.4	10	40
Lead	0.000942	0.0046	0.00189	0.0427	0.5	10	50
Antimony	0.019	0.0169	0.0381	0.171	0.06	0.7	5
Selenium	0.0217	0.00395	0.0434	0.0558	0.1	0.5	7
Zinc	0.0044	0.00535	0.0088	0.0527	4	50	200
Chloride	2320	186	4640	3810	800	15000	25000
Fluoride	0.984	0.745	1.97	7.67	10	150	500
Sulphate (soluble)	447	81.6	896	1150	1000	20000	50000
Total Dissolved Solids	6140	782	12300	12700	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.032	<0.16	1	-	-
Dissolved Organic Carbon	38.5	14.8	77	169	500	800	1000

Leach Test Information	**2:1**	**8:1**
Date Prepared	05-Nov-2013	06-Nov-2013
pH (pH Units)	8.215	8.249
Conductivity (µS/cm)	7,220.00	1,034.00
Temperature (°C)	20.40	17.10
Volume Leachant (Litres)	0.243	1.400
Volume of Eluate VE1 (Litres)	0.160	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
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14/11/2013 08:07:46

08:07:22 14/11/2013

CERTIFICATE OF ANALYSIS

SDG:	131101-111	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	249757
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Table of Results - Appendix

Method No	Reference	Description	Wet/Dry Sample [1]	Surrogate Corrected
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
PM114		Leaching Procedure for CEN Two Stage BatchTest 2:1/8:1 Cumulative		
PM115		Leaching Procedure for CEN One Stage Leach Test 2:1 & 10:1 1 Step		
TM018	BS 1377: Part 3 1990	Determination of Loss on Ignition		
TM061	Method for the Determination of EPH,Massachusetts Dept.of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)		
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)		
TM090	Method 5310, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 415.1 & 9060	Determination of Total Organic Carbon/Total Inorganic Carbon in Water and Waste Water		
TM104	Method 4500F, AWWA/APHA, 20th Ed., 1999	Determination of Fluoride using the Kone Analyser		
TM123	BS 2690: Part 121:1981	The Determination of Total Dissolved Solids in Water		
TM132	In - house Method	ELTRA CS800 Operators Guide		
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter		
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS		
TM168	EPA Method 8082, Polychlorinated Biphenyls by Gas Chromatography	Determination of WHO12 and EC7 Polychlorinated Biphenyl Congeners by GC-MS in Soils		
TM182	CEN/TC 292 - WI 292046-chacterization of waste-leaching Behaviour Tests- Acid and Base Neutralization Capacity Test	Determination of Acid Neutralisation Capacity (ANC) Using Autotitration in Soils		
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry		
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers		
TM213	In-house Method	Rapid Determination of PAHs by GC-FID		
TM259	by HPLC	Determination of Phenols in Waters and Leachates by HPLC		

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

CERTIFICATE OF ANALYSIS

SDG:	131101-111	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	249757
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	8363890	8363894	8363896	8363899
Customer Sample Ref.	SA1 B9	SA2 B6	SA4 B13	SA5 B22
AGS Ref.				
Depth				
Type	SOLID	SOLID	SOLID	SOLID
ANC at pH4 and ANC at pH 6	06-Nov-2013	06-Nov-2013	06-Nov-2013	06-Nov-2013
Anions by Kone (w)	12-Nov-2013	11-Nov-2013	12-Nov-2013	11-Nov-2013
CEN 10:1 Leachate (1 Stage)	07-Nov-2013		07-Nov-2013	
CEN 2:1 Leachate (2 Stage)		05-Nov-2013		05-Nov-2013
CEN 2:1 Readings		07-Nov-2013		07-Nov-2013
CEN 8:1 Leachate (2 Stage)		07-Nov-2013		07-Nov-2013
CEN 8:1 Readings		08-Nov-2013		08-Nov-2013
CEN Readings	14-Nov-2013		14-Nov-2013	
Dissolved Metals by ICP-MS	12-Nov-2013	11-Nov-2013	12-Nov-2013	11-Nov-2013
Dissolved Organic/Inorganic Carbon	12-Nov-2013	11-Nov-2013	12-Nov-2013	11-Nov-2013
Fluoride	11-Nov-2013	11-Nov-2013	11-Nov-2013	11-Nov-2013
GRO by GC-FID (S)	07-Nov-2013	06-Nov-2013	06-Nov-2013	06-Nov-2013
Loss on Ignition in soils	06-Nov-2013	06-Nov-2013	06-Nov-2013	06-Nov-2013
Mercury Dissolved	12-Nov-2013	11-Nov-2013	12-Nov-2013	11-Nov-2013
Mineral Oil	08-Nov-2013	07-Nov-2013	08-Nov-2013	07-Nov-2013
PAH Value of soil	07-Nov-2013	07-Nov-2013	07-Nov-2013	07-Nov-2013
PCBs by GCMS	10-Nov-2013	10-Nov-2013	10-Nov-2013	08-Nov-2013
pH	06-Nov-2013	06-Nov-2013	06-Nov-2013	06-Nov-2013
Phenols by HPLC (W)	12-Nov-2013	11-Nov-2013	12-Nov-2013	11-Nov-2013
Sample description	05-Nov-2013	05-Nov-2013	05-Nov-2013	05-Nov-2013
Total Dissolved Solids	12-Nov-2013	11-Nov-2013	12-Nov-2013	11-Nov-2013
Total Organic Carbon	06-Nov-2013	06-Nov-2013	06-Nov-2013	06-Nov-2013

SDG:	131101-111	**Location:**	Frodsham	**Order Number:**	ST12871
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	249757
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Appendix
General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICS and SVOC TICS.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as “Not detected”. If no asbestos fibre types are found all will be reported as “Not detected” and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible. The quantity of asbestos present is not determined unless specifically requested.

7. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP -No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals -total metals must be requested separately.

11. Results relate only to the items tested.

12. LODs for wet tests reported on a dry weight basis are not corrected for moisture content.

13. **Surrogate recoveries** -Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 -130 %.

14. **Product analyses** -Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors
employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

Sample Deviations

1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Holding time exceeded before sample received**
§	**Sampled on date not provided**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to sampled on date**
&	**Sample Holding Time exceeded - Late arrival of instructions.**

Asbestos

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: -
Trace -Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

ALcontrol Laboratories

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[redacted]

Wardell Armstrong LLP
Sir Henry Doulton House
Forge Lane
Etruria
Stoke on Trent
Staffordshire
ST1 5BD

Attention: Tim Cawood

CERTIFICATE OF ANALYSIS

Date:	29 November 2013
Customer:	H_WARDELL_SKT
Sample Delivery Group (SDG):	131121-41
Your Reference:	ST13418
Location:	Frodsham
Report No:	251982

We received 5 samples on Thursday November 21, 2013 and 5 of these samples were scheduled for analysis which was completed on Friday November 29, 2013. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

[redacted]
Operations Manager

CERTIFICATE OF ANALYSIS

SDG:	131121-41	**Location:**	Frodsham	**Order Number:**	ST13022
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251982
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
8455809	SA1		0.00 - 0.00	18/11/2013
8455830	SA2		0.00 - 0.00	18/11/2013
8455820	SA3		0.00 - 0.00	18/11/2013
8455840	SA4		0.00 - 0.00	18/11/2013
8455850	SA5		0.00 - 0.00	18/11/2013

Only received samples which have had analysis scheduled will be shown on the following pages.

CERTIFICATE OF ANALYSIS

SDG:	131121-41	**Location:**	Frodsham	**Order Number:**	ST13022
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251982
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

LIQUID

Results Legend

X Test

N No Determination Possible

Lab Sample No(s)			8455809	8455830	8455820	8455840	8455850
Customer Sample Reference			SA1	SA2	SA3	SA4	SA5
AGS Reference							
Depth (m)			0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Container			1l Glass bottle (ALE 1lplastic (ALE221) H2SO4 (ALE244) HNO3 Filtered (ALE Vial (ALE297) ZnAc (ALE246)	1l Glass bottle (ALE 1lplastic (ALE221) H2SO4 (ALE244) HNO3 Filtered (ALE Vial (ALE297) ZnAc (ALE246)	1l Glass bottle (ALE 1lplastic (ALE221) H2SO4 (ALE244) HNO3 Filtered (ALE Vial (ALE297) ZnAc (ALE246)	1l Glass bottle (ALE 1lplastic (ALE221) H2SO4 (ALE244) HNO3 Filtered (ALE Vial (ALE297) ZnAc (ALE246)	1l Glass bottle (ALE 1lplastic (ALE221) H2SO4 (ALE244) HNO3 Filtered (ALE Vial (ALE297) ZnAc (ALE246)
Anions by ion Chromatography	All	NDPs: 0 Tests: 5	X X X	X X X	X X X	X X X	X X X
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 5	X X X	X X X	X X X	X X X	X X X
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 5	X X X	X X X	X X X	X X X	X X X
EPH CWG (Aliphatic) Aqueous GC (W)	All	NDPs: 0 Tests: 5	X X X	X X X	X X X	X X X	X X X
EPH CWG (Aromatic) Aqueous GC (W)	All	NDPs: 0 Tests: 5	X X X	X X X	X X X	X X X	X X X
Free Sulphur	All	NDPs: 0 Tests: 5	X X X	X X X	X X X	X X X	X X X
GRO by GC-FID (W)	All	NDPs: 0 Tests: 5	X X X	X X X	X X X	X X X	X X X
Hexavalent Chromium (w)	All	NDPs: 0 Tests: 5	X X X	X X X	X X X	X X X	X X X
Mercury Dissolved	All	NDPs: 0 Tests: 5	X X X	X X X	X X X	X X X	X X X
PAH Spec MS - Aqueous (W)	All	NDPs: 0 Tests: 5	X X X	X X X	X X X	X X X	X X X
Phenols by HPLC (W)	All	NDPs: 0 Tests: 5	X X X	X X X	X X X	X X X	X X X
Sulphide	All	NDPs: 0 Tests: 5	X X X	X X X	X X X	X X X	X X X
TPH CWG (W)	All	NDPs: 0 Tests: 5	X X X	X X X	X X X	X X X	X X X

CERTIFICATE OF ANALYSIS

SDG:	131121-41	**Location:**	Frodsham	**Order Number:**	ST13022
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251982
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	SA1	SA2	SA3	SA4	SA5
			Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
			Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
			Date Sampled	18/11/2013	18/11/2013	18/11/2013	18/11/2013	18/11/2013
			Sample Time	.	.	.	.	.
			Date Received	21/11/2013	21/11/2013	21/11/2013	21/11/2013	21/11/2013
			SDG Ref	131121-41	131121-41	131121-41	131121-41	131121-41
			Lab Sample No.(s)	8455809	8455830	8455820	8455840	8455850
			AGS Reference					
Sulphide	<0.01 mg/l	TM101		<0.01 #	<0.01 #	<0.01 #	<0.01 #	<0.01 #
Arsenic (diss.filt)	<0.12 µg/l	TM152		89.9 #	21.4 #	4.05 #	18.8 #	28.1 #
Barium (diss.filt)	<0.03 µg/l	TM152		920 #	65.1 #	124 #	774 #	134 #
Beryllium (diss.filt)	<0.07 µg/l	TM152		<0.07 #	<0.07 #	<0.07 #	<0.07 #	<0.07 #
Boron (diss.filt)	<9.4 µg/l	TM152		1500 #	997 #	40.2 #	1700 #	1350 #
Cadmium (diss.filt)	<0.1 µg/l	TM152		<0.1 #	<0.1 #	<0.1 #	<0.1 #	<0.1 #
Chromium (diss.filt)	<0.22 µg/l	TM152		25.8 #	5.43 #	0.944 #	5.33 #	11.8 #
Copper (diss.filt)	<0.85 µg/l	TM152		2.7 #	3.59 #	<0.85 #	5.82 #	8.57 #
Lead (diss.filt)	<0.02 µg/l	TM152		0.959 #	1.76 #	0.059 #	3.9 #	0.646 #
Nickel (diss.filt)	<0.15 µg/l	TM152		17.2 #	14 #	0.638 #	18.2 #	4.55 #
Selenium (diss.filt)	<0.39 µg/l	TM152		35.6 #	12.4 #	<0.39 #	17.3 #	4.39 #
Vanadium (diss.filt)	<0.24 µg/l	TM152		15.8 #	4.04 #	0.368 #	4.47 #	5.6 #
Zinc (diss.filt)	<0.41 µg/l	TM152		21.5 #	27.3 #	9.66 #	22.2 #	44.1 #
Mercury (diss.filt)	<0.01 µg/l	TM183		<0.01 #	<0.01 #	<0.01 #	0.0161 #	0.019 #
Sulphate as S	<0.04 mg/l	TM226		18.2 #	100 #	12.9 #	306 #	42.7 #
Cyanide, Total	<0.05 mg/l	TM227		<0.05 @ #	<0.05 @ #	<0.05 @ #	<0.05 @ #	<0.05 @ #
Cyanide, Free	<0.05 mg/l	TM227		<0.05 @ #	<0.05 @ #	<0.05 @ #	<0.05 @ #	<0.05 @ #
Chromium, Hexavalent	<0.03 mg/l	TM241		<0.03 #	<0.03 #	<0.03 #	<0.03 #	<0.03 #
Phenols, Total Detected monohydric	<0.016 mg/l	TM259		<0.016 #	<0.016 #	<0.016 #	<0.016 #	<0.016 #
Sulphur, Free	<0.05 mg/l	TM294		<0.05	<0.05	<0.05	<0.05	<0.05

CERTIFICATE OF ANALYSIS

SDG:	131121-41	**Location:**	Frodsham	**Order Number:**	ST13022
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251982
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

PAH Spec MS - Aqueous (W)

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	SA1	SA2	SA3	SA4	SA5
			Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
			Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
			Date Sampled	18/11/2013	18/11/2013	18/11/2013	18/11/2013	18/11/2013
			Sample Time	.	.	.	.	.
			Date Received	21/11/2013	21/11/2013	21/11/2013	21/11/2013	21/11/2013
			SDG Ref	131121-41	131121-41	131121-41	131121-41	131121-41
			Lab Sample No.(s)	8455809	8455830	8455820	8455840	8455850
			AGS Reference					
Naphthalene (aq)	<0.1 µg/l	TM178		2.99 #	<0.1 #	<0.1 #	0.256 #	0.155 #
Acenaphthene (aq)	<0.015 µg/l	TM178		1.07 #	0.16 #	<0.015 #	0.0666 #	0.563 #
Acenaphthylene (aq)	<0.011 µg/l	TM178		0.226 #	0.0472 #	<0.011 #	0.0243 #	0.171 #
Fluoranthene (aq)	<0.017 µg/l	TM178		2.56 #	1.12 #	0.0297 #	0.194 #	4.24 #
Anthracene (aq)	<0.015 µg/l	TM178		1.54 #	0.225 #	<0.015 #	0.141 #	0.513 #
Phenanthrene (aq)	<0.022 µg/l	TM178		3.22 #	0.538 #	0.0254 #	0.0842 #	1.22 #
Fluorene (aq)	<0.014 µg/l	TM178		1.42 #	0.107 #	<0.014 #	0.0582 #	0.34 #
Chrysene (aq)	<0.013 µg/l	TM178		1.16 #	0.682 #	0.0214 #	0.134 #	2.82 #
Pyrene (aq)	<0.015 µg/l	TM178		2.21 #	1.14 #	0.0306 #	0.263 #	3.66 #
Benzo(a)anthracene (aq)	<0.017 µg/l	TM178		0.84 #	0.521 #	<0.017 #	0.0602 #	2.26 #
Benzo(b)fluoranthene (aq)	<0.023 µg/l	TM178		1.04 #	0.409 #	<0.023 #	0.0915 #	2.88 #
Benzo(k)fluoranthene (aq)	<0.027 µg/l	TM178		0.631 #	0.401 #	<0.027 #	0.0873 #	2.84 #
Benzo(a)pyrene (aq)	<0.009 µg/l	TM178		0.991 #	0.534 #	0.0171 #	0.106 #	3.74 #
Dibenzo(a,h)anthracene (aq)	<0.016 µg/l	TM178		0.181 #	0.101 #	<0.016 #	0.0218 #	0.776 #
Benzo(g,h,i)perylene (aq)	<0.016 µg/l	TM178		0.61 #	0.376 #	<0.016 #	0.0869 #	2.83 #
Indeno(1,2,3-cd)pyrene (aq)	<0.014 µg/l	TM178		0.498 #	0.287 #	<0.014 #	0.0468 #	2.48 #
PAH, Total Detected USEPA 16 (aq)	<0.247 µg/l	TM178		21.2	6.64	<0.247	1.72	31.5

CERTIFICATE OF ANALYSIS

SDG:	131121-41	**Location:**	Frodsham	**Order Number:**	ST13022
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251982
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

TPH CWG (W)

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	SA1	SA2	SA3	SA4	SA5
			Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
			Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
			Date Sampled	18/11/2013	18/11/2013	18/11/2013	18/11/2013	18/11/2013
			Sample Time	.	.	.	.	.
			Date Received	21/11/2013	21/11/2013	21/11/2013	21/11/2013	21/11/2013
			SDG Ref	131121-41	131121-41	131121-41	131121-41	131121-41
			Lab Sample No.(s)	8455809	8455830	8455820	8455840	8455850
			AGS Reference					
GRO Surrogate % recovery**	%	TM245		77	75	83	74	77
GRO >C5-C12	<50 µg/l	TM245		126 #	<50 #	<50 #	<50 #	<50 #
Methyl tertiary butyl ether (MTBE)	<3 µg/l	TM245		<3 #	<3 #	<3 #	<3 #	<3 #
Benzene	<7 µg/l	TM245		<7 #	<7 #	<7 #	<7 #	<7 #
Toluene	<4 µg/l	TM245		<4 #	<4 #	<4 #	<4 #	<4 #
Ethylbenzene	<5 µg/l	TM245		<5 #	<5 #	<5 #	<5 #	<5 #
m,p-Xylene	<8 µg/l	TM245		<8 #	<8 #	<8 #	<8 #	<8 #
o-Xylene	<3 µg/l	TM245		<3 #	<3 #	<3 #	<3 #	<3 #
Sum of detected Xylenes	<11 µg/l	TM245		<11	<11	<11	<11	<11
Sum of detected BTEX	<28 µg/l	TM245		<28	<28	<28	<28	<28
Aliphatics >C5-C6	<10 µg/l	TM245		<10	<10	<10	<10	<10
Aliphatics >C6-C8	<10 µg/l	TM245		14	<10	<10	<10	<10
Aliphatics >C8-C10	<10 µg/l	TM245		24	<10	<10	<10	<10
Aliphatics >C10-C12	<10 µg/l	TM245		40	<10	<10	<10	<10
Aliphatics >C12-C16 (aq)	<10 µg/l	TM174		321	45	<10	45	<10
Aliphatics >C16-C21 (aq)	<10 µg/l	TM174		410	56	<10	78	36
Aliphatics >C21-C35 (aq)	<10 µg/l	TM174		582	172	110	167	665
Total Aliphatics >C12-C35 (aq)	<10 µg/l	TM174		1310	273	110	290	701
Aromatics >EC5-EC7	<10 µg/l	TM245		<10	<10	<10	<10	<10
Aromatics >EC7-EC8	<10 µg/l	TM245		<10	<10	<10	<10	<10
Aromatics >EC8-EC10	<10 µg/l	TM245		17	<10	<10	<10	<10
Aromatics >EC10-EC12	<10 µg/l	TM245		27	<10	<10	<10	<10
Aromatics >EC12-EC16 (aq)	<10 µg/l	TM174		214	18	<10	22	26
Aromatics >EC16-EC21 (aq)	<10 µg/l	TM174		387	32	<10	41	58
Aromatics >EC21-EC35 (aq)	<10 µg/l	TM174		402	82	32	77	225
Total Aromatics >EC12-EC35 (aq)	<10 µg/l	TM174		1000	132	32	140	309
Total Aliphatics & Aromatics >C5-35 (aq)	<10 µg/l	TM174		2440	407	142	432	1010

CERTIFICATE OF ANALYSIS

SDG:	131121-41	**Location:**	Frodsham	**Order Number:**	ST13022
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251982
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Table of Results - Appendix

Method No	Reference	Description	Wet/Dry Sample [1]	Surrogate Corrected
TM061	Method for the Determination of EPH,Massachusetts Dept.of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)		
TM101	Method 4500B & C, AWWA/APHA, 20th Ed., 1999	Determination of Sulphide in soil and water samples using the Kone Analyser		
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS		
TM174	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Waters by GC-FID		
TM178	Modified: US EPA Method 8100	Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS in Waters		
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry		
TM226	In-House Method	Determination of Anions in Waters using Ion Chromatography		
TM227	Standard methods for the examination of waters and wastewaters 20th Edition, AWWA/APHA Method 4500.	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate		
TM241	Methods for the Examination of Waters and Associated Materials; Chromium in Raw and Potable Waters and Sewage Effluents 1980.	The Determination of Hexavalent Chromium in Waters and Leachates using the Kone Analyser		
TM245	By GC-FID	Determination of GRO by Headspace in waters		
TM259	by HPLC	Determination of Phenols in Waters and Leachates by HPLC		
TM294		Determination of Free Sulphur in liquids by HPLC		

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

CERTIFICATE OF ANALYSIS

SDG:	131121-41	**Location:**	Frodsham	**Order Number:**	ST13022
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251982
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	8455809	8455830	8455820	8455840	8455850
Customer Sample Ref.	SA1	SA2	SA3	SA4	SA5
AGS Ref.					
Depth	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Type	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID
Anions by ion Chromatography	26-Nov-2013	29-Nov-2013	26-Nov-2013	29-Nov-2013	26-Nov-2013
Cyanide Comp/Free/Total/Thiocyanate	28-Nov-2013	28-Nov-2013	28-Nov-2013	28-Nov-2013	28-Nov-2013
Dissolved Metals by ICP-MS	26-Nov-2013	26-Nov-2013	26-Nov-2013	26-Nov-2013	26-Nov-2013
EPH CWG (Aliphatic) Aqueous GC (W)	28-Nov-2013	28-Nov-2013	28-Nov-2013	28-Nov-2013	28-Nov-2013
EPH CWG (Aromatic) Aqueous GC (W)	28-Nov-2013	28-Nov-2013	28-Nov-2013	28-Nov-2013	28-Nov-2013
Free Sulphur	28-Nov-2013	28-Nov-2013	28-Nov-2013	28-Nov-2013	28-Nov-2013
GRO by GC-FID (W)	26-Nov-2013	22-Nov-2013	22-Nov-2013	22-Nov-2013	22-Nov-2013
Hexavalent Chromium (w)	28-Nov-2013	28-Nov-2013	25-Nov-2013	28-Nov-2013	28-Nov-2013
Mercury Dissolved	28-Nov-2013	28-Nov-2013	28-Nov-2013	27-Nov-2013	28-Nov-2013
PAH Spec MS - Aqueous (W)	28-Nov-2013	28-Nov-2013	28-Nov-2013	28-Nov-2013	28-Nov-2013
Phenols by HPLC (W)	29-Nov-2013	29-Nov-2013	29-Nov-2013	29-Nov-2013	29-Nov-2013
Sulphide	27-Nov-2013	27-Nov-2013	27-Nov-2013	27-Nov-2013	27-Nov-2013
TPH CWG (W)	28-Nov-2013	28-Nov-2013	28-Nov-2013	28-Nov-2013	28-Nov-2013

SDG:	131121-41	**Location:**	Frodsham	**Order Number:**	ST13022
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	251982
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Appendix
General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICS and SVOC TICS.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as “Not detected”. If no asbestos fibre types are found all will be reported as “Not detected” and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible. The quantity of asbestos present is not determined unless specifically requested.

7. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP -No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals -total metals must be requested separately.

11. Results relate only to the items tested.

12. LODs for wet tests reported on a dry weight basis are not corrected for moisture content.

13. **Surrogate recoveries** -Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 -130 %.

14. **Product analyses** -Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

Sample Deviations

1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Holding time exceeded before sample received**
§	**Sampled on date not provided**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to sampled on date**
&	**Sample Holding Time exceeded - Late arrival of instructions.**

Asbestos

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: -
Trace -Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

Appendix 5

Worksheet Assessment of Polychlorinated Biphenols (PCBs)

PCDDs, PCDFs and dioxin-like compounds worksheet for a commercial land use scenario

This worksheet should be used only in conjunction with *Soil Guideline Values for dioxins, furans and dioxin-like PCBs in soil, Science Report SC050021 / Dioxins SGV*

For each congener/compound, enter the site-specific representative soil concentration in the respective grey box. The Hazard Index is the ratio of the total soil exposure to the oral TDSI.

Substance	Soil Concentration		Exposure Factor		TEF		Average Daily Exposure	Contribution to ADE
	ng kg^{-1} DW		pg kg^{-1} BW day^{-1} per ng kg^{-1} DW soil		-		pg WHO-TEQ kg^{-1} BW day^{-1}	%
2,3,7,8-TCDD		x	4.75E-04	x	1	=		#VALUE!
1,2,3,7,8-PeCDD		x	4.75E-04	x	1	=		#VALUE!
1,2,3,4,7,8-HxCDD		x	4.75E-04	x	0.1	=		#VALUE!
1,2,3,6,7,8-HxCDD		x	4.75E-04	x	0.1	=		#VALUE!
1,2,3,7,8,9-HxCDD		x	4.75E-04	x	0.1	=		#VALUE!
1,2,3,4,6,7,8-HpCDD		x	4.75E-04	x	0.01	=		#VALUE!
OCDD		x	4.75E-04	x	0.0003	=		#VALUE!
2,3,7,8-TCDF		x	4.75E-04	x	0.1	=		#VALUE!
1,2,3,7,8-PeCDF		x	4.75E-04	x	0.03	=		#VALUE!
2,3,4,7,8-PeCDF		x	4.75E-04	x	0.3	=		#VALUE!
1,2,3,4,7,8-HxCDF		x	4.75E-04	x	0.1	=		#VALUE!
1,2,3,7,8,9-HxCDF		x	4.75E-04	x	0.1	=		#VALUE!
1,2,3,6,7,8-HxCDF		x	4.75E-04	x	0.1	=		#VALUE!
2,3,4,6,7,8-HxCDF		x	4.75E-04	x	0.1	=		#VALUE!
1,2,3,4,6,7,8-HpCDF		x	4.75E-04	x	0.01	=		#VALUE!
1,2,3,4,7,8,9-HpCDF		x	4.75E-04	x	0.01	=		#VALUE!
OCDF		x	4.75E-04	x	0.0003	=		#VALUE!
PCB-77		x	5.57E-04	x	0.0001	=		#VALUE!
PCB-81		x	5.57E-04	x	0.0003	=		#VALUE!
PCB-126		x	5.57E-04	x	0.1	=		#VALUE!
PCB-169		x	5.57E-04	x	0.03	=		#VALUE!
PCB-105	5.25E+03	x	5.57E-04	x	0.00003	=	8.77E-05	3.1
PCB-114		x	5.57E-04	x	0.00003	=		#VALUE!
PCB-118	1.33E+05	x	5.57E-04	x	0.00003	=	2.22E-03	78.6
PCB-123		x	5.57E-04	x	0.00003	=		#VALUE!
PCB-156	1.90E+04	x	5.57E-04	x	0.00003	=	3.18E-04	11.2
PCB-157		x	5.57E-04	x	0.00003	=		#VALUE!
PCB-167	1.20E+04	x	5.57E-04	x	0.00003	=	2.01E-04	7.1
PCB-189		x	5.57E-04	x	0.00003	=		#VALUE!

Total WHO-TEQ ADE	**2.83E-03**	**pg WHO-TEQ kg^{-1} BW day^{-1}**
TDSI	**1.30E+00**	**pg WHO-TEQ kg^{-1} BW day^{-1}**
Hazard Index	**0.00**	

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Appendix B: Frodsham Wind Farm Phase 2 Site Investigation, April 2015

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ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING, QUARRYING AND MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

FRODSHAM WIND FARM LIMITED

Frodsham Wind Farm

Phase 2 Site Investigation

April 2015

your earth our world

wardell armstrong

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DATE ISSUED: April 2015
JOB NUMBER: ST13418
REPORT NUMBER: 0004

FRODSHAM WIND FARM LIMITED

Frodsham Wind Farm

Phase 2 Site Investigation Report

April 2015

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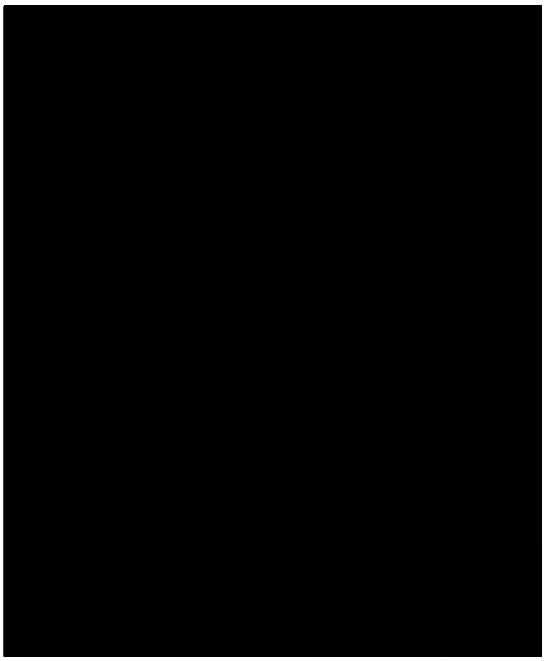

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ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

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7 CONCLUSIONS 20

APPENDICES

Appendix 1 Explosive Ordnance Threat Assessment in respect of Frodsham Wind Farm, Cheshire (BACTEC, August 2013)
Appendix 2 Ground Investigation at Frodsham Wind Farm, Cheshire (Environmental Scientifics Group, November 2014)
Appendix 2A Figures and Drawings
Appendix 2B Exploratory Hole Records
Appendix 2C Instrumentation and Monitoring
Appendix 2D In-Situ Testing
Appendix 2E Geotechnical Laboratory Test Results
Appendix 3 Trial Pit Logs

DRAWINGS

Drawing No.	Title	Scale
ST13418-004	Site Location Plan	1:50,000
ST13418-008	Access Routes and Oil Pipeline	1:10,000
ST13418-011	Phase 2 Site Investigation Layout	1:10,000

1 INTRODUCTION

1.1 This report has been prepared in accordance with Wardell Armstrong's letter of proposal dated 21 August 2014, and subsequent discussions with Annette Lardeur, of Peel Energy.

1.2 This report summarises the results of 2 phases of intrusive ground investigation, providing details on the prevailing ground conditions underlying the site.

1.3 As a basis for the report reference has been made to the following information:

Pre-feasibility Assessment, Scott Wilson 2007;
Phase 1 Geo-Environmental Desk Study Report, Scott Wilson 2010;
Preliminary Site Investigation, including Foundation & Engineering Construction Assessment, Wardell Armstrong 2014;
Ground Investigation at Frodsham Wind Farm, Cheshire, Environmental Scientifics Group 2014.

1.4 A wind farm is proposed to be built on the site. Drawing No ST13418-011 shows a plan of the proposed wind farm layout. The development proposal comprises 19 No. wind turbines. Sixteen turbines are located on the dredging deposit ground owned & operated by the Manchester Ship Canal Company (MSCC), with a further 3 turbines located immediately to the south on natural ground. A meteorological mast is also to be erected and two electrical sub-stations are to be built.

1.5 The purpose of this report is to summarise the factual records obtained during two phases of ground investigation at the proposed site of the Frodsham Wind Farm and to convey interpretation of that factual data, sufficient to inform Peel Energy of the key constraints to development. This report is not intended to convey the interpretation required for detailed design, and any interpretation is given to assist Peel in the assessment of both project risks and the tenders provided for the construction contract. It is understood that tenderers to the construction contract will have undertaken their own interpretation of the factual data.

2 SITE SETTING

Location

2.1 The site is within the area known as the Frodsham and Helsby Marshes. This is an area of low lying land close to the southern boundary of the River Mersey estuary.

2.2 The site is located approximately 4km to the south west of Runcorn town centre and 1km to the west of Frodsham town centre, located in the administrative Borough of Cheshire West and Chester. The site location is shown in Drawing No. ST13418-004.

Site Description

2.3 The site is elongated in shape; c3.5km long by c1.3km wide, with an area of approximately 450Ha.

2.4 The site is bounded to the north by a strip of marshland with ponds and, ultimately, the Manchester Ship Canal (MSC). To the east is generally flat agricultural land, mainly used for sheep grazing, leading to the River Weaver. To the south of the site is an area of low lying agricultural land used for arable and grazing purposes. There are generally no structures in this area with the exception of occasional farm buildings. The M56 is located approximately 1km to the south of the site. The land to the west is also mostly agricultural with limited farm structures, with the exception of the Kemira GrowHow chemical plant, directly to the southwest of the site off Marsh Lane. Some residential buildings are located c.1.5km to the west, and further to the west is the Essar Stanlow Oil Refinery.

2.5 The majority of the site has been used for the deposition of material dredged from the Manchester Ship Canal. The dredging grounds are owned and operated by MSCC, a part of the Peel Group. The remainder of the site comprises agricultural land for pasture and occasional arable use.

2.6 The deposit grounds are separated into distinct areas known as Cells, which are delineated by retaining bunds. The location of the Cells is shown on Drawing No. ST13418-011. The dredging deposits have raised the level of the land above the natural level of the marshland. One Cell (Cell 6) is in active use for the deposition of dredged material and is authorised for this use under an Environment Permit in place since 1995, issued and regulated by the Environment Agency (EA). No construction

works associated with the proposed wind farm are proposed within Cell 6. The land comprising the old full Cells is partly used as grazing land, but some areas remain unused and have reverted to semi-natural vegetation, such as reed bed or scrub.

2.7 The area surrounding the deposit ground is largely flat, typically at around 3.5-5.5m AOD. The deposit ground lagoons (Cells) dominate the topography, being circa 8m higher than the surrounding ground level.

2.8 The deposit grounds receive dredged sediment from the MSC. The dredged material ranges from sand with some gravel, to silt and clay. Decant water is returned via draw-off towers to nearby waterways, for which MSCC have existing consent to discharge.

3 ENVIRONMENTAL AND GEOTECHNICAL SETTING

3.1 The environmental and geotechnical status of the site has been assessed previously in a report entitled Preliminary Site Investigation (Wardell Armstrong, March 2014). A summary of the findings of this investigation is provided below.

Geology

Made Ground

3.2 The preliminary site investigation identified a significant thickness of Made Ground, up to 9.95m, in the locations of the MSCC dredging Cells. No Made Ground was identified in areas outside of the Cells. The Made Ground was of extremely low strength with an undrained shear strength as low as 5 kN/m². A desiccated surface crust is present across the surface of the Made Ground of the dredging deposits which allows limited trafficking of light plant.

Natural Superficial Deposits

3.3 Below the Made Ground, alluvial clay and peat was identified to a maximum depth of 16.50m bgl (base of unit), which is also of extremely low strength with an undrained shear strength of approximately 20 kN/m^2.

3.4 A "transitional zone" has been identified below the alluvial material in parts of the site, which generally comprise clay with sand and silt. Where present, this was typically firm and around 2m in overall thickness.

3.5 Below the transitional zone there is a thick layer of fluvio-glacial soil, generally comprising medium dense to very dense sand, the base of which was to a maximum depth of 24.60m bgl.

3.6 Glacial till (boulder clay) underlies the fluvio-glacial soil, comprising stiff or very stiff clay with occasional gravel. This was identified to range in thickness from 8.70m to >19.80m at depths between 29.20m bgl in the west and greater than 43.45m bgl in the east of the site.

Solid Strata

3.7 The bedrock underlying the site comprises sandstone of the Sherwood Sandstone Group; a principal aquifer.

Soil Contamination

3.8 The results of contamination analysis of soil samples, assessed against conventional commercial end-use screening values, indicate that there is little or no risk to human health from contamination at the site, with only concentrations of lead exceeding the screening values at two locations. In addition, several samples exceeded the solubility saturation limit for aliphatic C12 – C16 range hydrocarbons. None of the analysis identified significant gross contamination and hence there is no evidence that remedial measures would be required from a human health perspective.

3.9 Preliminary screening has identified asbestos in 6 samples, of which 4 were near to the ground surface. Additional asbestos quantification testing did not identify the presence of asbestos above the limit of detection and this is not considered to pose a significant risk.

Ground Gas

3.10 Ground gas monitoring has been carried out on two occasions, which has identified significantly elevated levels of ground gas, with methane being recorded to a maximum concentration of 86.7%.

Groundwater and Controlled Water Resources

3.11 Analysis of groundwater samples on a single occasion has identified moderate groundwater quality with consistently elevated levels of boron, chromium, copper, selenium, zinc, sulphates, PAHs and TPH being present. The anticipated source of this contamination is the dredging deposits. The majority of metals identified at the site are potentially leachable.

3.12 The Principal Aquifer (the Sherwood Sandstone Group), underlies glacial till (boulder clay) which represents a substantial barrier to the downward transmissivity of contamination from the Made Ground dredging deposits and Superficials (fluvio-glacial sand and gravel) Secondary Aquifer above. It is recognised that the shallow groundwater (Secondary Aquifer and perched water within the lagoon deposits) at the site is likely to be in direct hydraulic continuity with proximate surface water receptors. This is considered by risk assessment in our correspondence to CWaC dated 1 April 2014, and it is concluded that no specific remedial measures are required. The design of any piled foundations should consider the nature of the site's contamination and CSM, such that pathways are not created for contaminated groundwater to flow from the Made Ground and Secondary Aquifer to the Principal Aquifer.

Contamination Risk Assessment

3.13 The contamination analysis carried out indicates that it is unlikely that soil or groundwater remediation will be required in specific regard to the proposed wind farm development. However, this would need to be agreed in consultation with the CWaC and the EA, possibly requiring additional analysis and assessment to further assess the risk of contamination to the underlying Principal Aquifer and adjacent surface waters.

Conceptual Site Model

3.14 A Conceptual Site Model (CSM) was developed in the Phase 1 Geo-environmental Desk Study Report (Scott Wilson, 2010). A summary of the CSM can be found in Table 1, below.

Table 1 Summary of Conceptual Site Model (after Scott Wilson)		
Source	**Pathway**	**Receptor**
On-Site Sources		
Asbestos from demolished small structures and WW2 decoy sites	Inhalation	Human Health
Soil and groundwater contamination associated with possible Made Ground including that from the demolition of site structures and the dredging deposit grounds.	Dermal Ingestion Inhalation	Human Health
	Plant Root uptake	Flora
	Direct Contact/leaching	Building infrastructure, Flora, Fauna
	Leaching	Surface water – River Weaver, Hornsmill Brook, Manchester Ship Canal, Mersey Estuary and Groundwater – Minor aquifers of alluvium and glacial till deposits and Sherwood Sandstone principal aquifer.
Ground gas generation from Made Ground primarily from the deposit grounds and minor structures and from alluvium/peat.	Asphyxiation Explosion	Human Health Building Infrastructure
Off-Site Sources		
Ground gas generation from Made Ground primarily from the deposit grounds and minor structures and from alluvium/peat.	Asphyxiation Explosion	Human Health Building Infrastructure

Services

3.15 Several buried services cross the site. Of particular note is a series of high pressure chemical and oil pipelines which are located to the north of Cells 3 and 4, adjacent to the MSC and cross Cells 1 and 2 in an east-west direction. Their location is evident across Cell 1 where they are largely visible above ground. The general position of these pipelines, and their relevant cautionary zones is shown in Drawing No. ST13418-008. Other services include, inter alia, electricity and water supplies to the dredging wharf to the north of Cell 3 and to the agricultural buildings and farm to the north of Cell 2.

Unexploded Ordnance

3.16 The need for an unexploded ordnance risk assessment and survey was identified as a Planning Condition. A report has been produced by BACTEC, dated August 2013, entitled “Explosive Ordnance Threat Assessment in Respect of Frodsham Wind Farm, Cheshire”. The report concluded that the majority of the site falls within a ‘medium risk’ zone, with the north eastern corner of the site (Cells 1, 2 and 5) within a ‘high risk’ zone from unexploded ordnance. BACTEC recommended that a down-hole

magnetometer survey should take place in advance of any intrusive investigation locations within the high risk zone. The BACTEC report is included in Appendix 1.

4 PHASE 2 SITE INVESTIGATION

Introduction

4.1 A phase 2 intrusive site investigation has been undertaken, followed by subsequent laboratory geotechnical and geochemical testing.

4.2 The phase 2 site investigation was undertaken between the 18 August and 2 October 2014 by Environmental Scientifics Group Ltd (ESG). The investigation comprised of excavating trial pits, the drilling of cable percussive boreholes and windowless sample boreholes and in-situ testing comprised of thermal and electrical resistivity testing and plate load testing. Gas and groundwater monitoring standpipes were also installed in the majority of cable percussive boreholes.

4.3 ESG have prepared a factual report, detailing the results of the phase 2 site investigation. This is provided at Appendix 2, for reference.

4.4 The investigation locations are shown on Drawing ST13418-011 and ESG Drawings F4036-14/01 to 05, within Appendix 2A.

Trial Pits

4.5 Machine dug trial pits were located at proposed each turbine location and the met mast location to provide an indication of excavation stability at each turbine base and the met mast. Trial pits at turbines 11 and 12 (both on natural ground) were omitted due to access not being available at the time. A total of 18 No. trial pits were excavated. The trial pits were excavated using a Hitachi ZX110M low ground pressure 360° tracked excavator to depths ranging from 2.00m to 4.30m bgl.

4.6 The arisings were logged by a Wardell Armstrong Engineer. Hand Shear Vane tests were also carried out on the near surface cohesive soils. The logs are contained within Appendix 3.

Cable Percussive Boreholes

4.7 Cable percussive (CP) borehole locations were targeted to coincide with key points in the construction design of the wind farm. A borehole was drilled at each turbine location, meteorological mast location, sub-station location, bridge crossing and anticipated embankment transition location, along with a further borehole in the quayside area. A total of 33 CP boreholes were drilled as part of this phase 2 investigation.

4.8 The boreholes were advanced to depths ranging from 20m to 35m intended to coincide with likely piling depths. In-situ SPTs were carried out every 1m in the Made Ground and every 1.5 m in the natural strata.

4.9 The arisings were logged by a geologist from ESG; the logs are presented within Appendix 2B. Disturbed and undisturbed samples were taken from the boreholes for geotechnical laboratory testing, the results of which are presented within Appendix 2E.

Windowless Sampling Boreholes

4.10 The windowless sample (WLS) boreholes were targeted at 200m intervals along the proposed access routes through the site to the turbines and met mast. A total of 46 No. WLS boreholes were drilled.

4.11 The boreholes were advanced to depths ranging from 2m to 5m with SPTs carried out at 1m intervals.

4.12 The arisings were logged by a geologist from ESG; the logs are presented within Appendix 2B.

Plate Load Tests

4.13 In-situ plate load tests were carried out at 200m intervals along the proposed access route through the site to the turbines to provide a CBR value for pavement design purposes. The plate load test locations were set out to alternate between WLS locations at intermediate positions. A total of 49 No. plate load tests were carried out.

4.14 A shallow pit was excavated to 300mm below ground level and the test conducted on this ground. The pit was logged by a geologist from ESG and the test was carried out by an Engineer from ESG. A sample was taken from the investigation location and tested in a laboratory for moisture content. The logs and test results are presented in Appendix 2B and 2D, respectively.

Electrical Resistivity Testing

4.15 In-situ electrical resistivity testing was carried out at 7 locations, both of the sub-station locations and a representative spread of turbine locations across the site, to provide data to support the earthing design of the turbines and electrical sub-stations. Tests were carried out at the proposed location of turbines 2, 9, 13, 15 and 16.

4.16 The tests were carried out using the Wenner array method at three electrode spacings at each location, 1m, 3m, and 10m. The tests were carried out by an ESG Engineer and the results are presented in Appendix 2D.

Thermal Resistivity Testing

4.17 In-situ thermal resistivity testing was carried out at 7 locations across the site along the proposed route of the electrical export cable. The tests were carried out at a depth of 1.2m by an ESG Engineer and the results are presented in Appendix 2D.

Groundwater and Gas Monitoring

4.18 Standpipes were installed in 30 No. of the CP boreholes, with a response zone between 1m and 10m bgl. CP21-23 did not have standpipes installed.

4.19 The groundwater levels were monitored by an ESG Engineer towards the end of the fieldworks period, once the monitoring points had been allowed to come to equilibrium.

4.20 Gas concentrations were monitored for methane, oxygen, carbon dioxide, hydrogen sulphide and nitrogen. Ambient pressure, differential pressure and flow rate were also recorded at each standpipe. The full results of the monitoring are presented within Appendix 2C.

Laboratory Geotechnical and Geochemical Testing

4.21 Soil samples were collected from the CP boreholes and analysed at ESG's UKAS accredited geotechnical laboratory.

4.22 Representative samples were selected from a range of strata to be tested for moisture content, liquid and plastic limits, particle size distribution, undrained triaxial shear strength, drained triaxial shear strength, consolidation and compaction.

4.23 Chemical testing was also carried out to determine pH and sulphide levels in accordance with BRE-SD1 for concrete classification. The results are presented as Appendix 2E.

5 RESULTS OF THE SITE INVESTIGATION

5.1 The following represents a summary of the phase 2 site investigation findings.

Geology

5.2 Boreholes and trial pits identified a general sequence of strata as follows, in stratigraphical order: Topsoil and Subsoil, Made Ground, Alluvial Clay, Peat, 'Transition Zone', Fluvio Glacial Sands, Glacial Till and Permo-Triassic Sandstone.

Topsoil and Subsoil

5.3 Topsoil was encountered on the natural ground outside the deposit grounds and also on the Cells which have long been completed and used for pasture. The topsoils within the natural ground areas comprised a brown to orangey brown, soft to firm, slightly sandy, silty clay with a high organic content and rootlets, overlain by grass. In Cells 1 and 5, where topsoil/subsoil was also encountered, it occurred as a thin (0.10-0.20m) unit underneath the grass, consisting of a dark brown soft to firm, slightly sandy, very silty clay with a high organic content and frequent rootlets.

Made Ground

5.4 Made Ground was encountered in the dredging deposit Cells and also in the Cell bunds, associated access tracks and at the quayside. The dredging deposits vary spatially across each Cell with coarser material of sands closer to the original dredging outfall pipe and finer material found at the opposite end of the Cell closest

to the decant outflow. This was most apparent in Cell 4, where coarser material was found towards the eastern end of the Cell, towards the dredging outfall pipe and finer material towards the western end, nearer to the decant towers. The finer material was predominantly comprised of very soft to soft, dark brown and black to mottled grey, silty clay with an occasional hydrocarbon odour and organic fragments. The coarser dredging material consisted of orangey brown, loose, fine sand with occasional clay and silt.

5.5 The deposits within the Cells ranged in thickness from approximately 5.50m to 10.50m thick. SPT 'N' values through the dredging deposits ranged from N=0 to 1. A more competent dried surface crust was present across all of the Cells to a depth of approximately 1m. Shear strength results from hand shear vane tests ranged from 3 to 62 KPa. Undrained shear strength results from triaxial compression tests range from 2 to 20 KPa.

5.6 A number of the boreholes were drilled through the Cell bunds, and recorded their composition. Made Ground was recorded in these boreholes at depths up to 12.10m bgl. The bunds varied in composition but broadly followed the same construction. This generally comprised varying layers of clays, silts and sands of varying composition and thickness, which appear similar to the dredging materials found within the Cells. SPT 'N' values obtained within the bund walls varied widely across the site with "N" values ranging from 0 to 22. Undrained shear strength results from triaxial compression tests range from 22 to 42 KPa.

5.7 Made Ground was also recorded within the access roadway and the quayside areas. The Made Ground in these locations mainly consisted of limestone gravel and a reddish brown, clayey gravelly sand, with the gravel being of various materials. This Made Ground was recorded at depths up to 4.00m bgl. The SPT 'N' values varied between 1 and 30.

Alluvial Clay

5.8 A clay, thought to be from an alluvial/tidal origin, is present across the whole site in varying thicknesses up to 10.90m, from near surface to 14.90m bgl. The clays are typified as consisting of dark brown and black to mottled orange, silty clay with occasional fine sand bands. SPT 'N' values in these clays ranged from 1 to 13. Shear

strength from hand shear vane tests ranged from 35 – 54KPa. Undrained shear strength results from triaxial compression tests range from 4 to 48KPa.

Peat

5.9 A peat layer, underlying the alluvial clay, was encountered in most locations, at thicknesses up to 5m at a depth of between 1.00 to 17.50m bgl. SPT 'N' values in the peat ranged from 0 to 14. Undrained shear strength results from triaxial compression tests range from 88 – 89KPa.

Transitional Zone - Alluvial Sand and Silts

5.10 Underlying the peat layer is a sequence of sands and silts at up to 6.50m in thickness, at depths of between 7.60 to 18.10m bgl. The thickness of these deposits may be gradational with the underlying sands and gravels. Where encountered, these deposits are described as light grey to brown, sandy silt to silty sand with occasional clay and pockets of peat. SPT 'N' values range from 0 to 19. Undrained shear strength results from triaxial compression tests range from 36 to 44KPa.

Fluvio-Glacial Sands

5.11 The alluvial sand and silts are underlain by Fluvio-Glacial sands generally comprised of brown sand with varying amounts of gravel and silt. Frequent sandy clay lenses are also present. Where present, the gravel is fine to coarse with occasional cobbles of basalt, sandstone, mudstone, quartz and rare coal. These sediments can be found from depths of 7.20 to 20m bgl, to depths in excess of 35m with thicknesses ranging from 1 to greater than 26m. The base of the sands appears to be deepest in the east of the site, where the base was not proven. SPT 'N' values range greatly from 6 to 50. Undrained shear strength results from triaxial compression tests on the cohesive clay lenses contained within the sands range from 45 to 74 KPa.

Glacial Till

5.12 Underlying the sands is a unit of glacial till (boulder clay) ranging in thickness from 1.00m to in excess of 15m, at a depths from 14.3 to 32.5m bgl, to below 35m bgl. The glacial till is typified by sequences of stiff, dark brown, clay with occasional sand and gravel with frequent sand lenses. SPT 'N' values in the glacial till range from 12 to 41. Undrained shear strength results from triaxial compression tests range from 32 to 315KPa.

Sandstone

5.13 Sandstone of the Permo-Triassic Sherwood Sandstone Group forms the bedrock underneath the site. This was encountered at depths between 28.50m bgl in BH07, to the west of the site, as a red sand (inferred to be the weathered bedrock), to depths greater than 35m bgl, in boreholes where rock was not encountered. Where encountered in an unweathered state, it comprised a reddish brown sandstone.

Plate Load Tests

5.14 A total of 49 plate load tests were carried out across the site, at 200m intervals along the proposed access routes. The results were then processed to provide an equivalent CBR ratio, to aid with the pavement design.

5.15 Table 2, below, provides a summary of the results included within Appendix 2D.

Table 2
Results and Location of Plate Load Tests

Area	CBR Range	Moisture Content Range
Marsh Lane	1.5 – 9.8%	6.1 – 34%
Natural Ground	2.2 – 11%	15 – 25%
Lagoons	0.1 – 4.8%	12 – 84%
Bunds	0.4 – 12%	1.7 – 49%
Quayside	6 – 37%	2.5 – 16%

Electrical Resistivity Testing

5.16 Electrical resistivity testing was carried out at 3 different electrode spacings, to provide a measurement of the apparent resistivity at 1, 3 and 10m. The tests were carried out at 5 turbine locations spread over the site and both of the proposed sub-station locations. The average apparent resistivity at 1m was measured at 7.89Ωm; at 3m was measured at 1.55Ωm and at 10m was 1.57Ωm. However, all but two of the tests carried out at the 10m spacing failed, not recording any resistance. The full results are presented within Appendix 2D.

Thermal Resistivity Testing

5.17 In-situ thermal resistivity/conductivity testing was carried out at 7 locations along the proposed electrical cable route, at a depth of 0.9m bgl. The average thermal conductivity recorded was 1.08W/mK with values ranging from 0.331 to 1.898W/mK.

Laboratory Geochemical and Geotechnical Results

5.18 Samples obtained from the cable percussive boreholes were sent for laboratory testing. Table 3, below, outlines the tests undertaken and number of samples tested.

Table 3
Number and type of laboratory test

Test	Number of Samples
Moisture content	39
Atterburg Limits	39
Particle Size Distribution	39
BRE SD1	38
Compaction	9
Consolidation	20
Undrained Unconsolidated Triaxial Shear Strength	19
Drained Consolidated Triaxial Shear Strength	7

5.19 The results of all testing are presented in Appendix 2E.

Hydrogeology

5.20 Groundwater was encountered in all but two of the trial pits in Cell 4. The water appeared to be perched within the clay, confined to certain horizons or fissures within the clayey dredging deposits. Water was encountered in these pits at between 1.5 and 2.5m bgl.

5.21 Groundwater was also recorded at depths of between 0.52m and 6.49m bgl, during monitoring of the borehole standpipes. Table 4 provides a summary of the average water levels recorded in the standpipes for each area of the site.

Table 4
Groundwater Levels

Location	Average Depth to Water (m bgl)	Minimum Depth to Water (m bgl)	Maximum Depth to Water (m bgl)
Cell 4 Lagoon	1.49	0.89	2.53
Cell 5 Lagoon	3.35	1.86	4.44
Cell 1 Lagoon	4.55	1.38	6.27
Lagoon Bund Walls	4.58	2.34	6.49
Natural Ground (Turbines 11 – 13)	0.73	0.52	1
Quayside	2.34	2.34	2.34
Hoolpool Gutter	1.93	1.90	1.96

Ground Gas

5.22 Significant concentrations of both methane and carbon dioxide were found during monitoring of the borehole standpipes. Methane was recorded at concentrations of up to 70% v/v and carbon dioxide was recorded at concentrations of up to 20.8% v/v.

5.23 Methane was recorded at all locations on the lagoons or on the bund walls. All of the locations situated outside of the lagoon areas did not record any methane.

5.24 Carbon dioxide was recorded at elevated concentrations in all boreholes apart from 3 locations, BH13, BH26 and BHMM where no carbon dioxide was recorded.

5.25 Hydrogen sulphide was recorded at one location, BH08 at a concentration of 2.3 ppm.

5.26 The full results of the gas monitoring are presented in Appendix 2C.

6 RECOMMENDATIONS AND DEVELOPMENT CONSTRAINTS

Ground Conditions

6.1 This latest phase of investigation identified the same broad sequence of strata. However the fluvio-glacial sediments were found to be generally much thicker than previously identified, up to 26m thick.

Stability of Lagoons

6.2 This latest phase of investigation has confirmed the stability issues with the lagoon bund walls as identified in the preliminary investigation.

6.3 The stability of the bunds is marginal and they should not be used to support plant and vehicle loads unless strengthening works are undertaken.

6.4 A 35m standoff distance from the bunds must be maintained to any permanent structure or construction activity unless strengthening works are undertaken to minimise any impact on their stability.

Foundations

Turbines

6.5 Nothing has been found within the latest phase of investigation that fundamentally changes the original recommendations made within the preliminary site investigation, with regard to foundations for the turbines.

6.6 The Made Ground, alluvial clay and peat are not suitable founding horizons. All turbines will require piled foundations, and substantial penetration into the fluvio-glacial or glacial till deposits will be required to obtain sufficient pile capacity to resist the turbine loads.

6.7 It was suggested in the preliminary site investigation report that 600mm driven cast in place concrete piles would be sufficient, founded at depths between 14 and 29m bgl. The conditions revealed by the Phase 2 investigations are generally more favourable for pile design than previously anticipated. Table 5, below, provides anticipated approximate pile lengths for each turbine, based on 600mm diameter piles and a pile working loads of 1550kN in compression and 400kN in tension.

Table 5
Anticipated Approximate Turbine Pile Lengths

Turbine No.	Pile Length (m)
1	24m
2	19m
3	18m
4	19m
5	20m
6	18m
7	19m
8	26m
9	19m
10	19m
11	17m
12	17m
13	15m
14	22m
15	15m
16	17m
17	14m
18	17m
19	16m
Met Mast	14m

6.8 Further clearance may be required for each pile location to mitigate the risks arising from unexploded ordnance.

6.9 The standpipes from this phase and the earlier phase of investigation will need to be fully decommissioned prior to construction in accordance with the EA guidelines.

Ancillary Buildings

6.10 Two sub-stations are required for the wind farm development. It is anticipated that these will require driven concrete piles founded into the fluvio-glacial or glacial till sediments, although not as far as the turbine foundations. It is anticipated that piling requirements are likely to be similar to those indicated for the most proximate crane foundations.

Bridge Crossings

6.11 New bridges will need to be constructed to allow for the turbine components to be transported to the site. It is anticipated that new bridges will be required as follows:

over Hoolpool Gutter;

over the buried oil pipelines between Cell 1 and Cell 2;

over the at the quayside (although it is now understood that the quayside access may not be used).

6.12 It is anticipated that these bridge crossings will require piled foundations founded within the fluvio-glacial sand or the glacial till. Piling requirements are likely to be similar to those indicated for the turbine and crane foundations.

Temporary Works

6.13 The investigation indicates that a piling mat will be required at all structure locations. This will need to be designed by the contractor to suit the piling equipment employed, but it is anticipated that a piling mat comprising of the order of 1m thickness of compacted granular material, reinforced with 2 layers of geogrid, laid on a geotextile would be required. Consideration should also be given to some form of ground improvement, (e.g. lime or cement stabilisation) as an alternative or in addition to a piling mat.

6.14 Temporary excavations will require some form of support, probably in the form of sheet piles, as previously recommended. Additional ground improvement may also be required to provide a stable base to the excavation for construction operations and also to prevent heave of the base of the excavation

Crane Pads and Bases

6.15 The loads imposed by the cranes will be substantial. Typical requirements for crane pads are for an allowable bearing pressure of 250kN/m^2 at the surface of the crane pad with settlements not exceeding 25mm. For the ground conditions on this site, this is unlikely to be achievable using conventional construction using granular fill and geogrids. We consider that either discrete piled bases will need to be provided for the cranes, or a platform supported on piles or a substantial depth of ground improvement will be required. If the piled base option is adopted, a reinforced granular mattress will also be required to act as a running surface and laydown area.

6.16 Where piled bases or a piled mattress is adopted, pile lengths are anticipated to be similar to those suggested for the turbine foundations.

Access Roads

6.17 CBR values across the lagoons were recorded during the investigation to be extremely low, at a minimum of 0.1%, only reaching a maximum of 4.8% in the more sandy areas of the lagoons. The bund walls are marginally more competent with a minimum CBR value of 0.4% Access roads will need to be designed taking into account the very low CBR values. During the most recent phase of investigation, difficulty was experienced in moving even light plant across the lagoons, and the contractor will therefore need to devise a method of working for construction of the access roads that minimises the operation of plant directly on the lagoon surface. This may be a achieved by rolling a geogrid and geotextile ahead of the access road construction and placing the initial layer of road construction by casting material forward with plant operating from previously placed material. We anticipate that 'floating road' construction will be required with a total construction thickness of the order of 1m and two or more layers of geogrid reinforcement.

6.18 Across the rest of the site, the minimum recorded CBR value was 1.5%, and it is possible that a reduced thickness of road construction could be adopted in those

areas, although we would anticipate that the construction thickness would be not less than 750mm with a basal reinforcement layer.

Access Ramps

6.19 It is envisaged that three access ramps will be required to gain access up onto the lagoons, one up onto Cell 4 from Lordship Lane, one from Cell 5 up onto the bund wall and another from Cell 5 towards Cell 1. These will be substantial structures with a maximum height of the order of 8m, with respect to the access onto Cell 4. In view of the poor foundation conditions across the site, it is anticipated that these embankments would need to be constructed with a restricted filling rate to control generation of excess pore pressures in the foundation, in order to ensure stability. Ground improvement, including the use of vertical band drains to accelerate consolidation of the underlying ground, or vibrated concrete columns to support the base of the embankment, may be required. Alternatively, the embankments may be constructed using lightweight fills, such as expanded polystyrene fill.

Quayside Area

6.20 It was proposed that the adjacent Manchester Ship Canal and existing quayside be utilised to bring in turbine components by barge. This will require extensive re-engineering of the quayside area to provide a large enough laydown area for the components and to support the loads from cranes and other plant. As part of this, a piled reinforced concrete pad will be required to protect the oil pipelines which pass underneath the quayside, and ensure that loads from components, plant and vehicles do not surcharge the existing quay structure. In addition to this, a bridge will be required to be constructed over the large drainage ditch (and ammonia pipeline) behind the quay. It is also possible that the over ground ammonia pipeline to the GrowHow plant will obstruct movements in this area and will need to be moved.

Ground Gas

6.21 Initial gas monitoring as part of this phase of the investigation has confirmed the presence of high concentrations of both methane and carbon dioxide across the site. This will need to be taken into account during design of structures and temporary excavations, to reduce the risk of a dangerous accumulation of gas.

Contamination

6.22 No contamination sampling, either water or soil, was undertaken for this phase of investigation for the wind farm. As previously stated, no gross contamination exists on site which is expected to pose a risk to human health or controlled waters.

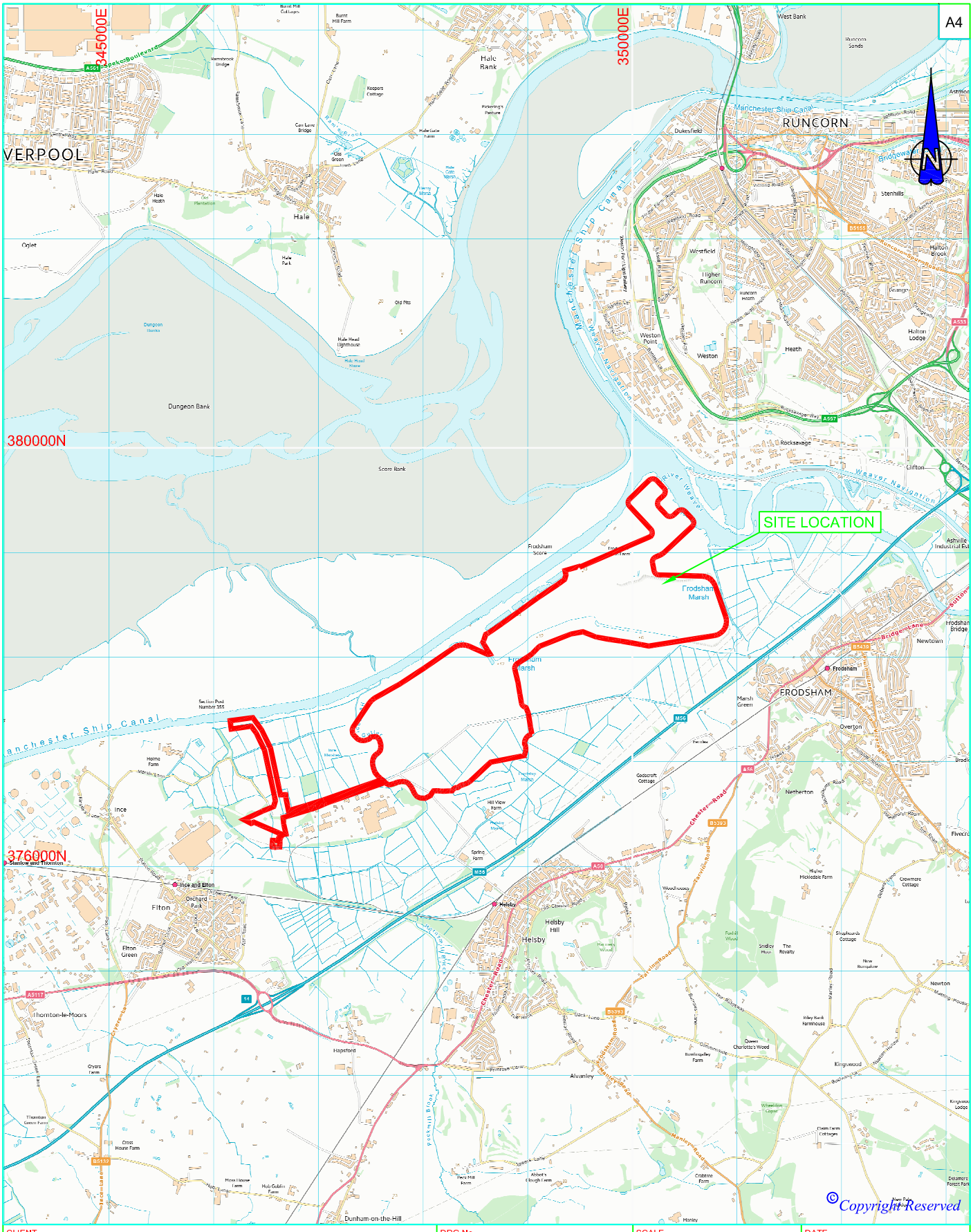
7 CONCLUSIONS

7.1 An intrusive site investigation has been carried out at the site in order to determine the nature of the prevailing ground conditions, to aid in the detailed design of a proposed wind farm on the site.

7.2 Boreholes, trial pits, thermal and electrical resistivity testing, plate load tests, laboratory geotechnical testing and monitoring of ground gas and water have all been undertaken to gain data to support the design of the wind farm.

7.3 The results have been compared to the recommendations previously given, in the Preliminary Site Investigation report (Wardell Armstrong, 2014). The results largely support these recommendations with minor technical amendments made on the basis of the new data.

7.4 There are no overriding geotechnical constraints on the project, despite the challenging ground conditions, which cannot be overcome with the employment of appropriate engineering solutions, as recommended in this report.



CLIENT	Peel Wind Farm (Frodsham) Ltd	DRG No. ST13418-004	SCALE 1:50,000	DATE 11/12/13
PROJECT	Geo-environmental Assessment Frodsham Wind Farm, Cheshire	DRAWN BY SJB	CHECKED BY RB	APPROVED BY RB
DRAWING TITLE	Site Location	wardell armstrong your earth our world		

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INSET 1
SCALE 1:2500

BH20 BH20A BH21A BH21 BH22
47 48 49

Manchester Ship Canal

CELL 1 CELL 2 CELL 3 CELL 4 CELL 5 CELL 6

PREFERRED LOCATION OF COMPOUND

LORDSHIP LANE

HGV ACCESS

INSET 2
SCALE 1:2500

R28 42 BH32 BH31 41

OS DATA PROVIDED BY CLIENT

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KEY

- SITE BOUNDARY
- PROPOSD TURBINE LOCATION AND TURBINE NUMBER
- SUBSTATION
- CP37 CABLE PERCUSSION BOREHOLES
- R19 SOIL RESISTIVITY TEST (UNDERTAKEN AT TURBINE AND SUB-STATION POSITIONS)
- 42 CBR LOCATION
- 45 WINDOWLESS SAMPLING LOCATIONS
- TP01 TRIAL PIT LOCATIONS
- PIPELINES & STANDOFF (ESSAR OIL (GREY STAR) UK. 01539 624845 ROBIN PALMER)

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D
B	SI LOCATIONS UPDATED	15/01/15	SJB	CS	CS
A	Issued for Contract	07/08/14	SJB	CS	CS

CLIENT
Peel Energy

PROJECT
Geo-environmental Assessment
Frodsham Wind Farm, Cheshire

DRAWING TITLE
Access Routes and Oil Pipeline

DRG No.	SCALE	DATE
ST13418-008	1:10,000 @ A1	26/06/14

DRAWN BY	CHECKED BY	APPROVED BY
SJB	CS	CS

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KEY

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345000E 346000E 347000E 348000E 349000E 350000E 351000E

380000N 379000N 378000N 377000N 376000N 375000N

CELL 1 CELL 2 CELL 3 CELL 4 CELL 5 CELL 6

Manchester Ship Canal

LORDSHIP LANE

Mud Ince Banks Sand and Mud Score Banks

OS DATA PROVIDED BY CLIENT

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REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D
A	First Issue	15/01/15	SJB	CS	CS

CLIENT: Peel Energy

PROJECT: Geo-environmental Assessment
Frodsham Wind Farm, Cheshire

DRAWING TITLE: Phase 2 Site Investigation Layout

DRG No.	SCALE	DATE
ST13418-011	1:10,000 @ A1	17/12/14

DRAWN BY	CHECKED BY	APPROVED BY
SJB	CS	CS

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		LIVERPOOL	TEL 0151 494 5431

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Explosive Ordnance Threat Assessment in respect of Frodsham Wind Farm, Cheshire

For
Wardell Armstrong

5057TA

5th August 2013

BACTEC

BACTEC International Limited

Tel: **Fax:**

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Glossary of Terms

Executive Summary

The Site:

Proposed Works:

Risk Assessment Methodology:

Explosive Ordnance Risk Assessment:

Medium-High **High Risk Zones**

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Bomb Penetration Assessment:
12m

Risk Mitigation Measures:

All works

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Shallow Intrusive Works

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Deep Intrusive Works

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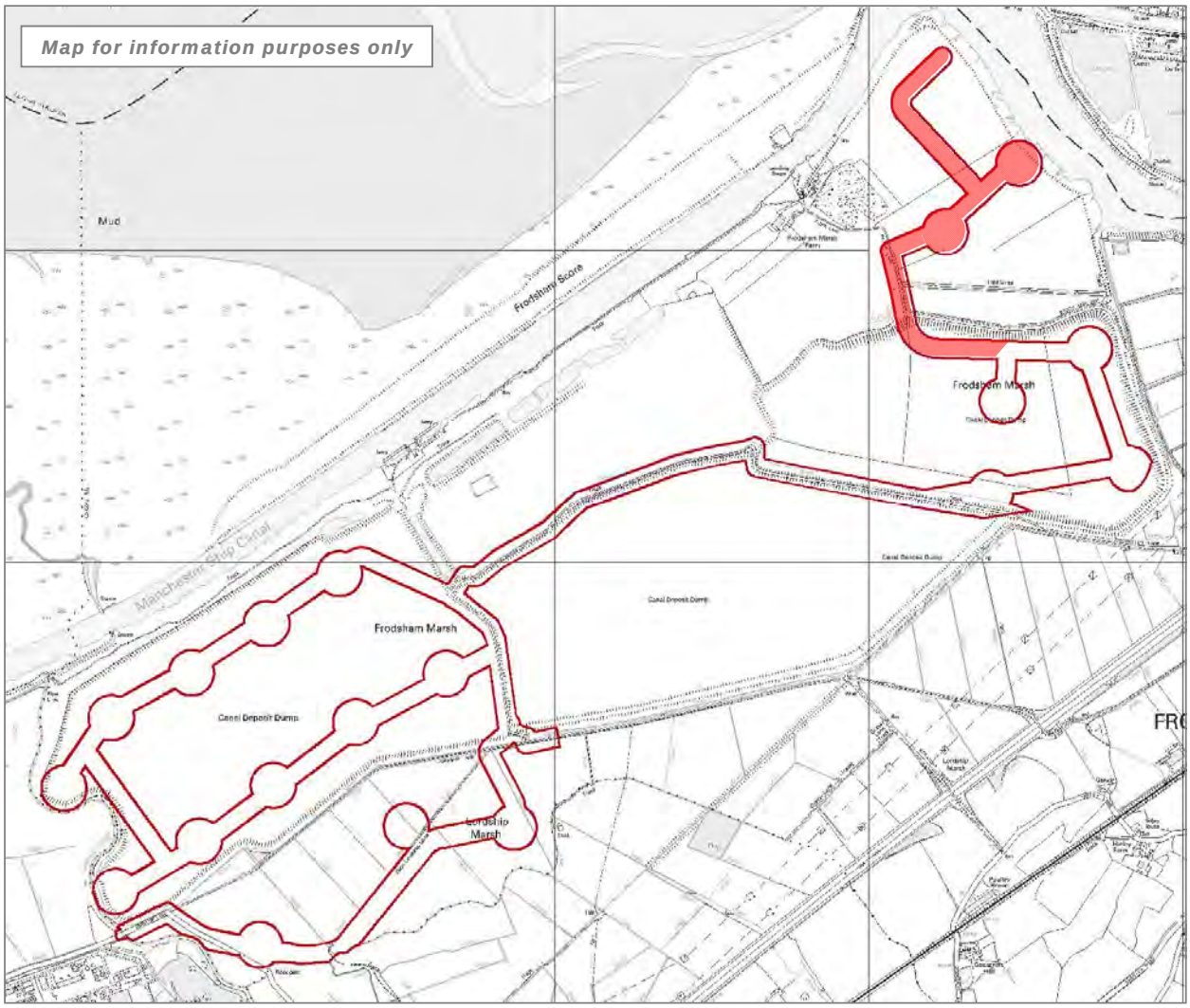
Risk Map



High Risk Zone -

Medium-High Risk Zone –

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2. Construction Industry Duties and Responsibilities

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3. The Role of the Authorities and Commercial Contractors

4. This Report

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5. The Site

6. Scope of the Proposed Works

7. Ground Conditions

8. Site History

Ince Marshes

Grinsome Farm

Frodsham Marsh Huts Moorditch Lane

[1] Latest pre-war and earliest post-war.

Canal Deposit Dump *Tramway*

9. The Threat from Aerial Bombing

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Record of German Ordnance Dropped on the Rural District of Runcorn	
Items Per 1,000 Acres	**4.5**

- o
- o
- o
- o

officially

Ref No.	Ordnance	Location	Approximate Distance From Site

o

o

o

12m

10. The Threat from Allied Military Ordnance

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- o
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Gun type	Calibre	Shell Weight	Shell Dimensions

11. Ordnance Clearance and Post-WWII Ground Works

12. The Overall Explosive Ordnance Threat Assessment

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Medium-High **High Risk**

High Risk Zone –

	Level of Risk			
Type of Ordnance	**Negligible**	**Low**	**Medium**	**High**
			*	
				*
			*	
			*	

Medium-High Risk Zone –

	Level of Risk			
Type of Ordnance	**Negligible**	**Low**	**Medium**	**High**
			*	
			*	
			*	
			*	

Bibliography

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- *Britain's Bombing Decoys of World War II*
- *The Baby Killers': German Air raids on Britain in the First World War*
- *German Air-Dropped Weapons to 1945,*
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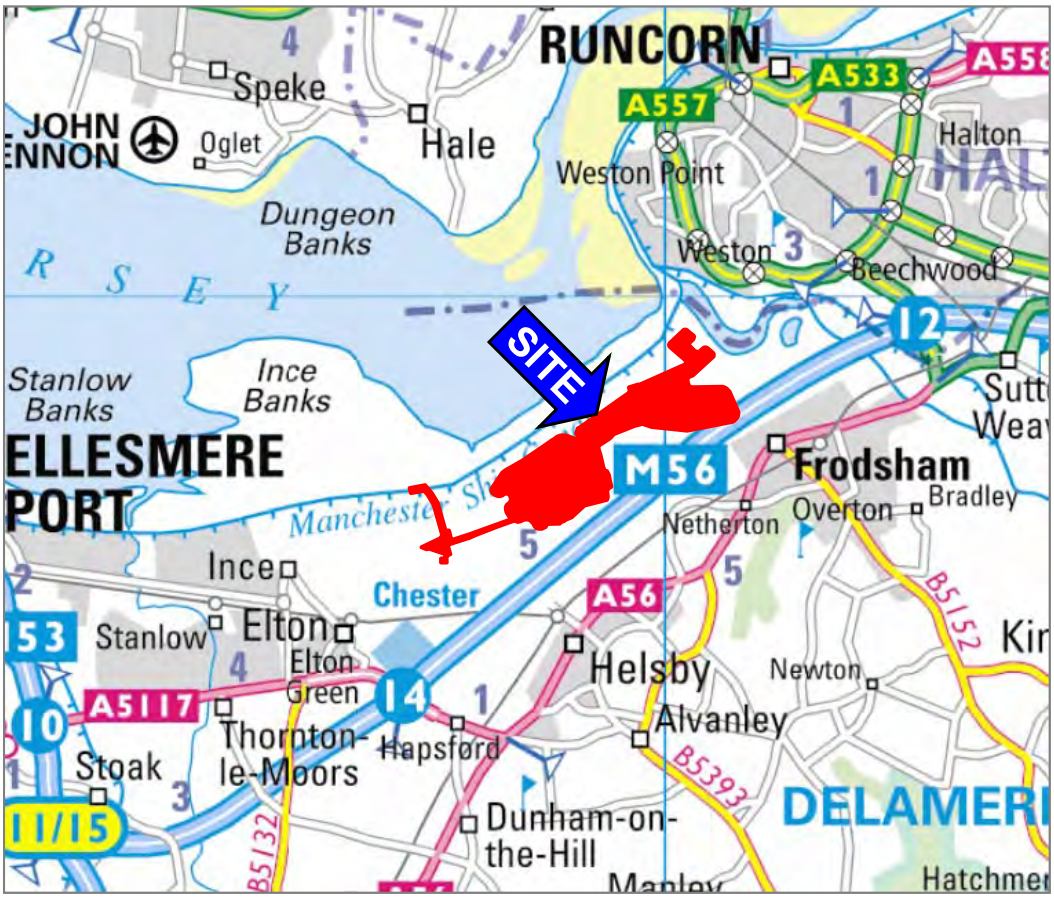
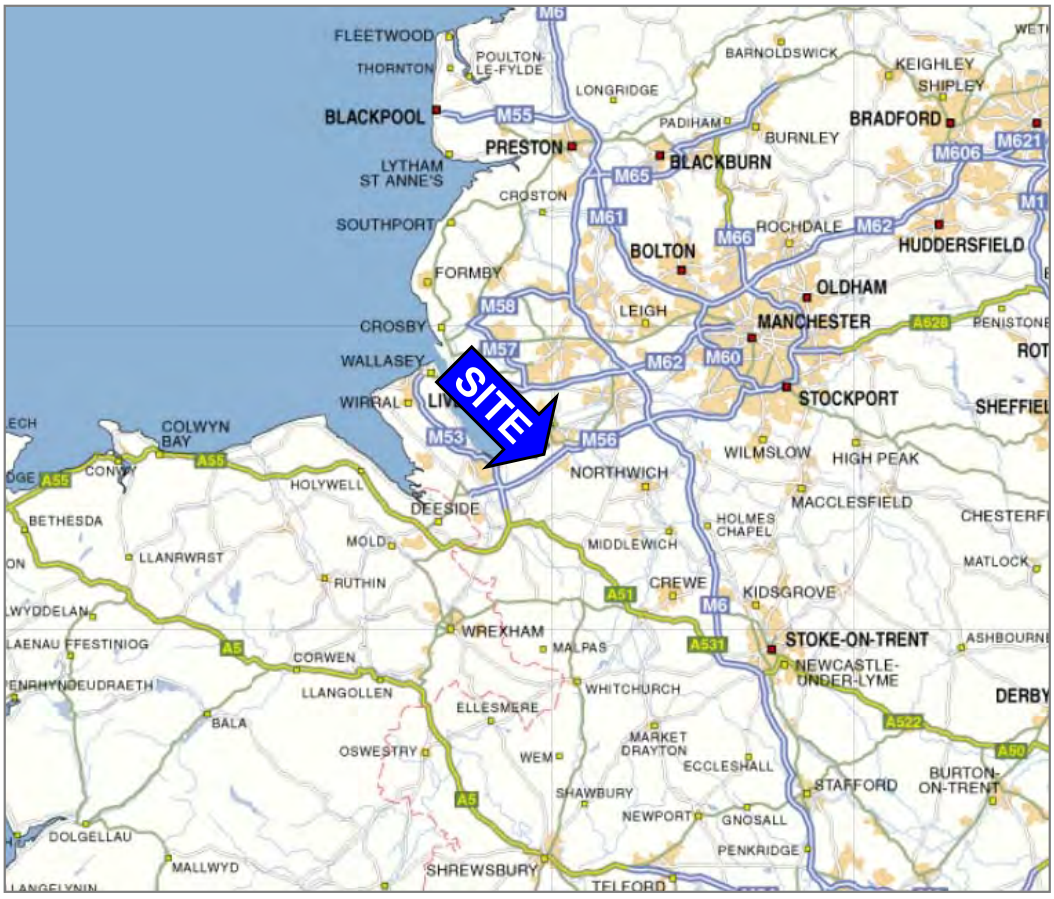
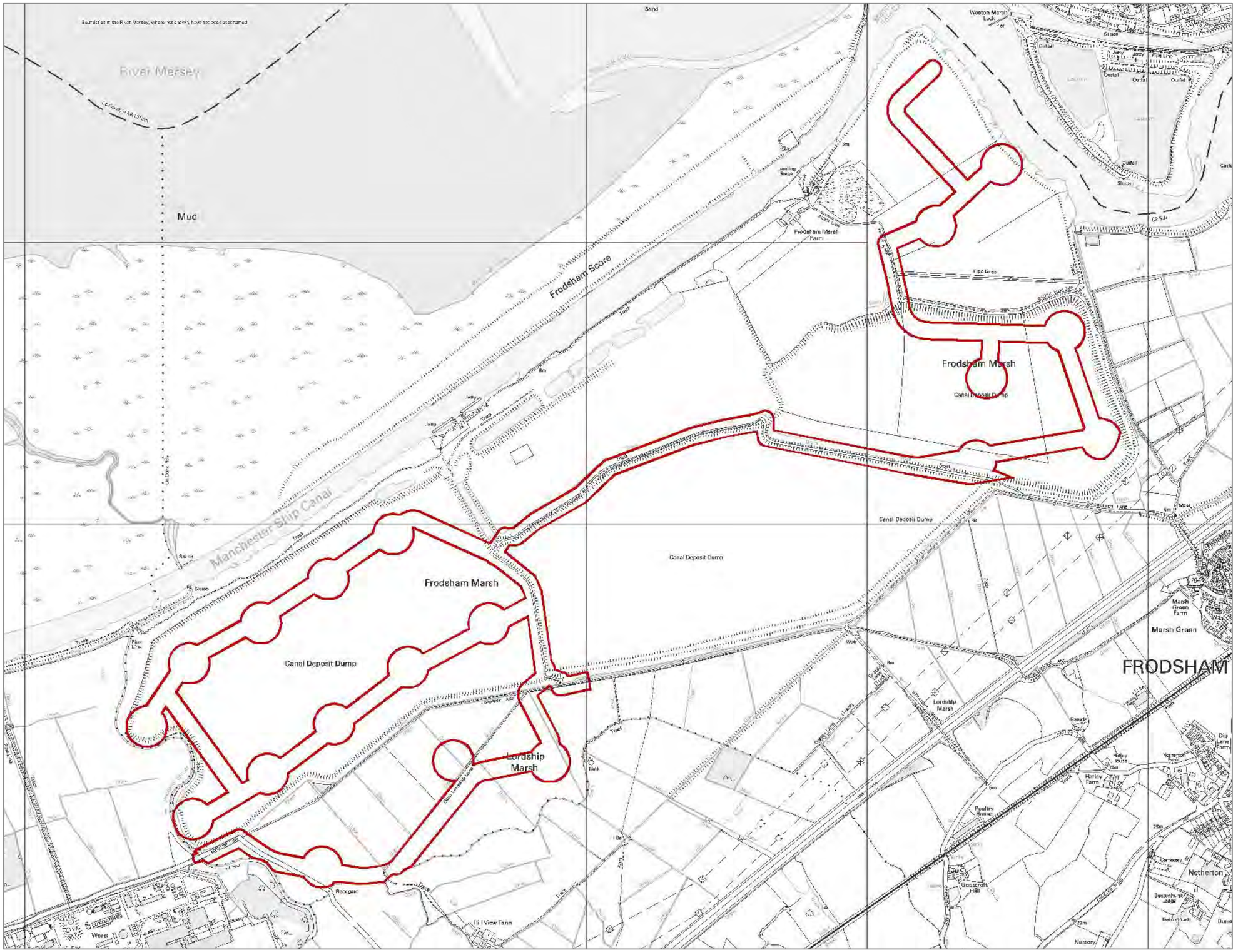
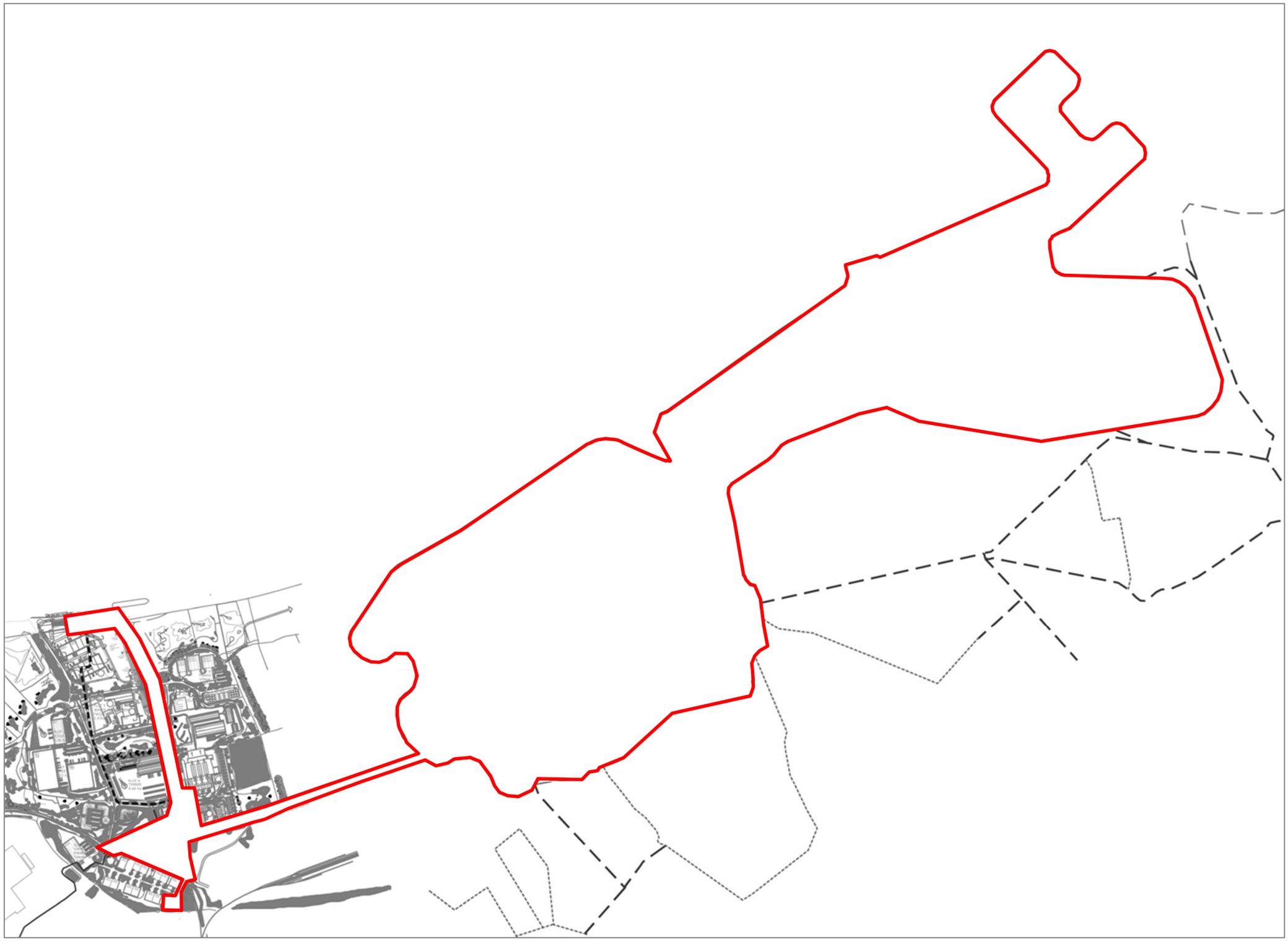
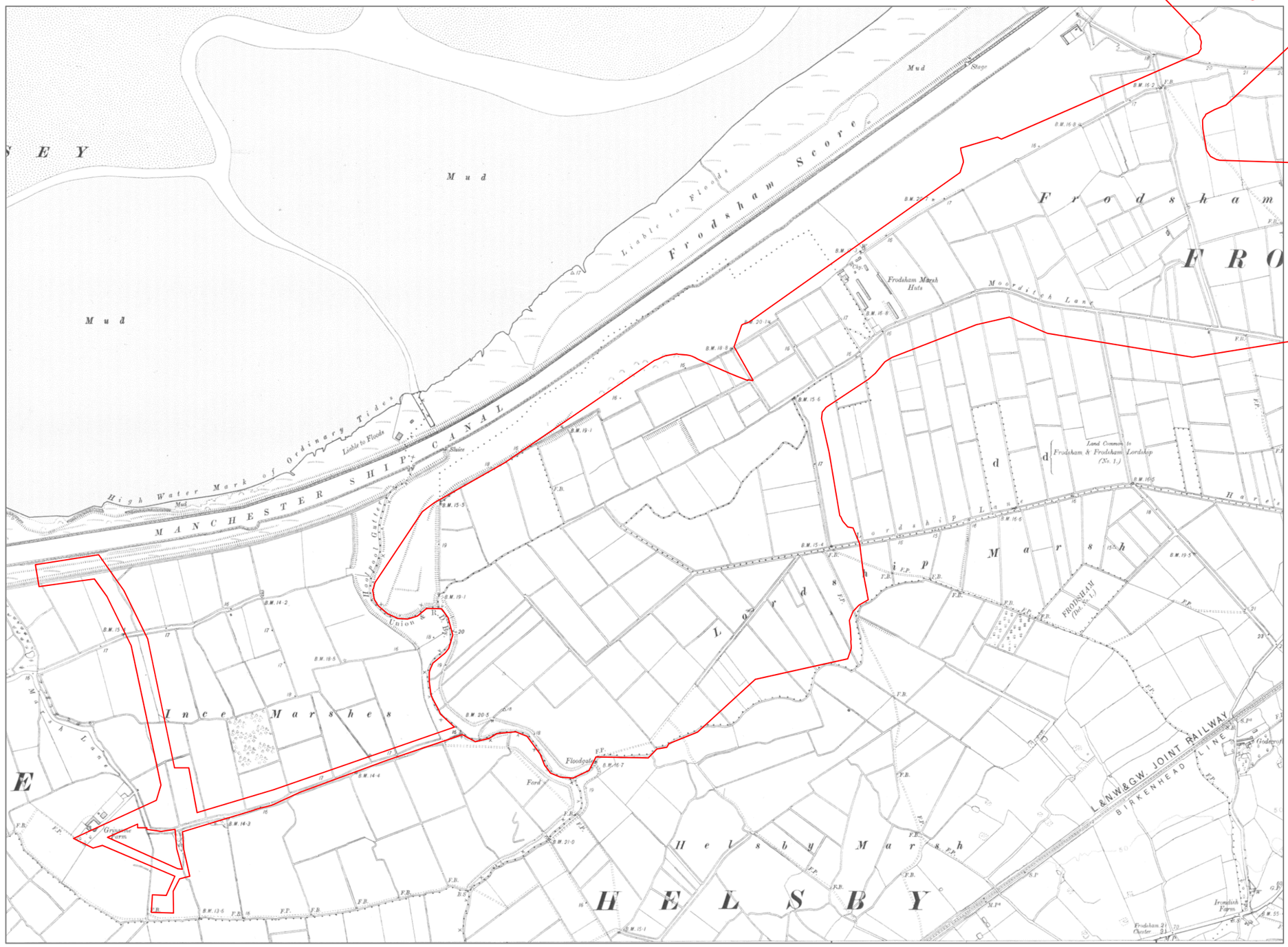
- *Blitz on Britain, The Bomber Attacks on the United Kingdom 1939 – 1945*
- *The Blitz Then and Now, Volume 1*
- *The Blitz Then and Now, Volume 2*
- *The Blitz Then and Now, Volume 3*
- *Britain Under Fire: The Bombing of Britain's Cities 1940-1945*

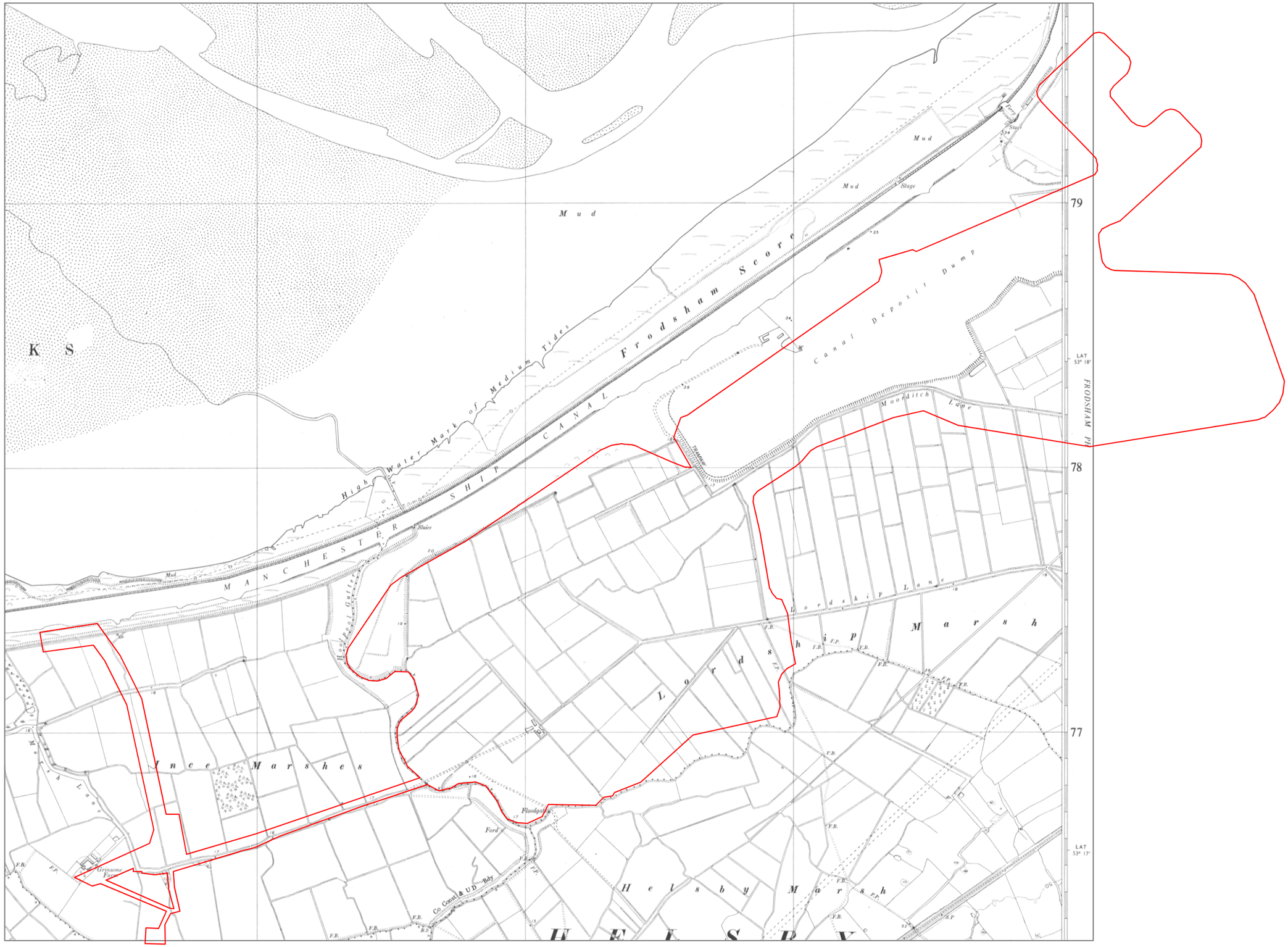

RUNCORN
A533
A557
Speke
Hale
Oglet
Halton
Weston Point
Dungeon Banks
Weston
Beechwood
SITE
Stanlow Banks
Ince Banks
ELLESMERE PORT
M56
Frodsham
Netherton
Overton
Bradley
Ince
Chester
A56
Stanlow
Elton
Elton Green
Helsby
Newton
A5117
Thornton-le-Moors
Hapsford
Alvanley
Stoak
Dunham-on-the-Hill
B5132
B5393
DELAMERE
Hatchmere


FLEETWOOD
THORNTON
POULTON-LE-FYLDE
BARNOLDSWICK
KEIGHLEY
SHIPLEY
LONGRIDGE
BLACKPOOL
PADIHAM
BURNLEY
BRADFORD
PRESTON
BLACKBURN
LYTHAM ST ANNE'S
CROSTON
SOUTHPORT
ROCHDALE
HUDDERSFIELD
BOLTON
FORMBY
OLDHAM
LEIGH
CROSBY
MANCHESTER
WALLASEY
SITE
WIRRAL
STOCKPORT
COLWYN BAY
WILMSLOW
HIGH PEAK
NORTHWICH
HOLYWELL
MACCLESFIELD
DEESIDE
BETHESDA
HOLMES CHAPEL
MOLD
MIDDLEWICH
LLANRWST
RUTHIN
CREWE
KIDSGROVE
WREXHAM
MALPAS
STOKE-ON-TRENT
CORWEN
NEWCASTLE-UNDER-LYME
LLANGOLLEN
WHITCHURCH
ELLESMERE
BALA
MARKET DRAYTON
OSWESTRY
WEM
ECCLESHALL
STAFFORD
BURTON-ON-TRENT
SHAWBURY
NEWPORT
GNOSALL
DOLGELLAU
PENKRIDGE
MALLWYD
SHREWSBURY
TELFORD

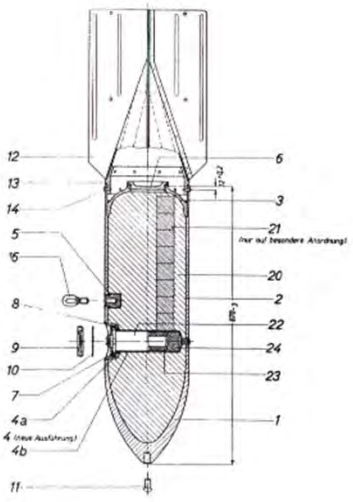

River Mersey
Mud
Sand
Frodsham Score
Manchester Ship Canal
Frodsham Marsh
Canal Deposit Dump
Lordship Marsh
Frodsham Marsh Ferry
Weston Marsh Lock
Canal Deposit Dump
Frodsham Marsh
Canal Deposit Dump
Marsh Green
FRODSHAM
Netherton
Pipe Lines
Sluice
Outfall
Jetty
Slipway
Tank
Track
Ditch
Bridge
Pond
Works
Nursery
Poultry House
Gatecroft Hall
Marsh Green Farm
Hartley Farm
Hartley House
Lordship Marsh
Ganage
Dip Lane Farm
Beechmarsh Lodge
Beechmarsh
Dunes
Recreation
Hill View Farm




Mud
Stage
Frodsham Score
Liable to Floods
Mud
Mud
High Water Mark of Ordinary Tides
Liable to Floods
Sluice
MANCHESTER SHIP CANAL
Frodsham Marsh Huts
Moorditch Lane
Land Common to Frodsham & Frodsham Lordship (No. 1.)
Frodsham Marsh
FRODSHAM (Dist. No. 1.)
Union Drain
Ince Marshes
Floodgate
Ford
Helsby Marsh
HELSBY
L&NW&GW JOINT RAILWAY
BIRKENHEAD LINE

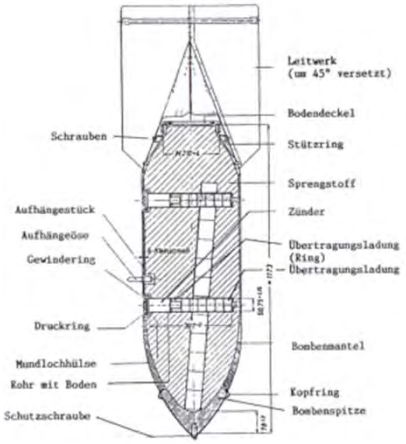

Mud
Mud
Mud
Stage
Frodsham Score
High Water Mark of Medium Tides
MANCHESTER SHIP CANAL
Canal Deposit Dump
Moorditch Lane
Lordship Marsh
Lordship Marsh
Hollow Gutter
Sluice
Mud
Mersey Lane
Jnce Marshes
Ploodgate
Ford
Grinsome Farm
Co. Count & U.D. Bay
Helsby Marsh
79
78
77
LAT 53° 18'
LAT 53° 17'
FRODSHAM PH

SC 50



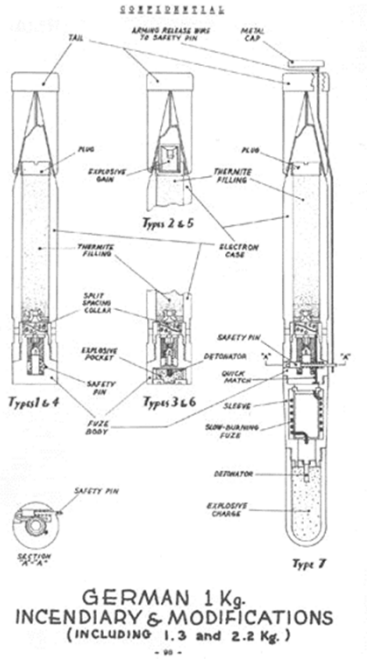
SC-50 JA (Güteklasse 1)

SC 250



SC-250 JA (Güteklasse I)

1kg Incendiary Bomb



GERMAN 1 Kg.
INCENDIARY & MODIFICATIONS
(INCLUDING 1.3 and 2.2 Kg.)

1st September 2012	Unexploded World War II Device
31st August 2012	Suspected Unexploded Weapon
11th August 2012	Unexploded Bomb
28th July 2012	'unexploded shells'
10th July 2012	Unexploded WWII Bomb
8th April 2012	large WWII Mine
5th March 2012	WWII shell found
21st February 2012	Two WWII bombs
9th January 2012	WWII shell uncovered
13th October 2011	WWII grenades

SKY NEWS Website of the Year — FIRST FOR BREAKING NEWS

M62 Motorway Closed For Detonation Of World War Two Bomb

5:04pm UK, Friday January 04, 2008

A busy motorway has been closed to allow for a wartime bomb to be detonated nearby.

The controlled explosion

Army expertsdestroyed the huge Second World War device in a controlled explosion near the M62.

The motorway was shut in both directions between junctions 37 and 38 as a safety precaution.

The "deeply buried" bomb had lain dormant in an East Yorkshire field for almost 64 years.

The device was discovered by a metal detecting enthusiast on New Year's Eve in a field near the B1230 at Balkholme, near Howden, which was also closed.

An Army bomb disposal team travelled up from Essex to join police, ambulance and fire services and utility companies at the scene.

Captain Tim Ives, of 33 Engineer Regiment, earlier said 10 soldiers would be employed to "reduce the effects of the controlled explosion by packing sand around the device".

Page last updated at 14:45 GMT, Friday, 22 May 2009 15:45 UK

E-mail this to a friend Printable version

Building site WWII bomb exploded

Building site WWII bomb exploded

A controlled explosion has been carried out on a World War II bomb found on a building site in East Sussex.

The 110lb (50kg) SC50 bomb, thought to have been dropped from a German aircraft in 1940 or 1941, was found at the Hollenden House site in Bexhill.

Children at St Peter and St Paul Primary School next door in Buckhurst Road were sent home early after the discovery on Thursday.

Police said a 160ft (50m) cordon was put round the site during the blast.

BBC

14:23 GMT, Thursday, 5 June 2008 15:23 UK

E-mail this to a friend Printable version

Unexploded bomb 'started to tick'

An unexploded World War II bomb started to tick and ooze liquid as experts tried to defuse it, police have said.

The large bomb was found in a river at Sugar House Lane, near Bromley-by-Bow Tube station in east London, on Monday.

Rush-hour travel was disrupted as overnight work to make the bomb safe continued into Thursday morning.

Police commander Simon O'Brien said: "It started to tick and ooze some pretty horrible substances." It stopped ticking when doused with liquid.

'Hero colleague'

"It measures approximately the size and length of a man, and weighs around 1,000kg (2,200lb).

International FRIDAY, 16 SEPTEMBER, 1994 23

Blown up by history

RESCUE workers search for survivors after a Second World War bomb exploded at a building site in Berlin, killing three people and injuring at least eight others.

A fire brigade spokesman said he feared the final death toll could be higher. One worker was still missing, believed to be trapped under a machine. "We've found human remains 100 metres away but we can't tell if they belong to the dead already found," the spokesman said.

The blast, set off by drilling work on Frankfurter Allee, one of east Berlin's busiest avenues, trapped workers under building machinery and sent huge chunks of concrete tumbling through the air.

A large office block was being built on the site of the explosion which sent shoppers scrambling for shelter and paralysed dense afternoon traffic. One eyewitness said: "There was a bang, then silence, and then it started raining stones and dirt."

Dozens of cars within a 250-metre radius were wrecked and the top two floors of a nearby apartment block caved in.

Radio reports claimed that the total number of injured stood at 14.

BBC Home News Sport Weather iPlayer TV Radio More...

NEWS LIVE: BBC NEWS CHANNEL

Page last updated at 14:37 GMT, Wednesday, 2 June 2010 15:37 UK

World War II bomb kills three in Germany

Three people have been killed and six injured trying to defuse a World War II bomb in central Germany.

Workers building a sports stadium had earlier unearthed the bomb in the town of Goettingen.

It was not immediately clear why the bomb, reportedly weighing 500kg (1,100lb), had detonated.

Unexploded WWII bombs dropped by Allied planes are frequently found in Germany, though it is unusual for them to explode unexpectedly.

A special commission is investigating the causes of the explosion, while prosecutors are considering whether the team leader should face charges of manslaughter through culpable negligence, the BBC's Oana Lungescu reports from Berlin.

More than 7,000 people were immediately evacuated when the 500kg bomb was found. Several schools, a kindergarten and local companies remain closed.

Last week, another device was successfully defused close to the site.

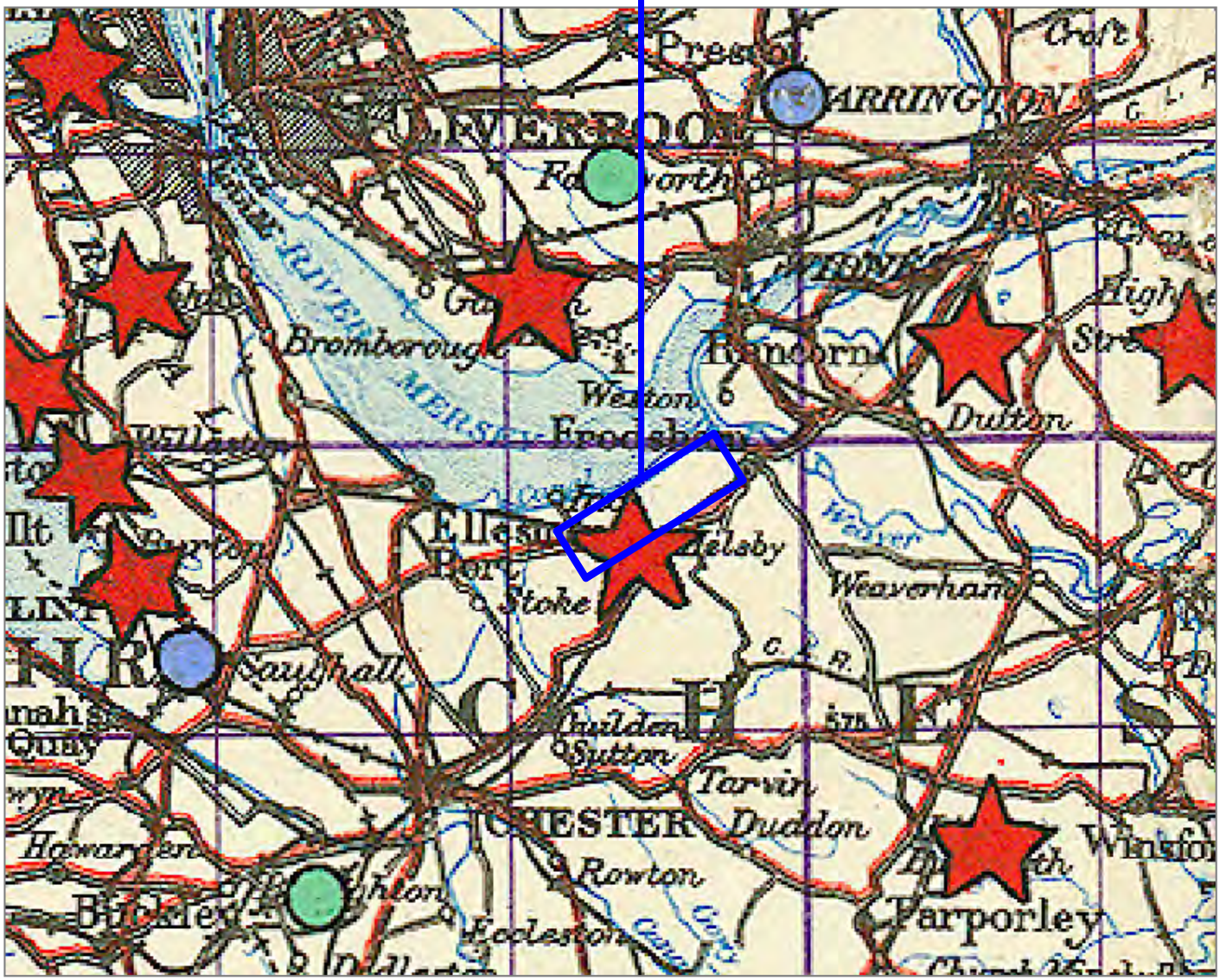
In Berlin, four bombs have been found in the past two months, including one near the capital's main airport.

Top Left:
Bottom Left:
Top Right:

Middle Right:

Bottom Right:

General site location



KEY

Q Site	●
SF (with or without QL)	★
QF (with or without QL)	●
Cover Plan Site	●
K Site (with or without Q)	⊕
Dummy Buildings	▲

Study area boundary
Abandoned bomb - 1 x 3.7inch AA Shell, Frodham Marshes.
Abandoned bomb - 1 x 3.7inch AA Shell. Clifton Hall Farm.
Pillbox
HAA Battery
HAA Battery
Bombing Decoy Sites

BAC TEC

North

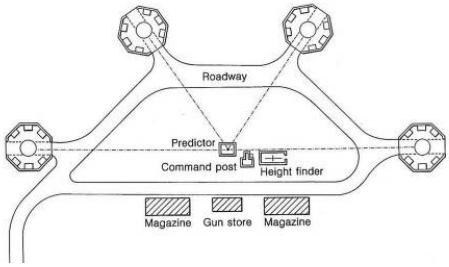
North

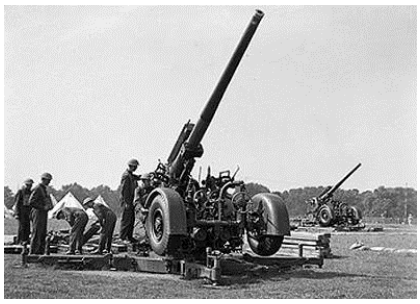
BAC TEC

North

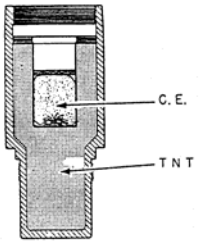
BAC TEC

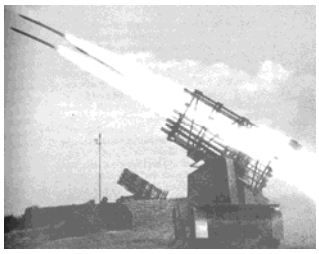
3.7 inch Anti-Aircraft Projectile

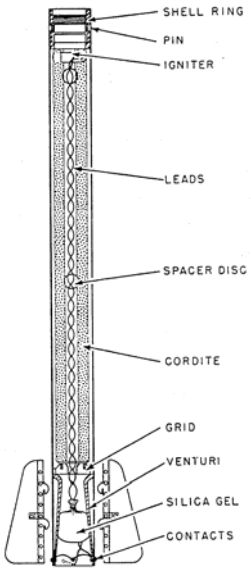




Rockets / Unrotated Projectiles

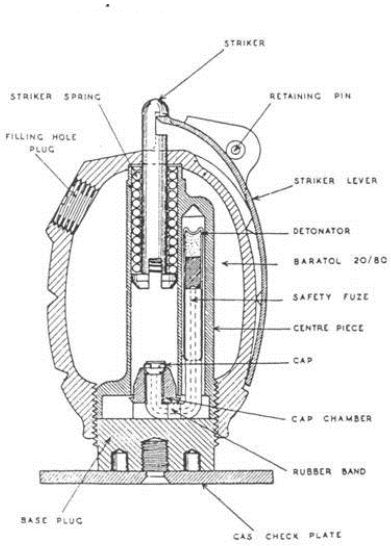






40mm Bofors Gun Projectile

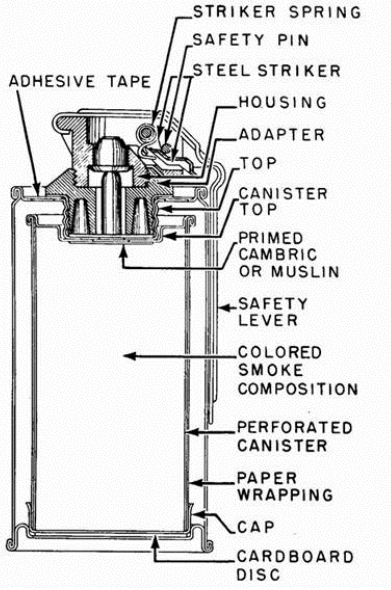
No. 36 'Mills' Grenade



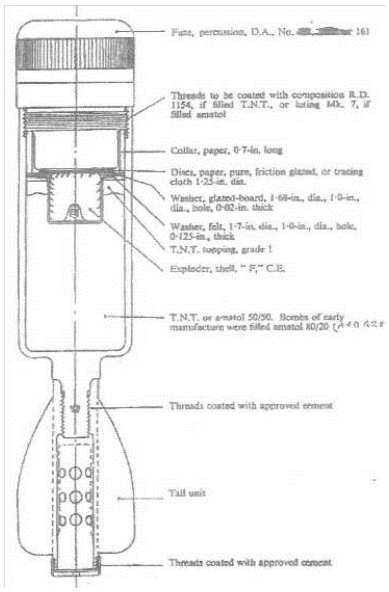
Grenade, .303 inch rifle, No. 36M, Mark I.

No. 69 Grenade

Typical Smoke Grenade

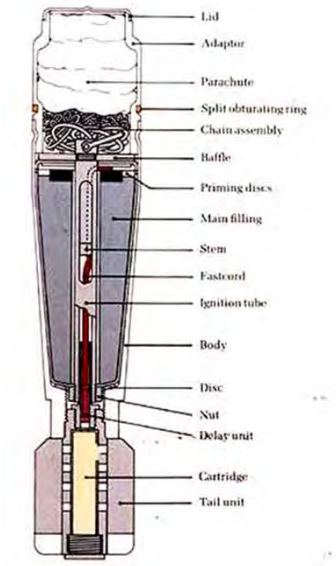


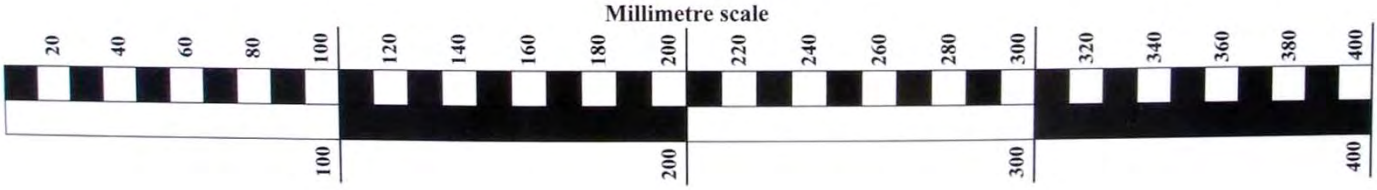
Typical 2 inch High Explosive Mortar



Typical 3 inch Smoke Mortar

Typical 2 inch Illuminating Mortar




Millimetre scale
20
40
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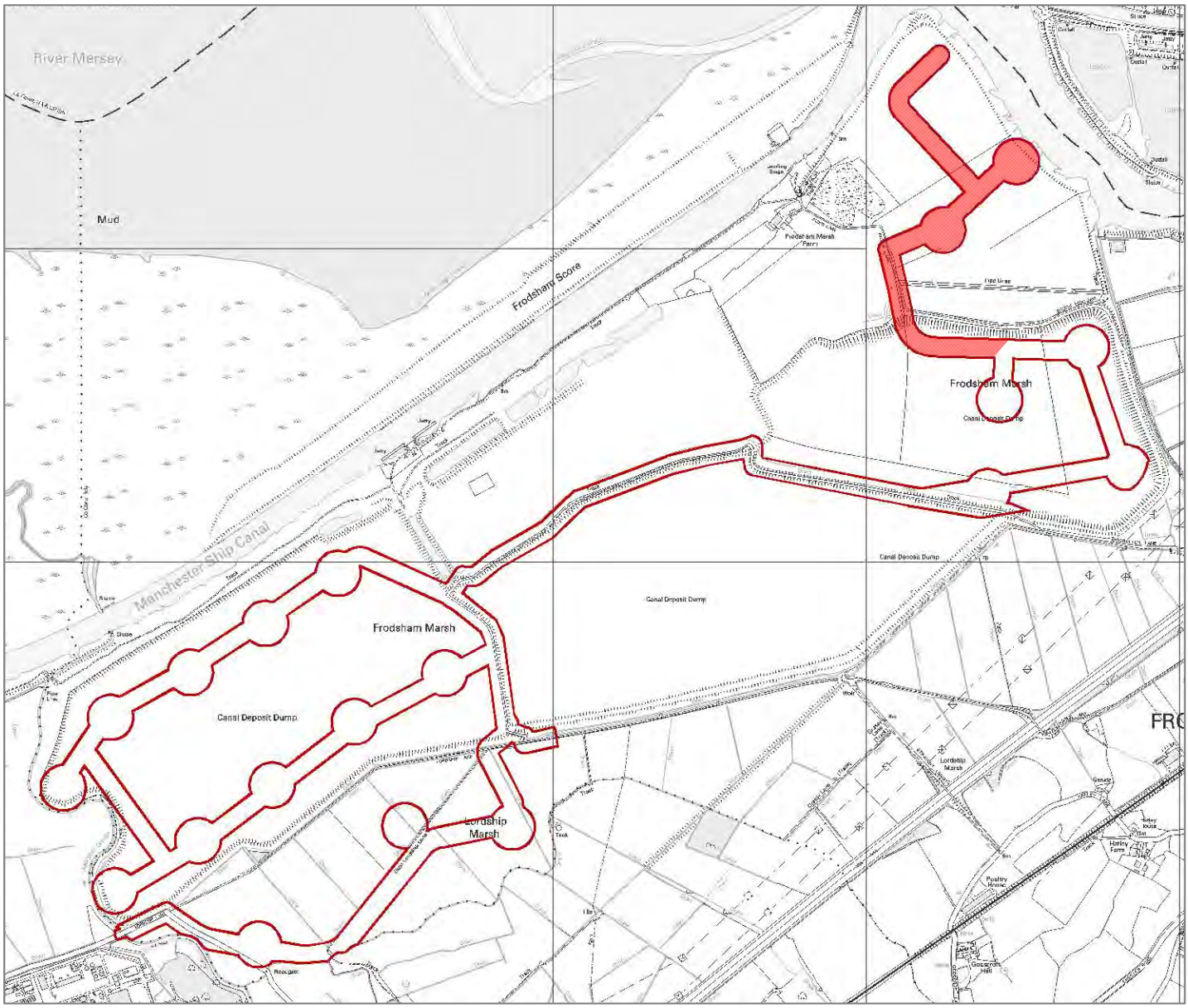
380
400

Map for information purposes only



High Risk Zone

Medium-High Risk Zone

BACTEC International Limited

Website: www.bactec.com

BACTEC

December 2014

Carried out for:
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December 2014

[redacted]

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Page

2.1 Location and Description 1
2.2 Published Geology 2

3.1 Exploratory Holes 2
3.2 Groundwater and Gas Monitoring 3
3.3 In Situ Testing 3

In August 2014 Environmental Scientifics Group (ESG) was commissioned by Wardell Armstrong LLP (WA), on behalf of Peel Wind Farms (Frodsham) Ltd (PWF), to carry out a ground investigation near Frodsham, Cheshire. The investigation was required to obtain geotechnical information for a proposed wind farm.

The scope of the investigation was specified by WA and comprised cable percussion boring, dynamic sampling, trial pits, In situ testing and laboratory testing. The investigation was performed in accordance with the contract specification, and the general requirements of BS 5930+A2 (2010), BS EN 1997-2 (2007), BS EN ISO 22475-1 (2006) and other relevant related standards identified below. The fieldwork took place between 18 August and 2 October 2014.

This report presents the factual records of the fieldwork and laboratory testing. The information is also presented as digital data as defined in AGS (2005).

The centre of the site is approximately 3 km west of Frodsham, Cheshire, at National Grid reference SJ 488 777, see Site Location Plan in Appendix A.

The site is rectangular in shape; 3.5km by 1.3km with an area of approximately 455Ha and is within the area known as the Frodsham and Helsby Marshes. This is an area of low lying land close to the southern boundary of the River Mersey estuary. The site is bounded to the north by a strip of marshland with ponds and subsequently the Manchester Ship Canal. To the east is generally flat agricultural land, mainly used for sheep grazing next to the River Weaver. To the south is agricultural land used for arable and grazing purposes. There are generally no structures in this area with the exception of occasional farm buildings. The M56 is located approximately 1km to the south of the site.

The land to the west is also mostly agricultural with limited farm structures, with the exception of the GrowHow Chemical Plant directly to the southwest of the site off Marsh Lane. Some residential buildings are located approximately 1.5km to the west, and further to the west is the Stanlow Oil

Refinery. The majority of the site is used for the deposition of material dredged from the Manchester Ship Canal.

The deposit grounds are separated into distinct areas known as cells, which are delineated by retaining bunds. The dredging deposits have raised the level of the land above the natural level of the marshland. The land comprising the old full cells is partly used as grazing land, but some areas remain unused and have reverted vegetation, such as reed bed or scrub.

The published geological map covering the site, British Geological Survey (BGS) Sheets 97 (1977) and BGS online viewer, show the south west of the site to be underlain by the Kinnerton Sandstone Formation, the centre and north west by the Chester Pebble Beds Formation and the north east by the Wilmslow Sandstone Formation all of Triassic age. Superficial Tidal Flat Deposits are indicated across the site area. Glaciofluvial Sheet Deposits and Till are indicated to the south east and south west of the site.

The fieldwork was carried out in general accordance with BS 5930+A2 (2010), BS EN 1997-2 (2007) and BS EN ISO 22475-1 (2006).

The exploratory hole and in situ test locations were selected by WA. The locations were set out by ESG using GPS. The co-ordinates and reduced levels were surveyed by ESG to National Grid and Ordnance Datum. The exploratory hole and in situ test locations are shown on the Site Plan in Appendix A.

The exploratory holes are listed in the following table.

TABLE 1 : SUMMARY OF EXPLORATORY HOLES

Cable Percussion Boring	37	35.00	BH01 to BH33, BH01A, BH20A, BH21A and BHMM
Dynamic Sampling	49	5.45	WS 01 to WS 49
Trial Pits	56	0.90	CBR01 to CBR49 and R22 to R28

The exploratory hole logs are presented in Appendix B. These provide information including the equipment and methods used, samples taken, tests carried out, water observations and descriptions of the strata encountered. Explanation of the terms and abbreviations used on the logs is given in the Key to Exploratory Hole Records in Appendix B, together with other explanatory information. The logging of soil is in accordance with BS EN ISO 14688-1+A1 (2013), as amplified by BS 5930+A2 (2010).

Standard penetration tests (SPT) in the dynamic sample and cable percussion boreholes were carried out in accordance with BS EN ISO 22476-3+A1 (2011) and the SPT hammer energy ratio certificates are included in Appendix B. The SPT results are presented on the logs as uncorrected N values.

On completion of the fieldwork geotechnical samples were transported to the Deeside office of ESG for temporary retention, with those required for testing being transferred to the laboratory at Doncaster.

Instrumentation installed in the exploratory holes for groundwater and gas monitoring are shown on the logs and summarised in Appendix C. Records of monitoring carried out by ESG during the fieldwork period are presented in Appendix C.

In situ testing was carried out in accordance with the relevant standards as tabulated below. The testing is summarised in the following table and the results are presented in Appendix D unless noted otherwise.

TABLE 2 : SUMMARY OF IN SITU TESTING

California Bearing Ratio	49	BS 1377 (1990)
Thermal Resistivity of Soil	7	IEEE-42: Guide for Soil Thermal Resistivity Testing
Electrical Resistivity of Soil	7	Wenner Array Method

Electrical resistivity of soil was determined using the Wenner Array method. Three tests were carried out at each of the seven locations at probe spacing's of 1, 3 and 10m. The probes were rotated 90 degrees at each location for each spacing value, and an average of both results was calculated to give the value of electrical resistivity.

Geotechnical laboratory testing was scheduled by WA and was carried out in accordance with BS 1377 (1990) unless otherwise stated. The testing is summarised below and the results are presented in Appendix E.

TABLE 3 : SUMMARY OF GEOTECHNICAL LABORATORY TESTING

Moisture Content Determination	
Atterberg Limit Determination	
Particle Size Distribution Analysis	
One-Dimensional Oedometer Consolidation Testing	12nr of 21nr results completed at the time of writing this report.
Unconsolidated Undrained Triaxial Compression Testing	
Consolidated Drained Triaxial Compression (Effective Stress)	1nr of 6nr results completed at the time of writing this report.
Determination of Dry Density / Moisture Content Relationship by Heavy Compaction Method 4.5kg	
pH, Water Soluble Sulphate, Chloride, Nitrate, Acid Soluble Sulphate and Total Sulphur Content of Soil	Test methods are BS 1377 or others recognised in BRE Special Digest 1 (2005); they are indicated on the results report sheets in Appendix E.

AGS : 2005 : Electronic transfer of geotechnical and geoenvironmental data (Edition 3.1 including addendum May 2005). Association of Geotechnical and Geoenvironmental Specialists.

BGS England and Wales Sheet 97 : 1977 : Runcorn. 1:50000 geological map (solid and drift) (Bedrock and Superficials). British Geological Survey.

BGS Geology of Britain Viewer : 2014. www.bgs.ac.uk. January 2014. British Geological Survey.

BRE Special Digest 1 : 2005 : Concrete in aggressive ground. Building Research Establishment.

BS 1377 : 1990 : Methods of test for soils for civil engineering purposes. British Standards Institution.

BS 5930:1999+A2 : 2010 : Code of practice for site investigations (Amendment 2). British Standards Institution.

BS EN 1997-2 : 2007 : Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing. British Standards Institution.

BS EN ISO 14688-1:2002+A1 : 2013 : Geotechnical investigation and testing - Identification and classification of soil - Part 1 Identification and description. British Standards Institution.

BS EN ISO 14688-2:2002+A1 : 2013 : Geotechnical investigation and testing - Identification and classification of soil - Part 2 Principles for a classification. British Standards Institution.

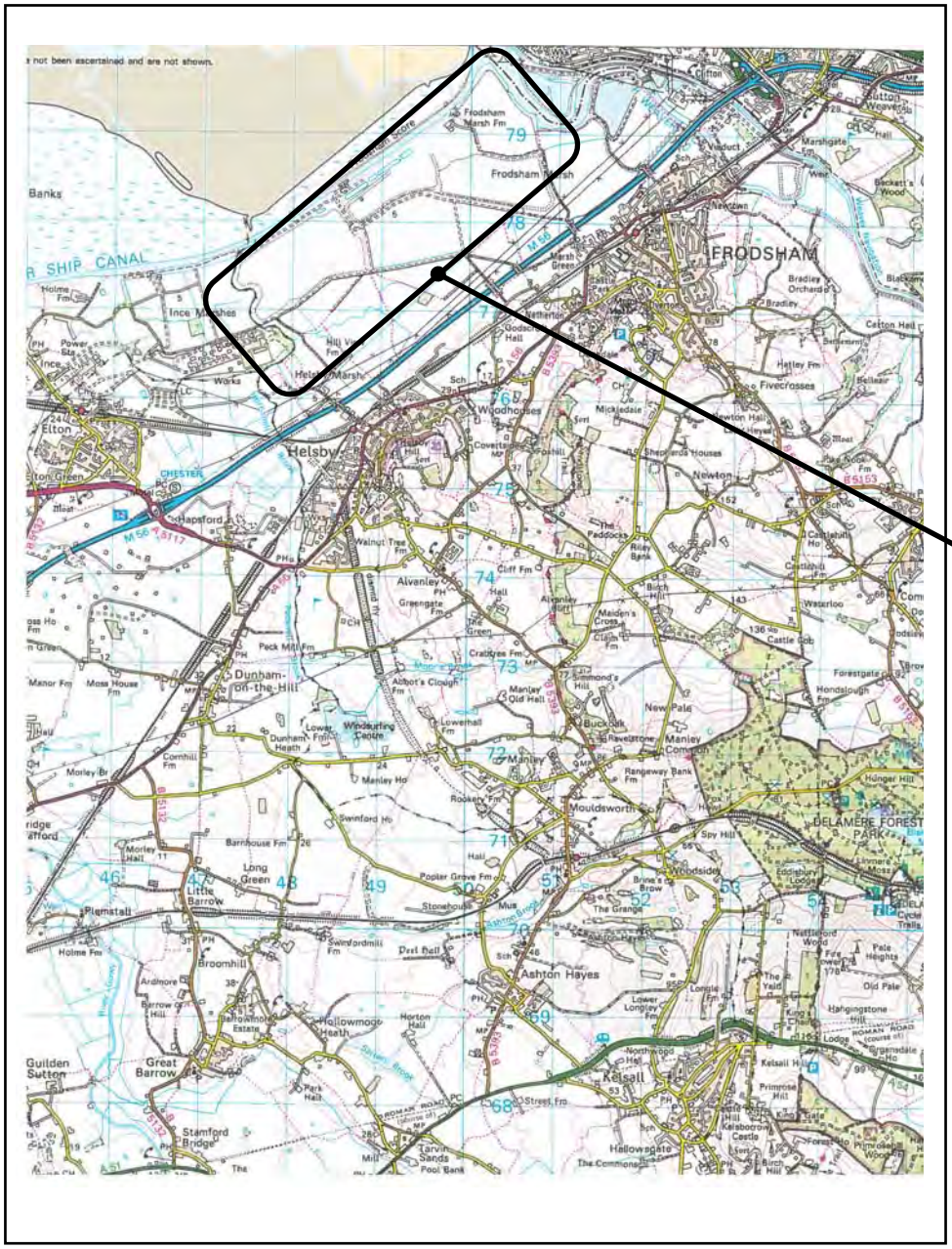
BS EN ISO 14689-1 : 2003 : Geotechnical investigation and testing - Identification and classification of rock - Part 1 Identification and description. British Standards Institution.

BS EN ISO 22475-1 : 2006 : Geotechnical investigation and testing – Sampling methods and groundwater measurements - Part 1 Technical principles for execution. British Standards Institution.

BS EN ISO 22476-3:2005+A1 : 2011 : Geotechnical investigation and testing - Field testing - Part 3 Standard penetration test. British Standards Institution.

Design Manual for Roads and Bridges (DRMB) Volume 7

Interim advice Note (IAN) 73/06



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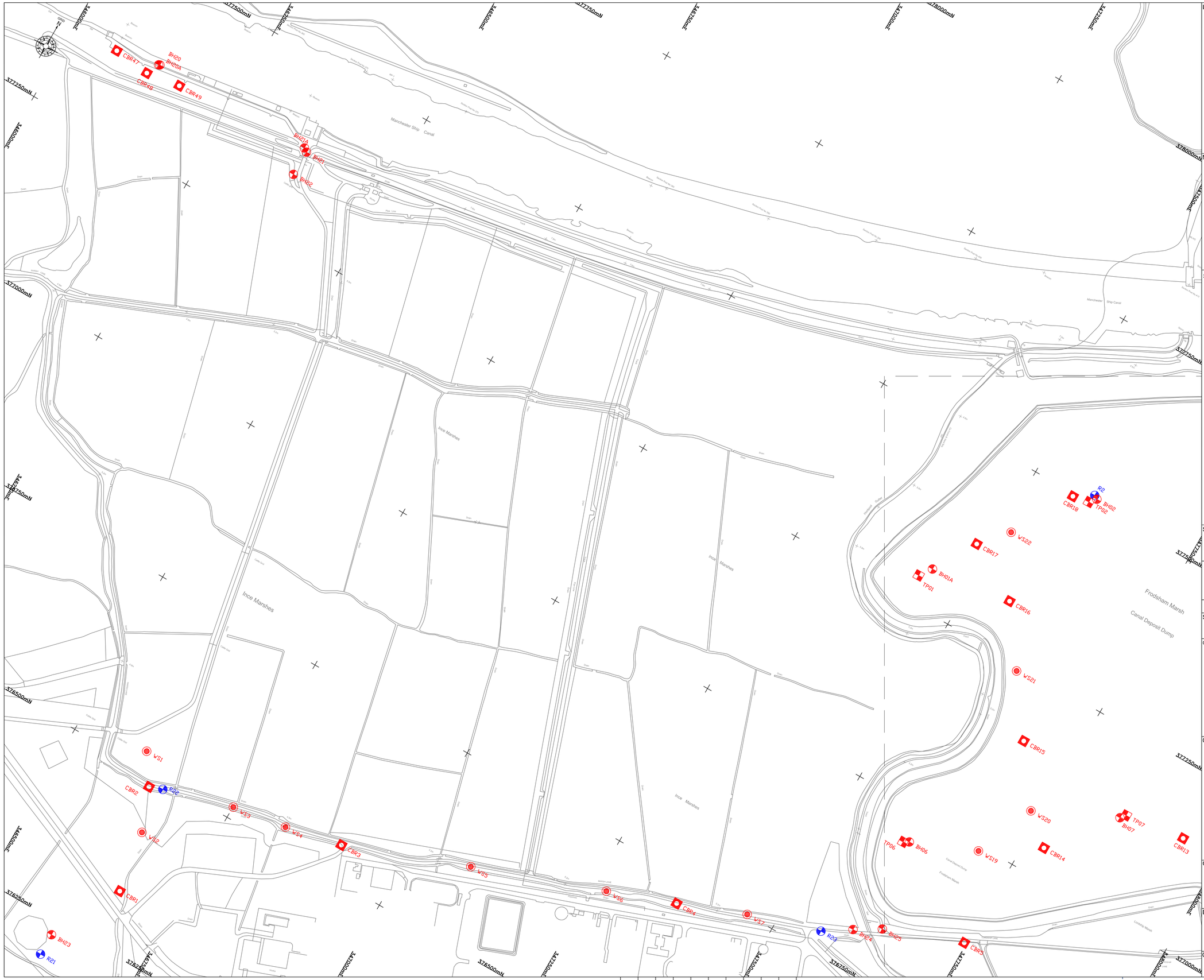

Legend:

- Denotes Borehole Location
- Denotes Electrical resistivity test location
- Denotes CBR Test Location
- Denotes Hand Dug Pit Location
- Denotes Trial Pit Location
- Denotes Window Sample Location

Notes:

1) Co-ordinates and levels related to Ordnance Survey National Grid and Datum using Leica's System 1200 dual frequency geodetic GPS receiver and SmartNet RTK correction. WGS84 position transformed using the Ordnance Survey OSTN/OSGM02 definitive transformation for the United Kingdom.

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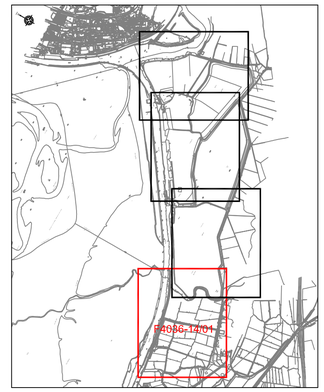

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Survey Date:	Surveyor:	Drawn By:
September 2014	TS	CMS

Client:

PEEL Energy

Engineer:

wardell armstrong

Wardell Armstrong
Sir Henry Doulton House
Forge Lane Etruria
Stone on Trent
Staffordshire
ST1 5BD

Contractor:

ESG Environmental Scientifics Group

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Fax: +44(0)1244 288100

Contract:

GROUND INVESTIGATION
AT THE PROPOSED FRODSHAM WIND FARM
FRODSHAM, CHESHIRE

DWG:

SITE PLAN
F4036-14/01

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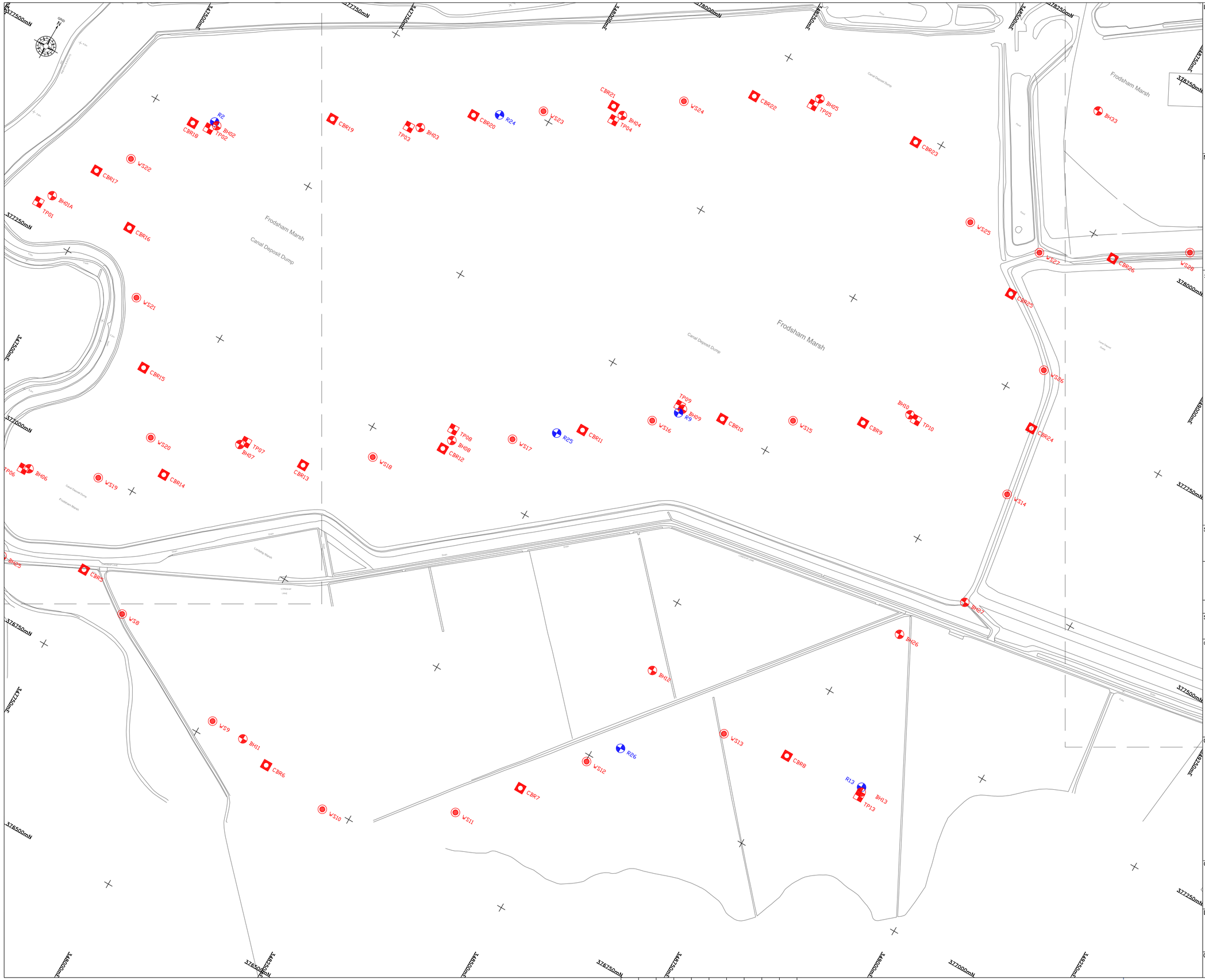
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Survey Date: September 2014
Surveyor: TS
Drawn By: CMS
Client:
Energy
Engineer:
wardell armstrong
Wardell Armstrong
Sir Henry Doulton House
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ST1 5BD
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ESG
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18 Deeside Industrial Estate
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www.esg.co.uk
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FRODSHAM, CHESHIRE
DWG:
SITE PLAN
F4036-14/02
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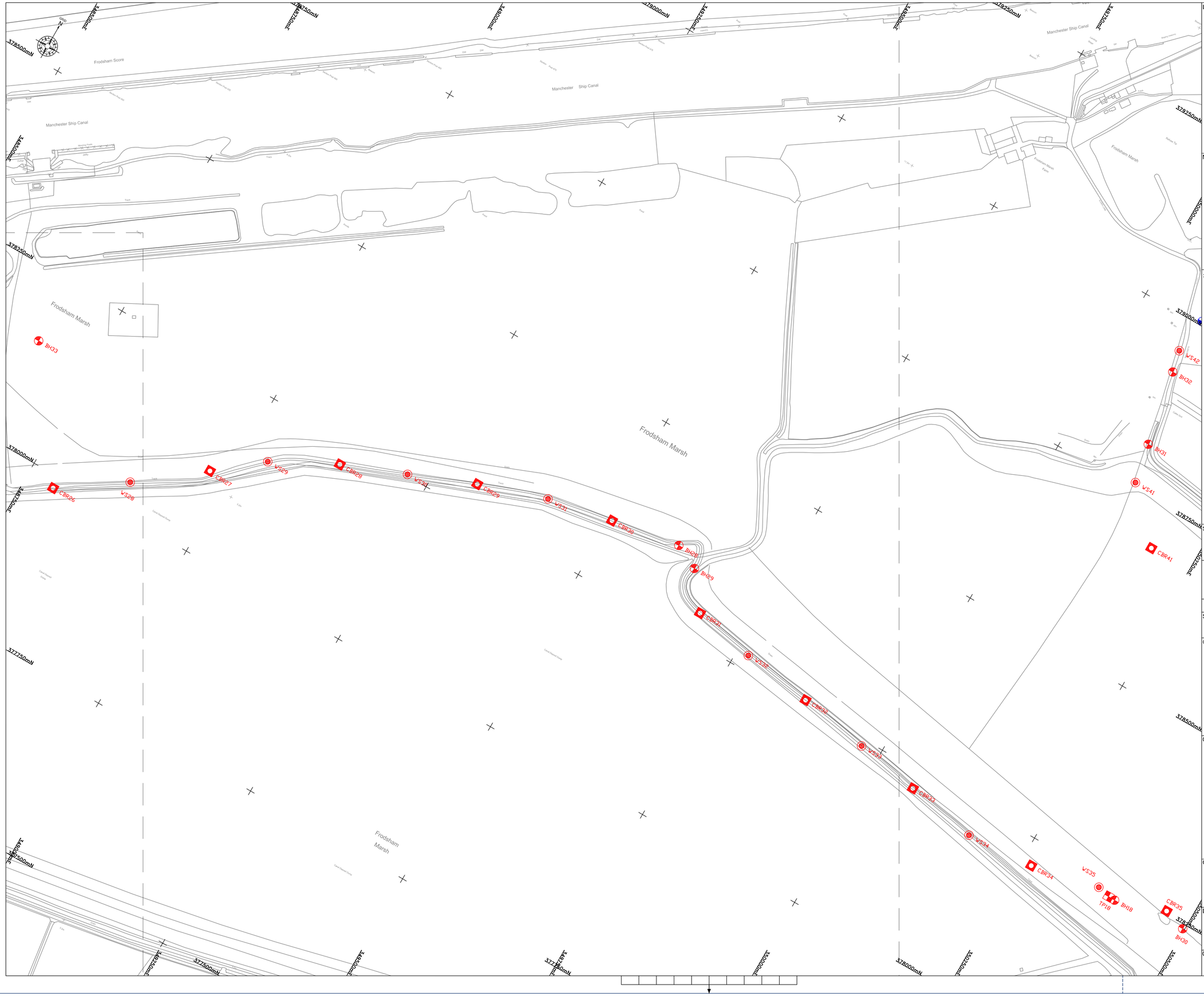

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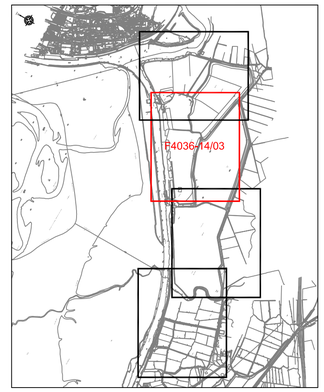

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GROUND INVESTIGATION
AT THE PROPOSED FRODSHAM WIND FARM
FRODSHAM, CHESHIRE

DWG:

SITE PLAN
F4036-14/03

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BH14
TP14
CBR44
BH17
TP17
CBR38
WS38
CBR37
BH19
TP19
WS37
CBR39
WS39
CBR40
WS40
BH15
TP15
R15
CBR42
R28
WS42
BH32
BH31
WS41
CBR41
BH16
TP16
R16
WS36
R20
R27
CBR36
CBR35
BH30
BH18
TP18
WS35
CBR34
CBR33
BHWM
TPWM
WS46
CBR46
WS45
CBR45
WS44
WS43
CBR43
River Weaver
Frodsham Marsh
Manchester Ship Canal
Frodsham Score
Fenemere Farm
Canal (Navigable)
Canal (Disused) Dunes
Marsh Dr
Marsh Ln
Fenemere Ln
Main Rd
Weaver Rd
Ferry Ln
Ferry Rd
Mill Ln
Mill Cl
Mill Rd
Mill Hill
Mill Hill Cl
Mill Hill Rd
Mill Hill Ln
Mill Hill Dr

Reference	East	North	Elevation
CBR1	346670,47	376332,84	4,02
CBR2	346632,29	376481,93	4,90
CBR3	346910,57	376547,05	5,96
CBR4	347364,79	376713,43	5,29
CBR5	347746,79	376869,48	5,56
CBR6	348109,80	376758,22	4,66
CBR7	348438,70	376910,65	4,99
CBR8	348743,48	377139,60	4,44
CBR9	348600,77	377603,49	11,63
CBR10	348424,88	377508,24	11,39
CBR11	348260,87	377395,24	11,05
CBR12	348102,09	377273,33	10,83
CBR13	347942,01	377153,66	10,76
CBR14	347777,48	377042,88	10,55
CBR15	347676,66	377160,20	10,43
CBR16	347559,78	377322,21	10,49
CBR17	347478,80	377369,29	10,60
CBR18	347563,28	377496,31	10,71
CBR19	347732,18	377600,44	10,88
CBR20	347903,18	377705,16	11,27
CBR21	348069,11	377815,86	12,24
CBR22	348234,97	377928,00	13,01
CBR23	348466,14	377986,08	13,28
CBR24	348811,74	377716,12	13,21
CBR25	348691,02	377867,13	13,02
CBR26	348791,10	377982,82	9,63
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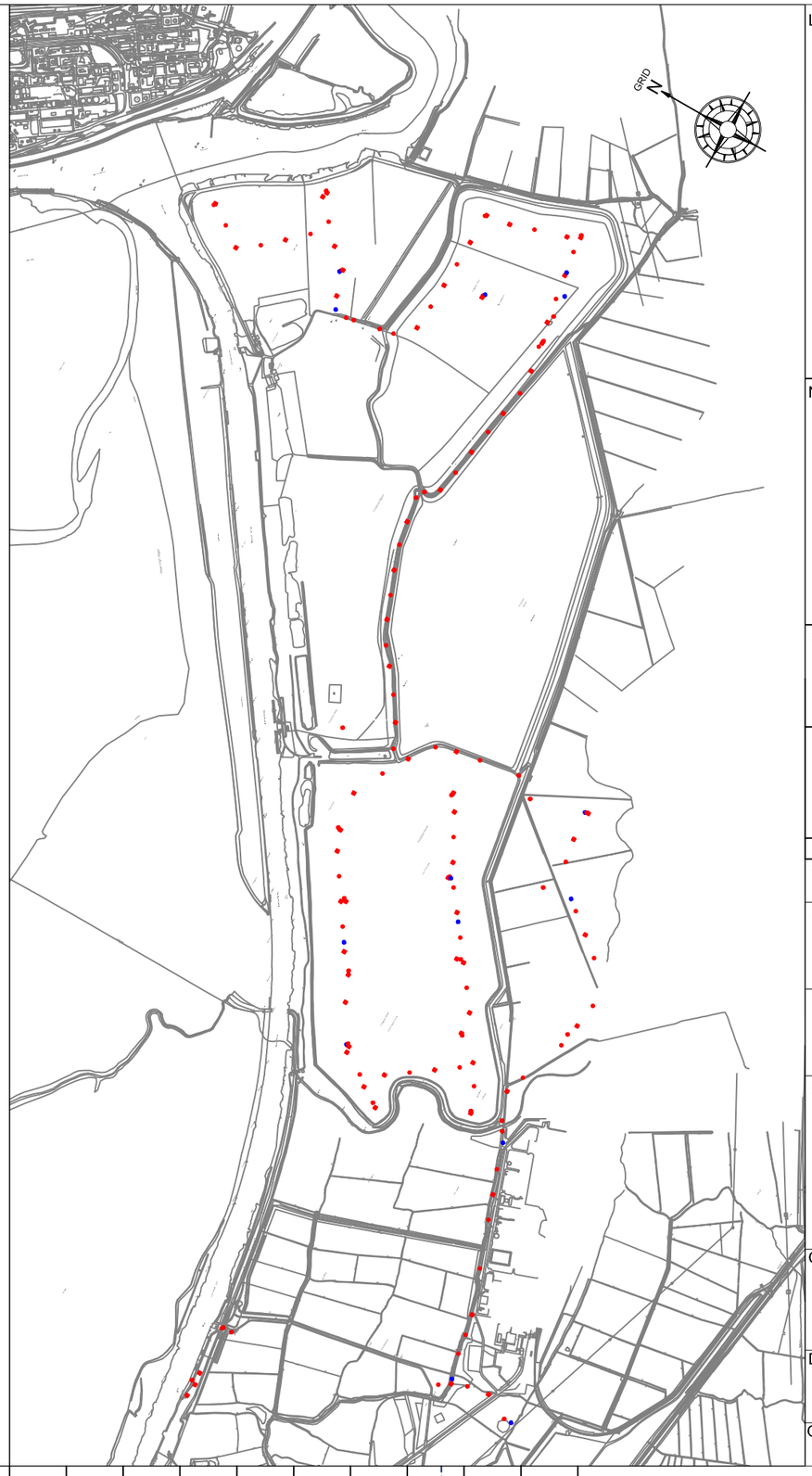
CBR30	349503,20	378340,59	9,43
CBR31	349677,63	378289,21	13,30
CBR32	349869,66	378257,12	13,42
CBR33	350064,77	378224,68	12,87
CBR34	350265,63	378213,71	10,99
CBR35	350464,86	378254,12	10,76
CBR36	350660,58	378286,88	10,69
CBR37	350796,67	378356,07	10,63
CBR38	350725,62	378577,27	10,73
CBR39	350586,03	378676,95	10,75
CBR40	350387,15	378682,23	11,18
CBR41	350187,77	378690,53	11,43
CBR42	350137,67	379029,39	11,20
CBR44	350450,48	379273,42	10,58
CBR45	350228,70	379316,06	11,68
CBR46	350103,83	379470,82	11,94
CBR47	346069,56	377365,22	6,21
CBR48	346122,34	377359,08	7,59
CBR49	346171,42	377366,52	7,66
BH01A	347442,08	377306,99	10,48
BH02	347594,84	377509,75	10,80
BH03	347846,42	377652,16	11,09
BH04	348086,47	377810,56	12,39
BH05	348317,50	377971,20	13,23
BH06	347607,51	376954,60	10,42
BH07	347849,63	377134,13	10,69
BH08	348107,51	377289,66	10,87
BH09	348368,89	377491,87	11,47
BH10	348652,86	377646,64	11,72
BH11	348062,40	376774,13	4,93
BH12	348517,58	377149,11	4,55
BH13	348860,76	377147,79	4,44
BH14	350477,63	379273,45	10,42
BH15	350235,01	379063,49	11,20
BH16	350429,26	378527,54	11,16
BH17	350707,07	378678,51	10,74
BH18	350392,95	378230,45	10,97
BH19	350830,30	378309,89	10,54
BH20	346131,08	377377,59	7,05
BH20A	346132,74	377378,28	6,96
BH21	346374,98	377375,21	7,22
BH21A	346369,63	377378,90	7,23
BH22	346374,82	377338,58	5,23
BH23	346617,32	376230,65	3,99
BH24	347600,42	376806,79	6,00
BH25	347636,12	376828,24	5,85
BH26	348795,88	377369,07	4,66
BH27	348853,36	377454,81	12,66
BH28	349603,26	378357,49	9,82
BH29	349638,93	378340,23	13,66
BH30	350497,22	378243,83	10,88
BH31	350110,14	378816,37	12,30
BH32	350088,90	378922,89	11,45
BH33	348668,51	378154,02	9,48
BHMM	350207,65	379631,27	11,08

Reference	East	North	Elevation
R2	347589,53	377512,92	10,70
R9	348366,72	377484,64	11,31
R13	348857,78	377154,02	4,39
R15	350227,37	379067,78	11,13
R16	350436,03	378522,31	11,15
R20	350587,97	378245,95	10,82
R21	346617,66	376198,99	4,03
R22	346651,16	376488,70	4,93
R23	347562,09	376781,95	6,00
R24	347934,96	377724,03	11,47
R25	348231,25	377373,14	10,95
R26	348533,66	377030,69	4,68
R27	350673,68	378286,64	10,75
R28	350089,11	379005,97	11,06
TP01	347429,62	377289,28	10,30
TP02	347587,00	377500,71	10,73
TP03	347831,94	377644,84	10,81
TP04	348078,90	377798,50	12,46
TP05	348313,34	377958,70	13,36
TP06	347599,82	376950,25	10,43
TP07	347855,46	377141,37	10,69
TP08	348101,45	377304,24	10,98
TP09	348363,04	377494,21	11,39
TP10	348663,94	377644,46	11,61
TP13	348860,98	377141,20	4,37
TP14	350472,31	379267,16	10,41
TP15	350238,85	379058,85	11,04
TP16	350421,43	378527,40	11,17
TP17	350710,78	378674,05	10,61
TP18	350382,90	378230,61	10,84
TP19	350821,73	378307,13	10,35
TPMM	350213,48	379628,26	10,96
TPMM1	350213,49	379628,27	10,96
WS1	346604,16	376524,23	4,50
WS2	346655,95	376420,98	4,04
WS3	346750,58	376516,91	8,48
WS4	346828,96	376529,46	4,92
WS5	347085,21	376612,42	5,08
WS6	347269,48	376678,67	4,85
WS7	347459,39	376750,15	5,84
WS8	347825,15	376841,89	5,15
WS9	348012,48	376774,45	4,71
WS10	348210,11	376743,93	4,99
WS11	348376,14	376834,57	4,77
WS12	348501,24	376990,37	4,56
WS13	348650,53	377122,11	4,52
WS14	348828,80	377617,73	13,17
WS15	348513,21	377556,22	11,54
WS16	348339,84	377456,33	11,14
WS17	348181,20	377334,24	10,90
WS20	347735,12	377079,32	10,53
WS21	347618,07	377241,32	10,46
WS22	347512,78	377408,17	10,66
WS23	347986,34	377759,76	11,85
WS24	348151,98	377871,73	12,56
WS25	348590,25	377926,28	12,89
WS26	348785,78	377796,52	13,12
WS27	348696,84	377937,98	11,44
WS28	348881,92	378044,97	9,68
WS29	349036,93	378168,13	9,63
WS30	349218,29	378251,96	9,73
WS31	349408,91	378321,74	9,66
WS32	349767,34	378271,26	13,68
WS33	349971,27	378240,43	13,14
WS34	350167,16	378206,94	12,96
WS35	350364,33	378235,21	10,85
WS36	350561,87	378270,85	10,88
WS37	350757,96	378303,92	10,61
WS38	350757,34	378481,92	10,62
WS39	350484,40	378679,56	11,09
WS40	350287,63	378685,47	11,20
WS41	350121,51	378760,03	11,56
WS42	350081,77	378953,73	11,65
WS43	350376,37	379204,14	10,81
WS44	350298,52	379241,89	11,01
WS45	350161,69	379390,50	12,10
WS46	350160,28	379549,72	11,33
WS19	347699,04	376992,69	10,45



Legend:

- Denotes Borehole Location
- Denotes Electrical resistivity test location
- Denotes CBR Test Location
- Denotes Hand Dug Pit Location
- Denotes Trial Pit Location
- Denotes Window Sample Location

Notes:

1) Co-ordinates and levels related to Ordnance Survey National Grid and Datum using Leica's System 1200 dual frequency geodetic GPS receiver and SmartNet RTK correction. WGS84 position transformed using the Ordnance Survey OSTN/OSGM02 definitive transformation for the United Kingdom.

2) Background mapping provided in digital format by Client. Reproduced with the Permission of Ordnance Survey on the behalf of The Controller of Her Majesty's Stationery Office, Crown Copyright,

Scale: Not to Scale

Rev.	Drawn	Date	Checked	Approved	Details
0	CMS	Oct '14	JNE	RV	Issued / Preliminary

Survey Date: September 2014 | Surveyor: TS | Drawn By: CMS

Client: Peel Energy

Engineer: wardell armstrong

Contractor: ESG Environmental Scientifics Group

Geotechnical House
18 Deeside Industrial Estate
Deeside, Flintshire
CH5 2LR

www.esg.co.uk
geo.surveys@esg.co.uk
Tel: +44(0)1244 288200

Contract:

GROUND INVESTIGATION AT THE PROPOSED FRODSHAM WIND FARM FRODSHAM, CHESHIRE

DWG:

CO-ORDINATE LISTING F4036-14-05

Original Sheet Size:	Scales:	Rev.:
A3	Horiz.: Not to scale Vert.: N.A.	0

U	Driven tube sample	nominally 100 mm diameter and full recovery unless otherwise stated
UT	Driven thin wall tube sample	
TW	Pushed thin wall tube sample	
P	Pushed piston sample	
L	Liner sample (from Windowless or similar sampler), full recovery unless otherwise stated	
CBR	CBR mould sample	
BLK	Block sample	
CS	Core sample (from rotary core) taken for laboratory testing	
AMAL	Amalgamated sample	

D	Small sample
B	Bulk sample

W	Water sample
G	Gas sample

Environmental chemistry samples (in more than one container where appropriate)

ES	Soil sample
EW	Water sample

Sample reference numbers are assigned to every sample taken. A sample reference of 'NR' indicates that attempt was made to take a tube sample, however, there was no recovery.

Monitoring samples taken after completion of hole construction are not shown on the exploratory hole logs.

SPT S or SPT C — Standard Penetration Test, open shoe (S) or solid cone (C)

The Standard Penetration Test is defined in BS EN ISO 22476-3 (2005). The incremental blow counts are given in the Field Records column; each increment is 75 mm unless stated otherwise and any penetration under self weight in mm (SW) is noted. Where the full 300 mm test drive is achieved the total number of blows for the test drive is presented as N = ** in the Test column. Where the test drive blows reach 50 the total blow count beyond the seating drive is given (without the N = prefix).

IV	*in situ* Vane shear strength, peak (p) and remoulded (r)
HV	Hand vane shear strength, peak (p) and remoulded (r)
PP	Pocket penetrometer test, converted to shear strength
KFH, KRH, KPI	Permeability tests (KFH = falling head, KRH = rising head; KPI = packer inflow); results provided in Field Records column (one value per stage for packer tests)

The mechanical indices (TCR/SCR/RQD & If) are defined in BS 5930+A2 (2010)

TCR	Total Core Recovery, %
SCR	Solid Core Recovery, %
RQD	Rock Quality Designation, %
If	Fracture spacing, mm. Minimum, typical and maximum spacings are presented. The term non-intact (NI) is used where the core is fragmented.

Flush returns, estimated percentage with colour where relevant, are given in the Records column

CRF	Core recovered (length in m) in the following run
AZCL	Assessed zone of core loss
NR	Not recovered

▼	Groundwater strike
▽	Groundwater level after standing period

Notes:
See report text for full references of standards

Details of standpipe/piezometer installations are given on the Record. Legend column shows installed instrument depths including slotted pipe section or tip depth, response zone filter material type and layers of backfill.

The type of instrument installed is indicated by a code in the Legend column at the depth of the response zone:

SP Standpipe
SPIE Standpipe piezometer
PPIE Pneumatic piezometer
EPIE Electronic piezometer

The installation of vertical profiling instruments is indicated on the Record. The base of tubing is shown in the Legend column.

The type of instrument installed is indicated by a code in the Legend column at the base of the tubing:

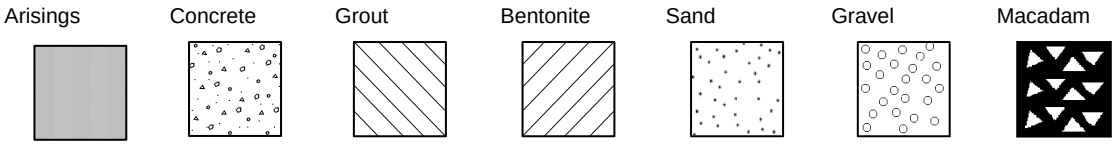
ICE Biaxial inclinometer
ICM Inclinometer tubing for use with probe
SLIP Slip indicator

The installation of single point instruments is indicated on the Record. The location of the measuring device is shown in the Legend column.

The type of instrument installed is indicated by a code in the Legend column:

ESET Electronic settlement cell/gauge
ETM Magnetic extensometer settlement point
EPCE Electronic embedment pressure cell
PPCE Electronic push in pressure cell

A legend describing the installation is shown in the rightmost column. Legends additional to BS5930 are used to describe the backfill materials as indicated below.



1 Soils and rocks are described in accordance with BS EN ISO 14688-1 (2002) and 14689-1 (2003) respectively as amplified by BS 5930+A2 (2010).

2 For fine soils, consistency determined during description is reported for those strata where undisturbed samples are available. Where the logger considers that the sample may not be representative of the condition in situ, for whatever reason, the reported consistency is given in brackets. The reliability of the sample is indicated by Probably or Possibly as appropriate. Hence (Probably firm) indicates the logger is reasonably confident of the assessment, but (Possibly firm) means less certainty. Where the samples available are too disturbed to allow a reasonable assessment of the in situ condition, no consistency is given.

3 Evidence of the occurrence of very coarse particles (cobbles and boulders) is presented on the logs, however, because of their size in relation to the exploratory hole these records may not be fully representative of their size and frequency in the ground mass.

4 The declination of bedding and joints is given with respect to the normal to the core axis. Thus in a vertical borehole this will be the dip.

5 The assessment of SCR, RQD and Fracture Spacing excludes artificial fractures

6 Strata legends are in accordance with BS 5930+A2 (2010).

7 Water level observations of discernible entries during the advancing of the exploratory hole are given at the foot of the log and in the Legend column. The term "none observed" is used where no discrete entries are identified although this does not necessarily indicate that the hole has not been advanced below groundwater level. Under certain conditions groundwater cannot be observed, for instance, drilling with water flush or overwater, or boring at a rate much faster than water can make its way into the borehole (ref BS5930+A2:2010, Clause 47.2.7). In addition, where appropriate, water levels in the hole at the time of recovering individual samples or carrying out in situ tests and at shift changes are given in the Records column.

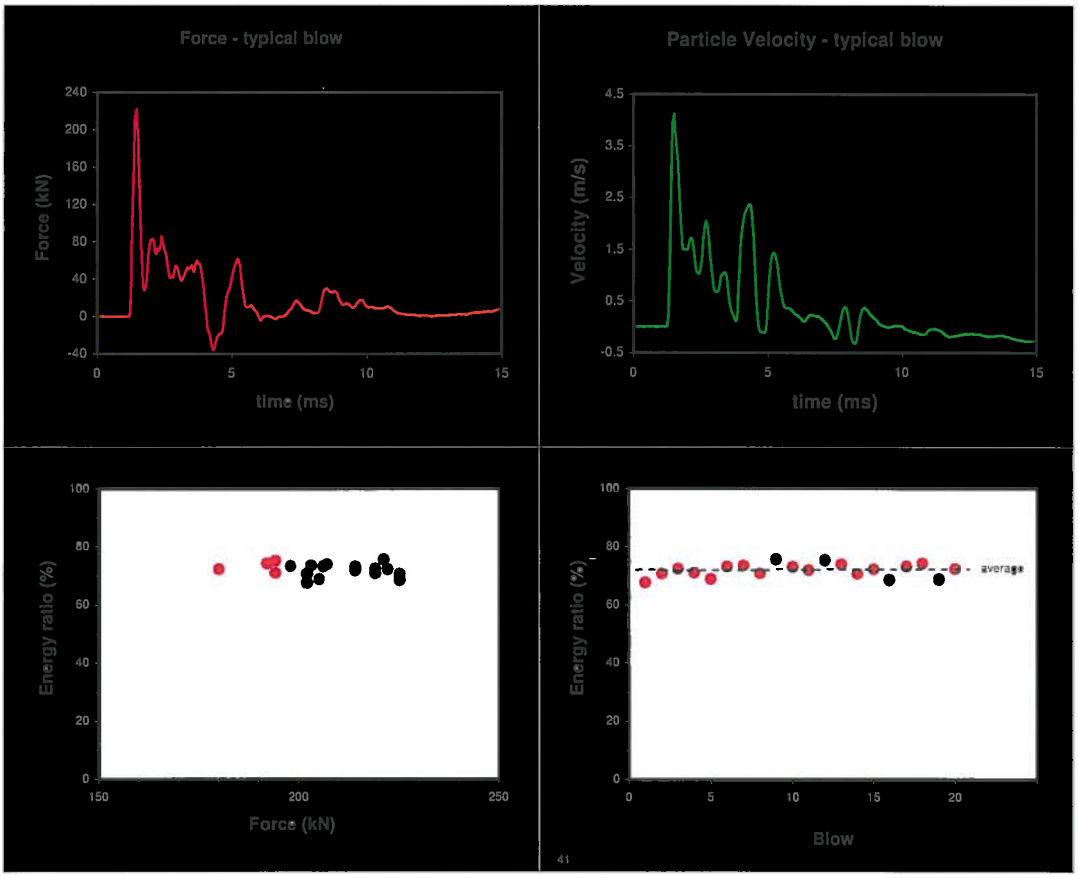
8 The borehole logs present the results of Standard Penetration Tests recorded in the field without correction or interpretation. However, in certain ground conditions (eg high hydraulic head or where very coarse particles are present) some judgement may be necessary in considering whether the results are representative of in situ mass conditions.

Notes:
See report text for full references of standards

Hammer Energy Report

Date of test:	16/01/2014	**Hammer ID:**	SM23
		Hammer mass (*m*)	63.5 kg
Instrumented rod:		**Fall height (*h*)**	0.76 m
Type	BW	**Test type:**	SPT
Cross-sectional area (*A*a)	11.30 cm^2	**Manufacturer:**	Archway
Young's modulus (*E*a)	207000 MPa	**Model:**	Automatic Trip Hammer
Length	0.60 m		
		Rig:	Commachio 205
Test rod type:	NWY	**Rig ID:**	R37
		Type:	Rotary
		Foreman:	N Turnbull

Remarks:
Data obtained from test carried out in BH1, located in ESG Doncaster yard. Test carried out at depth of 5.44 mbgl, with a total blow count of 20. Energy determined from every blow.



Theoretical energy (E_{theor}) = *m x g x h* = **0.473 kN-m (473 J)**

Measured energy (E_{meas}) *average of 20 blows* = **0.340 kN-m**

Energy ratio = $\frac{E_{meas}}{E_{theor}}$ = **72 %**

Test car [redacted]

Signed [redacted]

Test carried out in accordance with BS EN ISO 22476-3:2005

Equipment used: SPT Analyzer Serial No. 4032T

testconsult
EQUIPMENT

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Testconsult Limited
40A Hardwick Grange
Warrington
Cheshire
WA1 4RF

SPT Hammer Ref:	DB2
Test Date:	01/11/2013
Report Date:	01/11/2013
File Name:	DB2.spt
Test Operator:	TS

UKAS TESTING 0955

Instrumented Rod Data

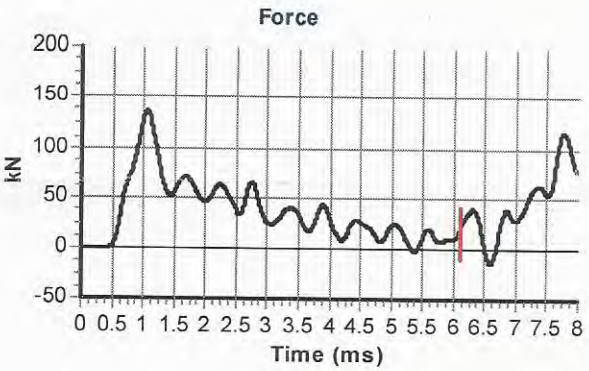
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.6
Assumed Modulus E_a (GPa):	200
Accelerometer No.1:	8355
Accelerometer No.2:	8356

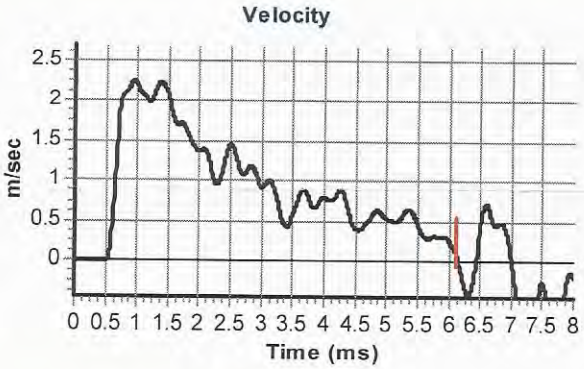
SPT Hammer Information

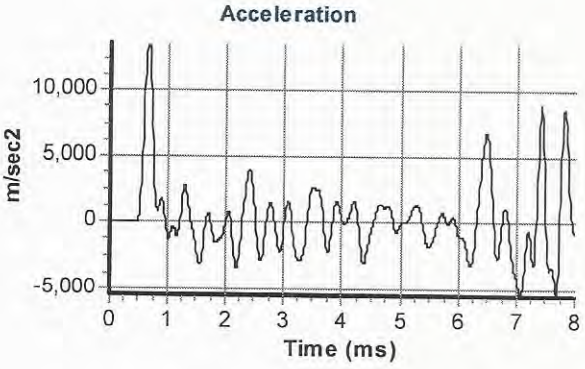
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	14.5

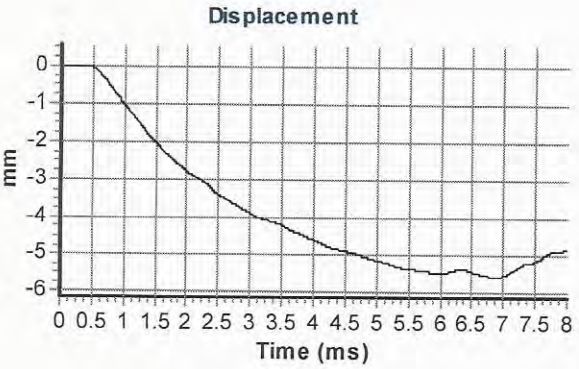
Comments / Location

Client: Danbar Drilling Services Ltd
Location: Testconsult Laboratory
Type: Trip Hammer









Calculations

Area of Rod A (mm2):	983
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	317

Energy Ratio E_r (%): **67**

[redacted]

Title: Senior Electronics Technician

The recommended calibration interval is 12 months

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SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

ARCHWAY ENGINEERING (UK) LTD
AINLEYS INDUSTRIAL ESTATE
ELLAND
WEST YORKSHIRE
HX5 9JP

SPT Hammer Ref:	LCD01
Test Date:	29/09/2014
Report Date:	9/29/2014
File Name:	LCD01.spt
Test Operator:	SH

Instrumented Rod Data

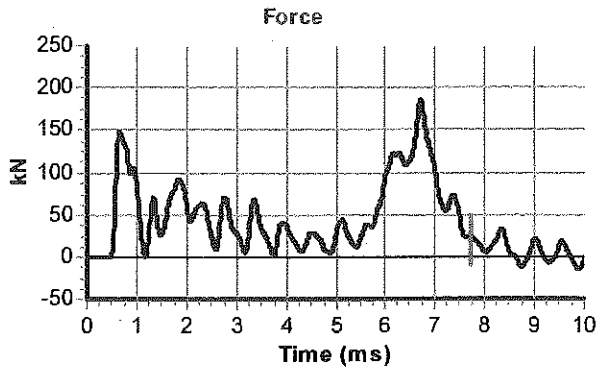
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.1
Assumed Modulus E_a (GPa):	200
Accelerometer No.1:	7079
Accelerometer No.2:	7080

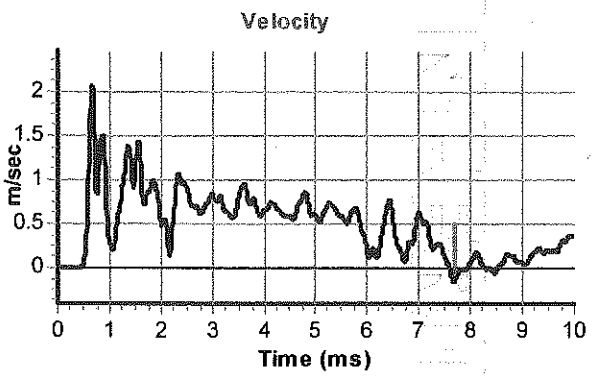
SPT Hammer Information

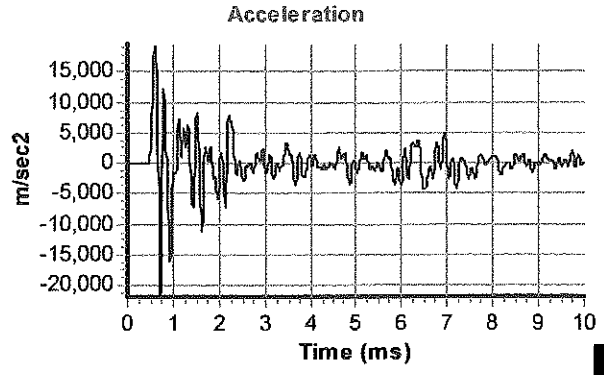
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	13.0

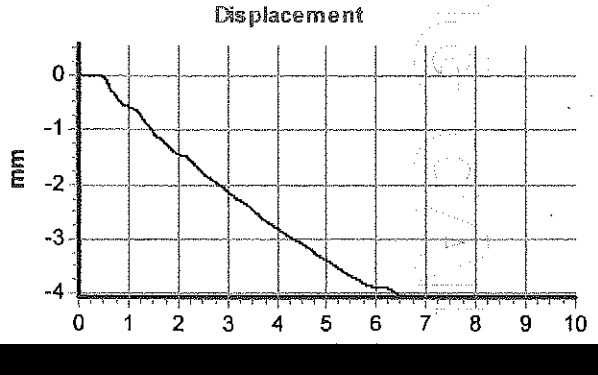
Comments / Location

CALIBRATION - AUTO TRIP HAMMER









Calculations

Area of Rod A (mm2):	918
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	245

Energy Ratio E_r (%): **52**

[redacted]

Signed: S. HOWARTH

Title: FITTER

The recommended calibration interval is 12 months

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SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

testconsult EQUIPMENT

Testconsult Limited
40A Hardwick Grange
Warrington
Cheshire
WA1 4RF

SPT Hammer Ref:	PB8
Test Date:	04/11/2014
Report Date:	10/11/2014
File Name:	PB8.spt
Test Operator:	TS

UKAS TESTING 0955

Instrumented Rod Data

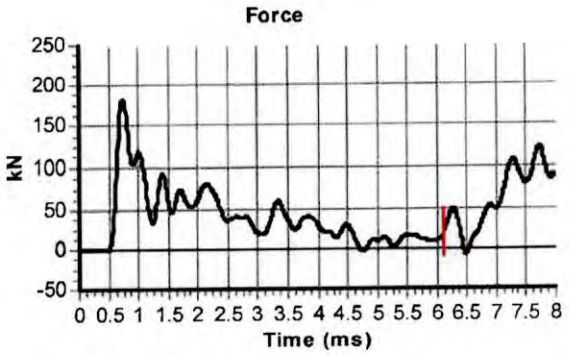
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.8
Assumed Modulus E_a (GPa):	208
Accelerometer No.1:	8965
Accelerometer No.2:	8966

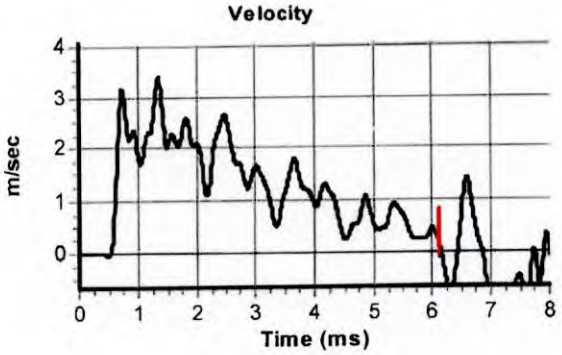
SPT Hammer Information

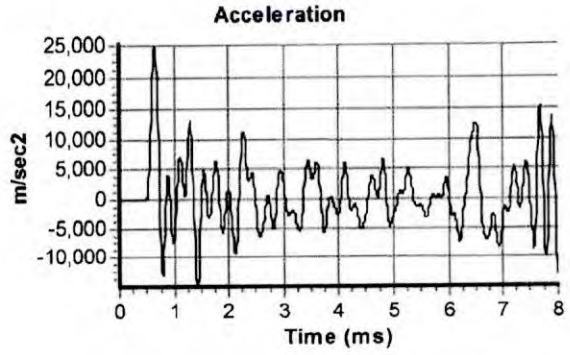
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	14.5

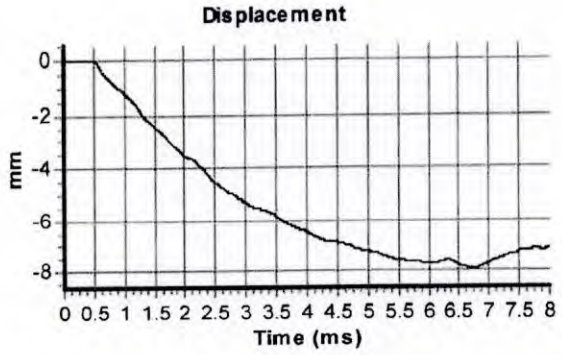
Comments / Location

Client: Paul Blackledge Drilling Ltd.
Location: Testconsult Laboratory
Type: Trip Hammer









Calculations

Area of Rod A (mm2):	1008
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	429

Energy Ratio E_r (%): **91**

[redacted]

Title: Senior Electronics Technician

The recommended calibration interval is 12 months

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SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Testconsult Limited
40A Hardwick Grange
Warrington
Cheshire
WA1 4RF

SPT Hammer Ref:	PB11
Test Date:	16/05/2014
Report Date:	19/05/2014
File Name:	PB11.spt
Test Operator:	TS

UKAS TESTING 0955

Instrumented Rod Data

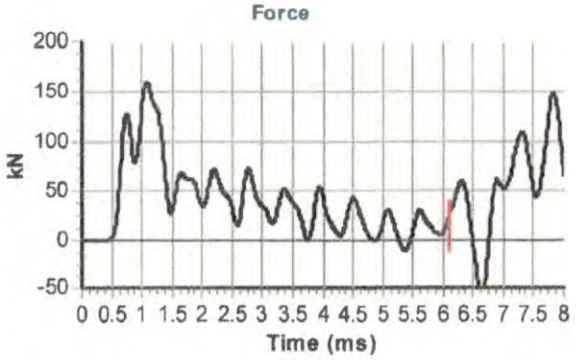
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.8
Assumed Modulus E_a (GPa):	208
Accelerometer No.1:	8965
Accelerometer No.2:	8966

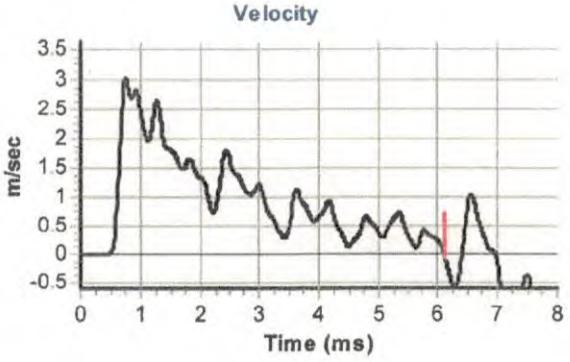
SPT Hammer Information

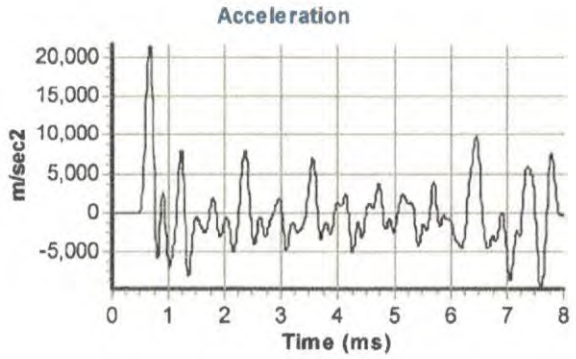
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	14.5

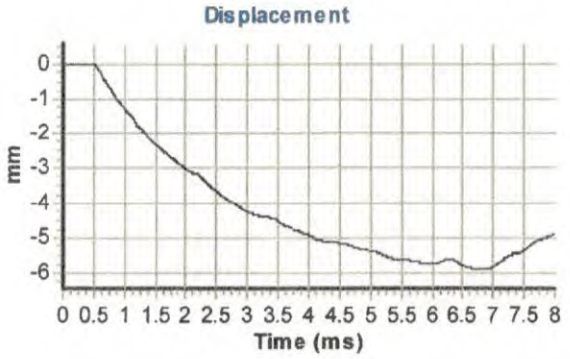
Comments / Location

Client: Paul Blackledge Drilling Ltd.
Location: Testconsult Laboratory
Type: Trip Hammer









Calculations

Area of Rod A (mm2):	1008
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	350

Energy Ratio E_r (%): **74**

[redacted]

Title: Senior Electronics Technician

The recommended calibration interval is 12 months

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EQUIPMENT

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Testconsult Limited
40A Hardwick Grange
Warrington
Cheshire
WA1 4RF

SPT Hammer Ref:	PB14
Test Date:	23/10/2014
Report Date:	23/10/2014
File Name:	PB14.spt
Test Operator:	TS

UKAS TESTING 0955

Instrumented Rod Data

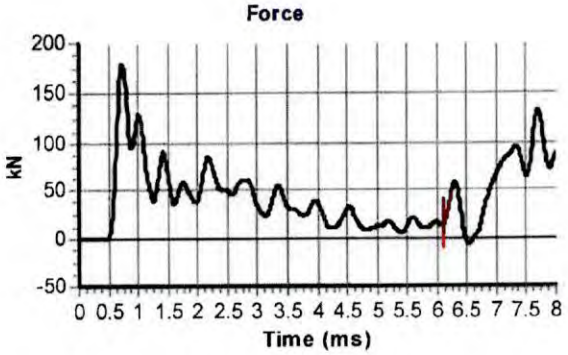
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.8
Assumed Modulus E_a (GPa):	208
Accelerometer No.1:	8965
Accelerometer No.2:	8966

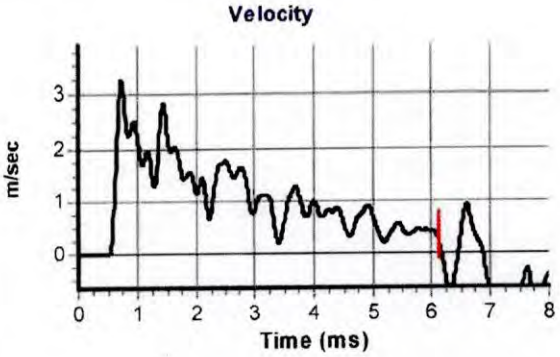
SPT Hammer Information

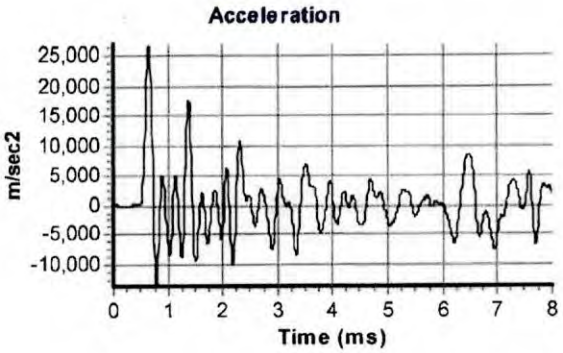
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	14.5

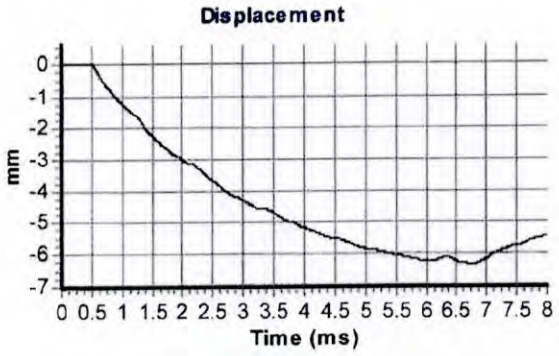
Comments / Location

Client: Paul Blackledge Drilling Ltd.
Location: Testconsult Laboratory
Type: Trip Hammer









Calculations

Area of Rod A (mm2):	1008
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	388

Energy Ratio E_r (%): **82**

[redacted]

Title: Senior Electronics Technician

The recommended calibration interval is 12 months

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testconsult
EQUIPMENT

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Testconsult Limited
40A Hardwick Grange
Warrington
Cheshire
WA1 4RF

SPT Hammer Ref:	PBWS1
Test Date:	11/11/2013
Report Date:	11/11/2013
File Name:	PBWS1.spt
Test Operator:	TS

UKAS TESTING
0955

Instrumented Rod Data

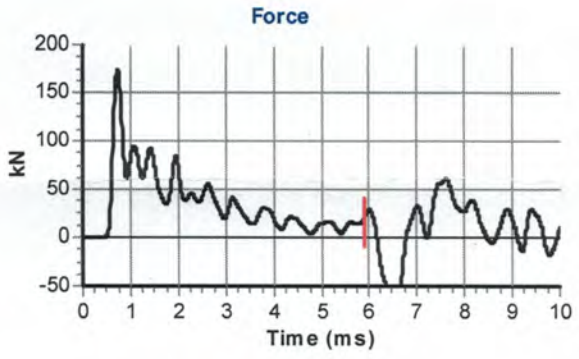
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.6
Assumed Modulus E_a (GPa):	200
Accelerometer No.1:	8355
Accelerometer No.2:	8356

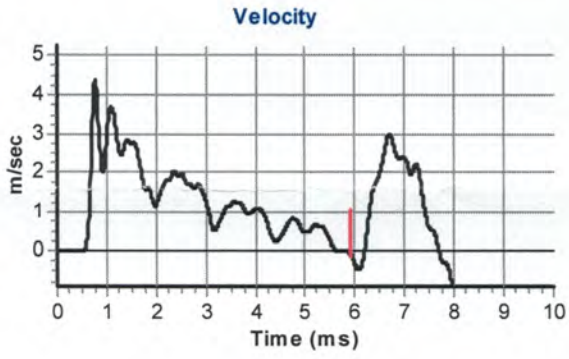
SPT Hammer Information

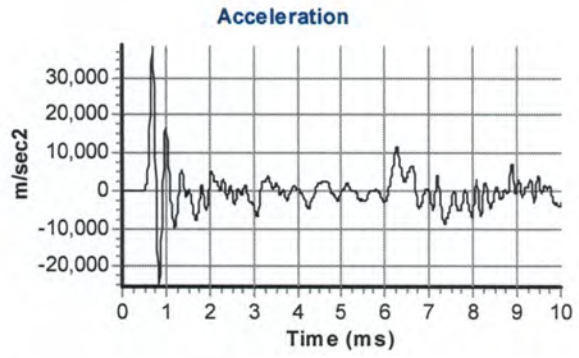
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	14.0

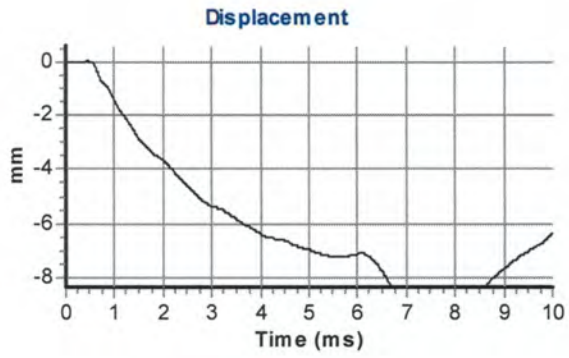
Comments / Location

Client: Paul Blackledge Drilling Ltd.
Location: Testconsult Laboratory
Type: WS









Calculations

Area of Rod A (mm2):	983
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	350

Energy Ratio E_r (%): **86**

[redacted]

Title: Senior Electronics Technician

The recommended calibration interval is 12 months

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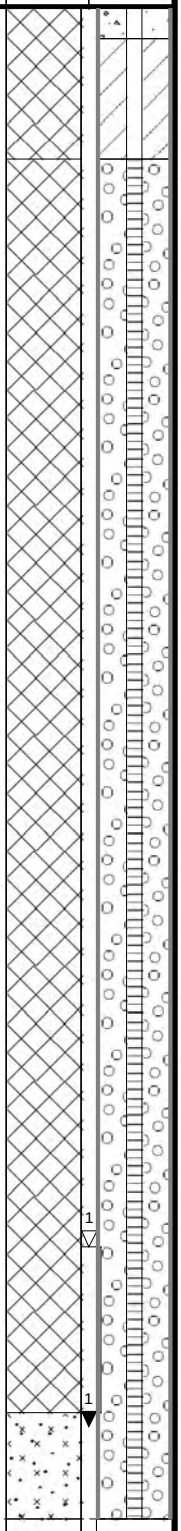
IW KGB IC	08/09/2014 10/09/2014	Dando 2000 Cable percussion boring to 35.00m. SPT Hammer ID: PBD8Rod Type: Whitworth	0.00m	35.00m 150mm 34.40m	+11.08 mOD E 350207.65 N 379631.27

							Level
0.50-1.00	B 1				MADE GROUND: Soft to firm dark brown sandy CLAY with roots and rootlets. (TOPSOIL).		(1.00)
1.00-1.45 1.00-1.45 1.00-1.45	SPT S D 2 B 3	N=2 (1,0/0,1,0,1)		dry	MADE GROUND: Very soft becoming soft, becoming thinly laminated, black mottled brown slightly sandy silty CLAY with strong hydrocarbon odour.		1.00 +10.08
1.70	D 4						
2.00-2.45 2.00-2.45 2.00-2.45	SPT S D 5 B 6	N=1 (0,0/0,1,0,0)	1.70	dry			
2.70	D 7						
3.00-3.45 3.00-3.45 3.00-3.45	SPT S D 8 B 9	N=2 (1,0/1,0,1,0)	2.90	dry			
3.70	D 10						
4.00-4.45 4.00-4.45 4.00-4.45	SPT S D 11 B 12	N=2 (1,0/0,1,0,1)	3.90	dry	4.00-9.30 m Thinly laminated.		
4.70	D 13						
5.00-5.45 5.00-5.45 5.00-5.45	SPT S D 14 B 15	N=2 (1,0/0,1,1,0)	4.50	dry			(8.30)
5.70	D 16		08/09/2014 4.50	1800 dry			
6.00-6.45 6.00-6.45 6.00-6.45	SPT S B 17 D 17	N=3 (1,0/1,1,1,0)	~~5.90~~	~~dry~~			
6.70	D 18						
7.00-7.45 7.00-7.45 7.00-7.45	SPT S D 19 B 20	N=3 (1,1/0,1,1,1)	6.70	dry			
7.70	D 21				7.40-9.30 m No hydrocarbon odour. Occasional roots and rootlets.		
8.00-8.45	U 22	15 blows	7.50	dry			
8.45-8.50	D 23						
9.00-9.45 9.00-9.45 9.00-9.45	SPT S D 24 B 25	N=8 (1,1/2,2,2,2)	8.90	dry			
		*			Loose to medium dense black and brown, becoming slightly gravelly, silty SAND with locally occasional pockets of soft		9.30 +1.78
					Stratum continues to 17.60 m		



1	9.30	Rose to 8.20 m after 5 minutes.	-

9.50	Water added to assist boring

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:18:12

IW KGB IC	08/09/2014 10/09/2014	Dando 2000 Cable percussion boring to 35.00m. SPT Hammer ID: PBD8Rod Type: Whitworth	0.00m	35.00m 150mm 34.40m	+11.08 mOD E 350207.65 N 379631.27

						Level	
10.00	D 26			black thinly laminated sandy silt. Gravel is angular to subangular fine and medium of various lithologies.			
10.50-10.95 10.50-10.95 10.50-10.95	SPT S D 27 B 28	N=11 (1,2/2,3,3,3)	10.40	2.00			
11.50	D 29						
12.00-13.95 12.00-12.45 12.00-12.45	SPT S D 30 B 31	N=20 (2,3/4,4,6,6)	11.90	2.00			
13.00	D 32						
13.50-13.95 13.50-13.95 13.50-13.95	SPT S D 33 B 34	N=18 (2,4/4,4,5,5)	13.40	1.50		(8.30)	
14.50	D 35						
15.00-15.45 15.00-15.45 15.00-15.45	SPT S D 36 B 37	N=14 (2,3/3,3,4,4)	14.90	2.00	15.00-16.00 m Occasional pockets of soft black thinly laminated sandy silt.		
16.00	D 38				16.00-17.60 m Slightly gravelly.		
16.50-16.95 16.50-16.95 16.50-16.95	SPT S D 39 B 40	N=19 (2,3/4,4,5,6)	16.50	2.00			
17.60	D 41					17.60 -6.52	
				Medium dense brown gravelly coarse SAND. Gravel is angular to subangular fine to coarse of various lithologies.			
18.00-18.45 18.00-18.45	SPT S B 42	N=16 (2,4/4,4,4,4)	17.90	3.00		(1.90)	
19.00	D 43						
19.50-19.95 19.50-19.95	SPT C B 44	N=21 (3,4/5,5,5,6)	19.40	3.50		19.50 -8.42	
				Medium dense multicoloured sandy slightly clayey GRAVEL with low cobble		(0.70)	
				Stratum continues to 20.20 m			

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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IW KGB IC	08/09/2014 10/09/2014	Dando 2000 Cable percussion boring to 35.00m. SPT Hammer ID: PBD8Rod Type: Whitworth	0.00m	35.00m 150mm 34.40m	+11.08 mOD E 350207.65 N 379631.27

						Level	
20.20	D 45				content. Gravel is angular to subrounded fine to coarse of various lithologies including sandstone, mudstone, basalt and quartz. Cobbles are subangular to subrounded of basalt and quartzite.	20.20 -9.12	
20.50-21.00	B 46					(0.80)	
21.00-21.45	U NR	19 blows No recovery	20.70	7.00	Firm thinly laminated brown slightly sandy slightly gravelly silty CLAY. Gravel is angular to subangular fine and medium of various lithologies.	21.00 -9.92	
					Orangish brown slightly gravelly SAND. Gravel is angular to subangular fine of various lithologies.		
22.00	D 48					(1.80)	
22.50-22.95	SPT S	N=20 (5,5/4,5,5,6)	25.40	15.00			
22.50-22.95	D 49						
22.50-22.95	B 50		09/09/2014	1800			
			22.40	7.50	Firm to stiff thinly laminated brown slightly sandy slightly gravelly silty CLAY with occasional sand lenses. Gravel is angular to subangular fine and medium of various lithologies.	22.80 -11.72	
23.50	D 51						
24.00-24.45	U 52	93 blows	23.90	13.50			
24.40-24.50	D 53					(2.70)	
25.50-25.95	SPT S	N=20 (5,5/4,5,5,6)	25.40	15.00			
25.50-25.95	D 54						
25.50-25.95	B 55				Firm to stiff, thinly laminated, brown slightly sandy silty CLAY with occasional sand lenses. Laminations are silt.	25.50 -14.42	
						(0.80)	
					Medium dense orangish brown slightly gravelly SAND. Gravel is angular to subangular fine of various lithologies.	26.30 -15.22	
26.50	D 56						
27.00-27.45	SPT S	N=16 (2,4/3,4,4,5)	26.90	17.00			
27.00-27.45	D 57						
27.00-27.45	B 58						
27.00-28.00	D 59						
28.50-28.95	SPT S	N=17 (3,3/3,4,5,5)	28.40	17.50			
28.50-28.95	D 60						
28.50-28.95	B 61						
29.50	D 62						
					Stratum continues to 35.00 m		

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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IW KGB IC	08/09/2014 10/09/2014	Dando 2000 Cable percussion boring to 35.00m. SPT Hammer ID: PBD8Rod Type: Whitworth	0.00m	35.00m 150mm 34.40m	+11.08 mOD E 350207.65 N 379631.27

						Level
30.00-30.45 30.00-30.45 30.00-30.45	SPT S D 63 B 64	N=15 (2,3/3,3,4,5)	29.90	18.00	Medium dense orangish brown slightly gravelly SAND. Gravel is angular to subangular fine of various lithologies.	
31.00	D 65					(8.70)
31.50-31.95 31.50-31.95 31.50-31.95	SPT S D 66 B 67	N=22 (2,4/4,6,6,6)	31.40	19.00		
32.50	D 68					
33.00-33.45 33.00-33.45 33.00-33.45	SPT S D 69 B 70	N=23 (3,4/5,5,6,7)	32.90	20.00		
34.00 34.00-34.95	D 71 D 72					
34.50-34.95 34.50-34.94	SPT S B 73	N=29 (2,4/6,6,8,9)	34.40	20.00		
			10/09/2014 32.90	1800 20.00		
					EXPLORATORY HOLE ENDS AT 35.00 m	35.00 -23.92

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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NK KGB IC	28/08/2014 29/08/2014	Dando 2000 Cable percussion boring to 19.40m. SPT Hammer ID: PBD14 Rods: Whitworth. Borehole terminated at 19.40m due to obstruction. Repositioned at BH01A.	0.00m	19.40m 150mm 18.00m	+10.48 mOD E 347442.08 N 377306.99

						Level	
0.50-0.95 0.50-1.00	SPT S B 1	N=4 (2,1/1,1,1,1)			MADE GROUND: TOPSOIL. (Drillers description).	(0.40) 0.40 +10.08	
1.00-1.45 1.00-1.45	B 2 D 2				MADE GROUND: Soft dark brown grey and mottled black slightly sandy silty CLAY with strong hydrocarbon odour.	(0.70) 1.10 +9.38	1
1.70	D 3				MADE GROUND: Black SILT with very strong hydrocarbon odour.		
2.00-2.45 2.00-2.45 2.00-2.45	SPT S B 4 D 4	N=0 (0,0/-,-,-,-)	1.50				1
2.70	D 5						
3.00-3.45	U NR	5 blows No recovery	2.90	damp		(4.40)	
3.50	D 7						
4.00-4.45 4.00-4.45 4.00-4.45	SPT S B 8 D 8	N=0 (1,0/-,-,-,-)	3.90	damp			2
4.70	D 9						
5.00-5.45	U NR	6 blows No recovery	4.90	4.00			
5.50	D 11					5.50 +4.98	2
6.00-6.45 6.00-6.45 6.00-6.45	SPT S B 12 D 12	N=6 (2,1/2,2,1,1)	5.90	5.30	Thinly laminated brownish grey, dark grey and black with occasional mottled orange thinly laminated very sandy SILT.	(1.50)	
7.00	D 13				Soft becoming firm thickly laminated brown and grey mottled black slightly sandy silty CLAY.	7.00 +3.48	
7.50-7.95	U NR	15 blows No recovery	7.40	damp			
8.00	D 15						
8.70	D 16						
9.00-9.45 9.00-9.45 9.00-9.45	SPT S B 17 D 17	N=11 (2,2/3,2,3,3)	8.90	dry			3
					Stratum continues to 19.40 m		

1	2.00	Rose to 1.00 m after 20 minutes.	-
2	5.50	Rose to 4.00 m after 20 minutes.	-

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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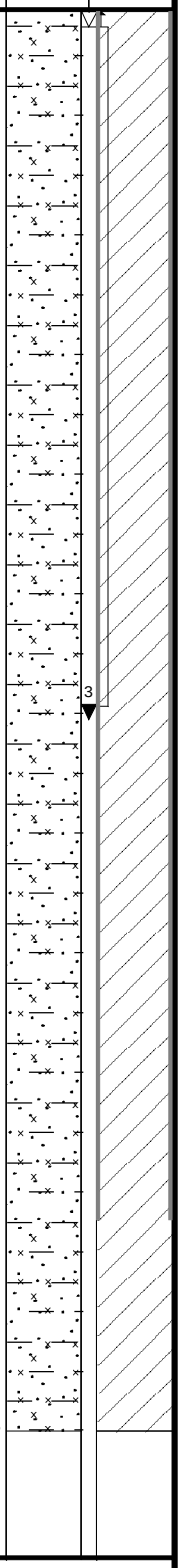
426.4817/12/2014 13:18:20

NK KGB IC	28/08/2014 29/08/2014	Dando 2000 Cable percussion boring to 19.40m. SPT Hammer ID: PBD14 Rods: Whitworth. Borehole terminated at 19.40m due to obstruction. Repositioned at BH01A.	0.00m 19.40m 150mm 18.00m		+10.48 mOD E 347442.08 N 377306.99

							Level
10.30	D 18				Soft becoming firm thickly laminated brown and grey mottled black slightly sandy silty CLAY.		
10.50-10.95	SPT S	N=5 (1,1/1,2,1,1)	10.40	damp			
10.50-10.95	B 19						
10.50-10.95	D 19						
11.70	D 20						
12.00-12.45	SPT S	N=2 (1,0/1,1,0,0)	11.90	damp			
12.00-12.45	B 21						
12.00-12.45	D 21						
13.30	D 22						(12.40)
13.50-13.95	U 23	10 blows 225 mm rec	13.40	damp			
14.00	D 24						
14.70	D 25						
15.00-15.45	SPT S	N=10 (3,4/3,2,2,3)	14.90	11.00		15.00 m Becoming firm	
15.00-15.45	B 26						
16.30	D 27						
16.50-16.95	SPT S	N=16 (5,5/3,4,5,4)	16.40	12.00			
16.50-16.95	B 28						
17.70	D 29						
18.00-18.45	SPT S	N=16 (4,5/4,4,4,4)	17.90	12.50			
18.00-18.45	B 30						
18.00-18.45	D 30						
			28/08/2014 17.90	12.50			
			29/08/2014 18.00	7.00			
					EXPLORATORY HOLE ENDS AT 19.40 m		19.40 -8.92



3	14.60	Rose to 10.00 m after 20 minutes.	-

19.30 -19.40 120 mins Chisel

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:18:21

NK KGB IC	01/09/2014 02/09/2014	Dando 2000 Hand dug inspection pit to 1.20m. Cable percussion boring to 30.00m. SPT Hammer ID: PBD14 Rods: Whitworth. Open hole to 20.00m, samples taken below that.	0.00m 30.00m 150mm 28.90m		+10.48 mOD E 347442.08 N 377306.99

				Level
		*	MADE GROUND: TOPSOIL (Drillers description).	(0.40)
			MADE GROUND: Soft to firm dark brown grey mottled black slightly sandy silty CLAY with strong hydrocarbon odour.	0.40 +10.08 (0.70)
			MADE GROUND: Black SILT with very strong hydrocarbon odour.	1.10 +9.38 (4.40)
			Thinly laminated brownish grey to dark grey and black locally mottled orange very sandy SILT.	5.50 +4.98 (1.50)
			Soft thickly laminated brown and grey mottled black slightly sandy silty CLAY.	7.00 +3.48
			Stratum continues to 20.00 m	

0.00 20.00 Open hole boring

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:18:23

NK KGB IC	01/09/2014 02/09/2014	Dando 2000 Hand dug inspection pit to 1.20m. Cable percussion boring to 30.00m. SPT Hammer ID: PBD14 Rods: Whitworth. Open hole to 20.00m, samples taken below that.	0.00m 30.00m 150mm 28.90m		+10.48 mOD E 347442.08 N 377306.99

					Level	
				Soft thickly laminated brown and grey mottled black slightly sandy silty CLAY.	(13.00)	
			01/09/2014 1800			1

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:18:24

NK KGB IC	01/09/2014 02/09/2014	Dando 2000 Hand dug inspection pit to 1.20m. Cable percussion boring to 30.00m. SPT Hammer ID: PBD14 Rods: Whitworth. Open hole to 20.00m, samples taken below that.	0.00m 30.00m 150mm 28.90m		+10.48 mOD E 347442.08 N 377306.99

						Level	
20.00-20.45 20.00-20.45 20.00-20.45	SPT S D 1 B 2	N=21 (5,5/6,6,5,4)	19.90	10.00	Medium dense becoming loose brown slightly gravelly SAND. Gravel is angular to subrounded fine to coarse of various lithologies including coal and basalt.	20.00	-9.52
21.00	D 3						
							(2.60)
21.50-21.95 21.50-21.95 21.50-21.95	SPT S D 4 B 5	N=8 (2,2/1,2,2,3)	21.40	16.00	21.50 m Becoming loose		
22.70	D 6				Firm to stiff brown slightly gravelly slightly sandy CLAY. Gravel is angular to subangular fine to coarse of various lithologies.	22.60	-12.12
23.00-23.45	U NR	100 blows No recovery	22.90	18.00			(0.50)
23.50	D 8				Medium dense brown slightly gravelly SAND. Gravel is angular to subrounded fine to coarse of various lithologies including coal and basalt.	23.10	-12.62
24.50-24.95 24.50-24.95 24.50-24.95	SPT S B 10 D 9	N=13 (3,4/3,3,3,4)	24.40	20.00			(3.60)
25.70	D 11						
26.00-26.45 26.00-26.45 26.00-26.45	SPT S D 12 B 13	N=13 (4,4/3,3,4,3)	25.90	21.00			
26.70	D 14				Firm to stiff brown vertically thinly laminated silty CLAY with abundant silt laminae.	26.70	-16.22
							(0.40)
					Medium dense brown fine and medium very silty SAND.	27.10	-16.62
27.50-27.95 27.50-27.95 27.50-27.95	SPT S D 15 B 16	N=14 (2,3/3,4,4,3)	27.40	21.50			
28.00-28.45	SPT S	N=14 (3,3/4,4,3,3)	28.90	22.00			(2.90)
29.00-29.45 29.00-29.45	D 17 D 18						
			02/09/2014 28.90	1800 22.00			
30.00	D 19				EXPLORATORY HOLE ENDS AT 30.00 m		

1 27.10 Rose to 15.00 m after 20 minutes. -

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:18:25

IW KGB IC	28/08/2014 01/09/2014	Dando 2000 Cable percussion boring to 29.95m. SPT Hammer ID: PBD8. Rod Type: Whitworth	0.00m	29.95m 150mm 27.50m	+10.80 mOD E 347594.84 N 377509.75

						Level
0.10-0.50	B 1				MADE GROUND: Soft to firm dark grey slightly sandy silty CLAY with rootlets. (TOPSOIL).	(0.50)
0.50-1.00	B 2				MADE GROUND: Locally thinly laminated black dark brown slightly sandy clayey SILT with roots and very strong hydrocarbon odour.	0.50 +10.30
1.00-1.45	SPT S	N=2 (1,0/1,0,1,0)		dry	1.00-1.45 m Thinly laminated	
1.00-1.45	D 3					
1.00-1.45	B 4					
1.70	D 5				1.70-2.45 m Band of soft dark greyish brown silty clay	
2.00-2.45	SPT S	N=2 (1,0/1,0,0,1)	1.70	dry		
2.00-2.45	D 6					
2.00-2.45	B 7					
2.70	D 8					
3.00-3.45	SPT S	N=0 (0,0/-,-,-,-)	2.90	dry		
3.00-3.45	B 10					
3.00-3.45	D 9					
3.70	D 11					
4.00-4.45	SPT S	N=1 (1,0/0,0,1,0)	3.70	dry		(7.00)
4.00-4.45	D 12					
4.00-4.45	B 13					
4.70	D 14					
5.00-5.45	SPT S	N=0 (1,0/-,-,-,-)	4.50	dry		
5.00-5.45	B 15					
5.70	D 16					
			28/08/2014	1700		
6.00-6.45	SPT S	N=1 (1,0/0,0,1,0)	~~5.90~~	~~dry~~		
6.00-6.45	D 17		29/08/2014	0800		
6.00-6.45	B 18		5.90	dry		
6.70	D 19					
7.00-7.45	SPT S	N=1 (0,0/0,1,0,0)	6.90	dry		
7.00-7.45	D 20					
7.00-7.45	B 21					
						7.50 +3.30
					Possible MADE GROUND: soft to firm light grey mottled orange slightly sandy silty CLAY with rootlets.	
8.00	D 22					(1.20)
8.50-8.95	U 23	24 blows 360 mm rec	8.20	dry	8.50-8.70 m Mottled black thinly laminated with a slight hydrocarbon odour	
						8.70 +2.10
8.95-9.00	D 24				Soft to firm light grey mottled orange slightly sandy silty CLAY with abundant roots and plant remains. Organic odour noted.	
						(1.70)
					Stratum continues to 10.40 m	

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:18:28

IW KGB IC	28/08/2014 01/09/2014	Dando 2000 Cable percussion boring to 29.95m. SPT Hammer ID: PBD8. Rod Type: Whitworth	0.00m	29.95m 150mm 27.50m	+10.80 mOD E 347594.84 N 377509.75

						Level	
10.00-10.45 10.00-10.45 10.00-10.45	SPT S D 25 B 26	N=4 (1,1/1,1,1,1)	9.90	dry	Soft to firm light grey mottled orange slightly sandy silty CLAY with abundant roots and plant remains. Organic odour noted. 10.00-10.40 m Pockets of thinly laminated brown fibrous peat	10.40 +0.40	
11.00	D 27				Thinly laminated light grey very sandy SILT.		
11.50-11.95 11.50-11.95 11.50-11.95	SPT S B 28 D 28	N=1 (1,0/0,0,0,1)	11.40	dry			
12.50	D 29					(4.60)	
13.00-13.45 13.00-13.45 13.00-13.45	SPT S D 30 B 31	N=6 (1,1/2,1,1,2)	12.90	damp			
14.00	D 32						
14.50-14.95 14.50-14.95 14.50-14.95	SPT S D 33 B 34	N=6 (1,2/1,1,2,2)	14.40	damp			
15.50	D 35				Medium dense light grey very gravelly silty SAND. Gravel is subangular to rounded fine to coarse of various lithologies including basalt and quartzite.	15.00 -4.21	
16.00-16.45 16.00-16.45 16.00-16.45	SPT S D 36 B 37	N=19 (2,4/4,4,5,6)	15.90	11.00		(3.00)	
17.00	D 38						
17.50-17.95 17.50-17.95	SPT C B 39	N=21 (3,4/4,5,5,7)	17.40 29/08/2014 1700 17.40	dry 11.00			
18.50	D 40		01/09/2014 0800 18.00	14.00	Firm to stiff brown slightly sandy slightly gravelly CLAY. Gravel is angular to subangular fine to coarse of various lithologies including basalt, quartz, quartzite and sandstone.	18.00 -7.20	
19.00-19.45	U 41	85 blows	18.90	dry			
19.45-19.50	D 42						
					Stratum continues to 22.60 m		

1	15.00	Rose to 11.00 m after 20 minutes. -

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:18:29

IW KGB IC	28/08/2014 01/09/2014	Dando 2000 Cable percussion boring to 29.95m. SPT Hammer ID: PBD8. Rod Type: Whitworth	0.00m 29.95m 150mm 27.50m	+10.80 mOD E 347594.84 N 377509.75

						Level
20.50-20.95 20.50-20.95 20.50-20.95	SPT S D 43 B 44	N=31 (5,5/6,7,9,9)	20.00	dry	Firm to stiff brown slightly sandy slightly gravelly CLAY. Gravel is angular to subangular fine to coarse of various lithologies including basalt, quartz, quartzite and sandstone.	(4.60)
21.50	D 45					
22.00-22.45	U 46	100 blows 315 mm rec	21.90	dry		
22.45-22.50	D 47					
						22.60 -11.80
23.50-23.95 23.50-23.95 23.50-23.95	SPT S D 48 B 49	N=23 (3,4/4,6,6,7)	23.40	17.50	Medium dense brown locally slightly gravelly medium and coarse SAND. Gravel is angular to subangular fine to coarse.	(2.90)
24.50	D 50				24.50-25.00 m Slightly gravelly.	
25.00-25.45 25.00-25.45 25.00-25.45	SPT S D 51 B 52	N=18 (2,3/4,4,5,5)	24.90	20.00		
						25.50 -14.70
26.00	D 53				Firm to stiff brown slightly sandy slightly gravelly CLAY. Gravel is angular to subangular fine to coarse of various lithologies including basalt, quartz, quartzite and sandstone.	
26.50-26.95	U 54	100 blows 405 mm rec	26.00	dry		
26.95-27.00	D 55					(4.45)
28.00-28.45 28.00-28.45 28.00-28.45	SPT S D 56 B 57	N=39 (4,7/8,10,10,11)	27.50	dry		
29.00	D 58					
29.50-29.95	U 59	100 blows 315 mm rec	27.50	dry		
			01/09/2014 27.50	1700 27.50		29.95 -19.15
					EXPLORATORY HOLE ENDS AT 29.95 m	

2 22.60 Rose to 17.00 m after 20 minutes. -

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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SS SA IC	29/08/2014 03/09/2014	Dando 150 Cable percussion boring to 30.00m. SPT Hammer ref: PBD10	0.00m 11.40m	11.40m 30.00m	200mm 150mm	11.40m 30.00m	+11.09 mOD E 347846.42 N 377652.16

						Level
0.00-0.30	B 1		29/08/2014	0800	MADE GROUND: Grey brown slightly sandy silty SILT. Sand is fine. (TOPSOIL).	(0.30)
0.30-1.20	B 2					0.30 +10.79
					MADE GROUND: Soft to firm friable grey mottled brown slightly sandy CLAY. Sand is fine.	(1.20)
1.20-1.65	SPT S	N=0 (1,2/-,-,-,-)				
1.20-1.65	B 4					1.50 +9.59
					MADE GROUND: Very soft becoming soft brown mottled black slightly sandy silty CLAY. Sand is fine. Strong hydrocarbon odour.	
2.00-2.45	SPT S	N=2 (1,0/1,0,0,1)	1.90	dry		
2.00-2.45	B 6		1.90	dry		
3.00-3.45	SPT S	N=0 (1,0/-,-,-,-)	2.90	dry		
3.00-3.45	D 7		2.90	dry		
3.00-3.45	B 8					
4.00-4.45	SPT S	N=2 (1,1/1,0,1,0)	3.90	dry		
4.00-4.45	B 10					
4.00-4.45	D 9		3.90	dry		(6.50)
5.00-5.45	SPT C	N=0 (0,0/-,-,-,-) SW=450	4.90	dry		
5.00-5.45	B 12					
6.00-6.90	SPT C	N=0 (0,0/-,-,-,-) SW=450	5.90	dry		
6.00-6.45	B 14					
7.00-7.45	SPT S	N=4 (1,0/1,2,0,1)	6.90	dry		
7.00-7.45	D 15		6.90	dry		
7.00-7.45	B 16		29/08/2014	1800		
			6.90	dry		
			01/09/2014	0800		
			6.90	dry		
8.00-8.45	SPT S	N=6 (1,1/1,2,1,2)	7.90	dry		
8.00-8.45	D 17		7.90	dry		8.00 +3.09
8.00-8.45	B 18				MADE GROUND: Brown mottled black and grey slightly sandy clayey SILT. Sand is fine. Strong hydrocarbon odour.	
						(1.50)
9.00-9.45	SPT S	N=4 (1,2/1,1,1,1)	8.90	dry		
9.00-9.45	D 19		8.90	dry		
9.00-9.45	B 20					
9.50	D 21					9.50 +1.59
					Black fibrous PEAT.	
					Stratum continues to 10.50 m	

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:18:34

SS SA IC	29/08/2014 03/09/2014	Dando 150 Cable percussion boring to 30.00m. SPT Hammer ref: PBD10	0.00m 11.40m	11.40m 30.00m	200mm 150mm	11.40m 30.00m	+11.09 mOD E 347846.42 N 377652.16

						Level		
10.00-10.45	U 22	19 blows	9.90		Black fibrous PEAT.	(1.00)		
10.50	D 23				Soft to firm grey mottled brown silty slightly sandy CLAY. Root material, pockets of peat and plant remains.	10.50	+0.59	
						(1.00)		
11.50-11.95 11.50-11.95 11.50-11.95 11.70	SPT S D 24 B 25 D 26	N=2 (1,0/1,0,1,0)	11.40 11.40	dry dry	Light grey sandy clayey SILT. Sand is fine.	11.50	-0.41	
						(2.00)		
13.00-13.45 13.00-13.45	SPT S B 28	N=0 (1,0/-,-,-,-)	12.90	dry				
13.70	D 29	*			Loose becoming medium dense grey slightly gravelly silty fine to coarse SAND. Gravel is subangular to subrounded fine and medium of sandstone, mudstone, limestone, flint and basalt.	13.50	-2.41	
14.50-14.95 14.50-14.95 14.70	SPT C B 31 D 32	N=8 (1,2/2,2,2,2)	14.40	10.60				
16.00-16.45 16.00-16.45	SPT C B 34	N=9 (1,2/2,3,2,2)	15.90 15.90	11.50 11.50				
16.70	D 35					(6.50)		
17.50-17.95 17.50-17.95 17.70	SPT C B 37 D 38	N=10 (1,2/2,3,3,2)	01/09/2014 15.90 ~~17.40~~ 02/09/2014 15.90	1800 11.50 ~~8.00~~ 0800 8.00	17.50 m Becoming medium dense			
19.00-19.45 19.00-19.45	SPT C B 40	N=11 (1,2/2,3,3,3)	18.90	10.20				

13.50 17.50 Water added to assist boring

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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SS SA IC	29/08/2014 03/09/2014	Dando 150 Cable percussion boring to 30.00m. SPT Hammer ref: PBD10	0.00m 11.40m 200mm 11.40m 11.40m 30.00m 150mm 30.00m		+11.09 mOD E 347846.42 N 377652.16

								Level	
20.00	D 41				Stiff to very stiff reddish brown slightly sandy, becoming sandy, slightly gravelly, becoming gravelly, silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine and medium of sandstone, mudstone and basalt.	20.50-22.00 m Becoming sandy and gravelly.	20.00	-8.91	
20.50-20.95	U 42	50 blows 315 mm rec							
21.00	D 43							(2.00)	
22.00-22.45	SPT C	N=13 (2,2/4,3,4,2)	21.90	20.00	Medium dense brown slightly gravelly fine to coarse SAND. Gravel is subangular to subrounded fine and medium of sandstone, mudstone, flint and basalt.		22.00	-10.91	1
22.00-22.45	B 45								
22.70	D 46								
23.50-23.95	SPT C	N=16 (2,3/4,4,4,4)	23.40	19.10				(3.00)	
23.50-23.95	B 48								
23.70	D 49								
25.00-25.45	SPT S	N=14 (3,4/4,5,2,3)	24.90	dry	Stiff to very stiff reddish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded to rounded fine and medium of basalt.		25.00	-13.91	
25.00-25.45	D 50		24.90	dry					
25.00	B 51								
25.70	D 52							(2.00)	
26.50-26.95	U NR	41 blows No recovery	26.40	damp					
			02/09/2014	1800					
			26.40	damp					
27.00	D 54		03/09/2014	0800	Very stiff brown slightly sandy silty CLAY. Sand is fine.		27.00	-15.91	
			26.40	6.00					
28.00-28.45	SPT S	N=31 (5,5/7,8,8,8)	27.90	8.20				(3.00)	
28.00-28.45	D 55								
28.00-28.45	B 56								
28.70	D 57								
29.50-29.95	SPT S	N=29 (6,5/8,7,6,8)	29.40	15.00					
29.50-29.95	D 58		29.40	15.00					
29.50-29.95	B 59								
			03/09/2014	1800					
			29.40	15.00					
					EXPLORATORY HOLE ENDS AT 30.00 m				

1 22.00 Rose to 20.00 m after 20 minutes. -

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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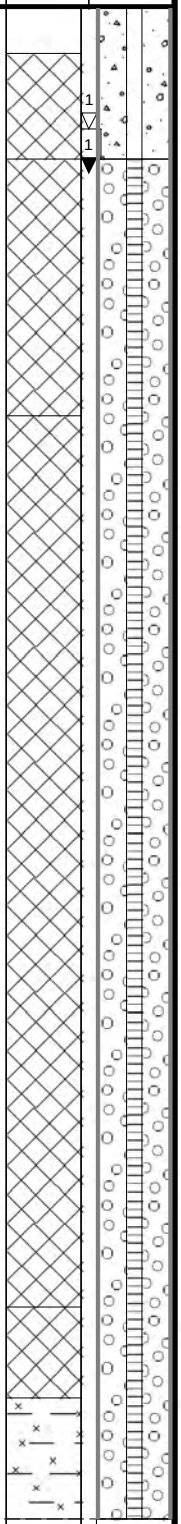
426.4817/12/2014 13:18:36

IW KGB IC	03/09/2014 05/09/2014	Dando 2000 Cable percussion boring to 33.45m. SPT Hammer ID: PBD8 Rods: Whitworth	0.00m	33.45m 150mm 32.90m	+12.39 mOD E 348086.47 N 377810.56

						Level
				MADE GROUND: Grass and TOPSOIL. (Drillers description).	(0.30)	
					0.30 +12.09	
0.50-1.00	B 1			MADE GROUND: Brown and dark grey silty fine and medium SAND with roots and plant remains.	(0.70)	
1.00-1.45	SPT S	N=3 (1,0/1,1,0,1)	0.80		1.00 +11.39	
1.00-1.45	D 2			MADE GROUND: Very loose dark grey brown and black very silty SAND with a strong hydrocarbon odour.		
1.00-1.45	B 3					
1.70	D 4				(1.70)	
2.00-2.45	SPT S	N=3 (1,0/0,1,1,1)	1.70 dry			
2.00-2.45	D 5					
2.00-2.45	B 6					
2.70	D 7			MADE GROUND: Locally thickly laminated black mottled greyish brown very sandy SILT with a very strong hydrocarbon odour. 2.70-3.00 m Thickly laminated	2.70 +9.69	
3.00-3.45	SPT S	N=1 (1,0/0,0,0,1)	2.80 dry			
3.00-3.45	D 8					
3.45	B 8					
3.70	D 9					
4.00-4.45	SPT S	N=1 (0,0/0,1,0,0)	3.90 dry			
4.00-4.45	D 10					
4.00-4.45	B 11					
4.70	D 12					
5.00-5.45	SPT S	N=2 (1,0/0,1,1,0)	4.50 dry			
5.00-5.45	D 13					
5.00-5.45	B 14					
5.70	D 15				(5.90)	
6.00-6.45	SPT S	N=5 (1,1/1,1,1,2)	5.90 dry			
6.00-6.45	D 16					
6.00-6.45	B 17					
6.70	D 18					
7.00-7.45	SPT S	N=3 (1,0/0,1,1,1)	6.90 dry			
7.00-7.45	D 19					
7.00-7.45	B 20					
7.70	D 21					
8.00-8.45	SPT S	N=4 (1,0/1,1,1,1)	7.50 dry	8.00-8.60 m Thickly laminated		
8.00-8.45	D 22					
8.00-8.45	B 23					
8.70	D 24			Firm to stiff light grey mottled orange and brown slightly sandy silty CLAY with rootlets. (Possible MADE GROUND).	8.60 +3.79	
9.00-9.45	U 25	42 blows 315 mm rec	8.80 dry		(0.60)	
9.45-9.50	D 26			Soft thinly laminated light grey mottled brown and black, becoming dark greyish brown, silty CLAY with pockets of fibrous peat.	9.20 +3.19	
				Stratum continues to 12.00 m		



1	1.00	Rose to 0.80 m after 20 minutes.	-

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:18:39

IW KGB IC	03/09/2014 05/09/2014	Dando 2000 Cable percussion boring to 33.45m. SPT Hammer ID: PBD8 Rods: Whitworth	0.00m	33.45m 150mm 32.90m	+12.39 mOD E 348086.47 N 377810.56

						Level	
10.50-10.95 10.50-10.95 10.50-10.95	SPT S D 27 B 28	N=7 (1,1/2,1,2,2)	10.40	dry	Soft thinly laminated light grey mottled brown and black, becoming dark greyish brown, silty CLAY with pockets of fibrous peat. 10.50-12.00 m Very slight hydrocarbon odour	(2.80)	
11.50	D 29				11.50-12.00 m Becoming dark greyish brown		
12.00-12.45 12.00-12.45	B 30 U NR	17 blows No recovery	10.40 03/09/2014 10.40 04/09/2014 13.40	dry 1700 dry 0800 1.00	Loose light grey slightly gravelly very silty medium and coarse SAND. Gravel is a fine and medium.	12.00 +0.39	
13.00	D 31	*					
13.50-13.95 13.50-13.95 13.50-13.95	SPT S D 32 B 33	N=9 (1,2/2,2,2,3)	13.40	1.50		(3.00)	
14.50	D 34						
15.00-15.45 15.00-15.45 15.00-15.45	SPT S D 35 B 36	N=11 (2,2/3,2,3,3)	14.90	1.50	Medium dense greyish brown medium and coarse SAND.	15.00 -2.62	
16.00	D 37						
16.50-16.95 16.50-16.95 16.50-16.95	SPT S D 38 B 39	N=19 (3,3/4,4,6,5)	16.40	1.00			
17.50	D 40					(5.50)	
18.00-18.45 18.00-18.45 18.00-18.45	SPT S D 41 B 42	N=22 (2,4/4,6,6,6)	17.90	1.00			
19.00	D 43						
19.50-19.95 19.50-19.95 19.50-19.95	SPT S D 44 B 45	N=29 (4,4/6,7,7,9)	19.40	1.00			
					Stratum continues to 20.50 m		

13.00 Water added to assist boring

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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IW KGB IC	03/09/2014 05/09/2014	Dando 2000 Cable percussion boring to 33.45m. SPT Hammer ID: PBD8 Rods: Whitworth	0.00m	33.45m 150mm 32.90m	+12.39 mOD E 348086.47 N 377810.56

						Level	
					Medium dense greyish brown medium and coarse SAND.		
20.50	D 46					20.50	-8.11
					Medium dense greyish brown slightly gravelly medium and coarse SAND. Gravel is angular to subangular fine of basalt and quartz.		
21.00-21.45	SPT S	N=26 (3,4/6,6,7,7)	20.90	1.00			
21.00-21.45	D 47						
21.00-21.45	B 48						
22.00	D 49						
22.50-22.95	SPT S	N=17 (2,3/3,4,4,6)	22.40	1.00		(4.00)	
22.50-22.95	D 50						
22.50-22.95	B 51						
23.50	D 52						
24.00-24.45	SPT S	N=28 (3,4/6,7,7,8)	23.90	2.00			
24.00-24.45	D 53						
24.00-24.45	B 54						
24.50-25.00	B 55					24.50	-12.11
					Firm thinly laminated brown slightly gravelly slightly silty CLAY. Gravel is angular to subangular fine and medium of various lithologies.	(0.50)	
						25.00	-12.61
					Medium dense orangish brown, locally slightly clayey, fine to coarse SAND.		
25.50-25.95	SPT S	N=22 (2,3/4,6,6,6)	25.40	1.50			
25.50-25.95	D 56						
25.50-25.95	B 57						
26.50	D 58				26.50-27.00 m Slightly clayey	(3.30)	
27.00-27.45	SPT S	N=28 (4,5/6,6,7,9)	26.90	2.00			
27.00-27.45	D 59						
27.00-27.45	B 60		04/09/2014	1700			
			26.90	2.00			
			05/09/2014	0800			
			28.00	15.00			
28.30	D 61					28.30	-15.91
28.50-28.95	B 62				Firm thinly laminated brown slightly sandy silty CLAY with abundant silt laminations.		
28.50-28.95	U NR	100 blows No recovery	28.40	17.50		(1.70)	
29.50	D 63						

2 30.00 Rose to 13.00 m after 20 minutes. -

22.50 -23.00 60 mins Chisel

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:18:41

IW KGB IC	03/09/2014 05/09/2014	Dando 2000 Cable percussion boring to 33.45m. SPT Hammer ID: PBD8 Rods: Whitworth	0.00m	33.45m 150mm 32.90m	+12.39 mOD E 348086.47 N 377810.56

						Level	
30.00-30.45 30.00-30.45 30.00-30.45	SPT S D 64 B 65	N=48 (10,10/11,11,12,14)	28.50	13.00	Extremely weak reddish brown fine to coarse SANDSTONE. Recovered as fine to coarse sand and angular to subangular fine and medium sandstone gravel.	30.00	-17.61
31.00	D 66						
31.50-31.91 31.50-31.95 31.50-31.95	SPT S D 67 B 68	50 (15,10 for 50mm/ 27,23 for 60mm)	31.40	13.00		(3.45)	
32.50	D 69						
33.00-33.37	SPT C	50 (25 for 105mm/50 for 40mm)	32.90	13.00			
			05/09/2014 32.90	1700 13.00			
					EXPLORATORY HOLE ENDS AT 33.45 m	33.45	-21.06

2 30.00 Rose to 13.00 m after 20 minutes. -

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:18:42

NK KGB IC	04/09/2014 10/09/2014	Dando 2000 Cable percussion boring to 35.00m. SPT Hammer ID: PBD14 Rods: Whitworth	0.00m	35.00m 150mm 34.00m	+13.23 mOD E 348317.50 N 377971.20

						Level	
					MADE GROUND: Gravel over TOPSOIL. (Drillers description).	0.10 +13.13	
0.50-1.00	D 1				MADE GROUND: Light brown fine and medium SAND with roots and rootlets.	(1.10)	
1.00-1.45 1.00-1.45	SPT S B 3	N=1 (1,0/0,0,1,0)				1.20 +12.03	
					MADE GROUND: Very loose dark brown and black silty SAND.		
2.00-2.45 2.00-2.45 2.00-2.45	SPT S D 4 B 5	N=0 (0,0/-,-,-,-)	1.50	damp			
2.70	D 6					(2.60)	
3.00-3.45 3.00-3.45	SPT S B 8	N=0 (0,0/-,-,-,-)	2.90	damp			
3.70	D 9					3.80 +9.43	1
4.00-4.45 4.00-4.45 4.00-4.45	SPT S D 10 B 11	N=1 (1,0/0,0,0,1)	4.90	damp	MADE GROUND: Thinly laminated sandy clayey SILT. Strong hydrocarbon odour.	4.00 +9.23	
					MADE GROUND: Black sandy clayey SILT with very strong hydrocarbon odour.		1
4.70	D 12						
5.00-5.45 5.00-5.45 5.00-5.45	SPT S D 13 B 14	N=1 (1,0/0,1,0,0)	4.90	damp			
5.70	D 15						
6.00-6.45 6.00-6.45 6.00-6.45	SPT S D 16 B 17	N=0 (0,0/-,-,-,-)	5.90	damp			
7.00	D 18					(5.60)	
7.50-7.95 7.50-7.95 7.50-7.95	SPT S D 19 B 20	N=0 (1,0/-,-,-,-)	7.40	damp			2
8.70	D 21						
9.00-9.45 9.00-9.45 9.00-9.45	SPT S D 22 B 23	N=2 (1,0/0,1,0,1)	8.90	damp			
9.60	D 24					9.60 +3.63	3 1
					Possible MADE GROUND: Soft to firm grey		
					Stratum continues to 11.50 m		

1	4.50	Rose to 4.00 m after 20 minutes.	4.70

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:18:45

NK KGB IC	04/09/2014 10/09/2014	Dando 2000 Cable percussion boring to 35.00m. SPT Hammer ID: PBD14 Rods: Whitworth	0.00m	35.00m 150mm 34.00m	+13.23 mOD E 348317.50 N 377971.20

						Level	
					mottled orange and brown slightly sandy silty CLAY with rootlets.		
10.50-10.95	U 25	20 blows	10.40	damp		(1.90)	
11.00	D 26						
					Brown and black slightly clayey fibrous PEAT with pockets of amorphous peat.	11.50 +1.73	
11.70	D 27					(0.50)	
12.00-12.45	SPT S	N=9 (2,2/3,2,2,2)	11.90	dry	Soft to firm thinly laminated light grey mottled brown slightly sandy CLAY with abundant plant remains, organic material and pieces of amorphous peat.	12.00 +1.23	
12.00-12.45	D 28						
12.00-12.45	B 29					(1.00)	
			04/09/2014	1700			
			11.90	dry			
13.00	D 30					13.00 +0.23	
			05/09/2014	0800	Light grey very sandy SILT with roots and plant remains.		
			11.90	damp			
13.50-13.95	SPT S	N=6 (2,2/1,2,1,2)	13.40	damp			
13.50-13.95	D 31						
13.50-13.95	B 32						
						(3.00)	
14.70	D 33						
15.00-15.45	SPT S	N=6 (1,1/2,1,2,1)	14.90	damp			
15.00-15.45	D 34						
15.00-15.45	B 35						
16.00	D 36					16.00 -2.77	
16.50-16.95	SPT S	N=6 (1,2/2,1,1,2)	16.40	10.00	Dense to medium dense brown and grey, locally brown, slightly gravelly medium and coarse SAND with locally occasional clay pockets. Gravel is angular to subangular fine and medium of various lithologies.		
16.50-16.95	D 37						
16.50-16.95	B 38	*					
17.70	D 39						
18.00-18.45	SPT S	N=13 (3,2/3,4,3,3)	17.90	12.00			
18.00-18.45	D 40						
18.00-18.45	B 41						
19.00	D 42				19.00-20.00 m Brown	(6.00)	
			10/09/2014	0800			
			26.50	8.00			
19.50-19.95	SPT S	N=11 (3,3/2,4,3,2)	19.40	15.00			
19.50-19.95	D 43						
19.50-19.95	B 44						
					Stratum continues to 22.00 m		

2	11.00	Rose to 8.00 m after 20 minutes.	11.80
3	16.00	Rose to 10.00 m after 20 minutes.	-

17.00	18.00	Slow boring - blowing sands	
20.00	21.00	Slow boring - blowing sands	

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:18:46

NK KGB IC	04/09/2014 10/09/2014	Dando 2000 Cable percussion boring to 35.00m. SPT Hammer ID: PBD14 Rods: Whitworth	0.00m	35.00m 150mm 34.00m	+13.23 mOD E 348317.50 N 377971.20

							Level	
20.70	D 45	*			Dense to medium dense brown and grey, locally brown, slightly gravelly medium and coarse SAND with locally occasional clay pockets. Gravel is angular to subangular fine and medium of various lithologies.	20.00-22.00 m Brown		
21.00-21.45 21.00-21.45 21.00-21.45	SPT S D 46 B 47	N=16 (4,4/5,4,4,3)	20.90 05/09/2014 1700 20.90	17.00 17.00		21.45-22.00 m Occasional pockets of clay		
22.00	D 48				Medium dense multicoloured sandy GRAVEL. Gravel is angular to subangular fine to coarse of various lithologies including sandstone, mudstone, basalt and quartz.		22.00	-8.77
22.50-22.95 22.50-22.95 22.50-22.95	SPT C C 49 B 50	N=14 (4,4/3,4,3,4)	22.40	12.00			(1.00)	
23.00	D 51				Firm, becoming thinly laminated, brown slightly gravelly slightly sandy silty CLAY. Gravel is angular to subangular fine to coarse of various lithologies.		23.00	-9.77
24.00-24.45	U 52	60 blows 225 mm rec	24.00	damp				
24.50	D 53						(3.10)	
25.00	D 54	*						
25.50-25.95 25.50-25.95 25.50-25.95	SPT S D 55 B 56	N=31 (6,6/7,7,8,9)	25.00	damp		25.50-26.10 m Thinly laminated		
26.10	D 57				Medium dense brown silty, becoming very silty, fine and medium SAND with locally occasionally clay pockets.		26.10	-12.87
27.00-27.45 27.00-27.45 27.00-27.45	SPT S D 58 B 59	N=16 (3,4/4,3,4,5)	26.90	10.00				
28.00	D 60							
28.50-28.95 28.50-28.95 28.50-28.95	SPT S D 61 B 62	N=16 (4,4/3,4,5,4)	28.40	19.00		28.50-30.00 m Occasional pockets of clay	(4.90)	
29.70	D 63							
					Stratum continues to 31.00 m			

1 26.10 Rose to 10.00 m after 20 minutes. -

20.00 21.00 Slow boring - blowing sands
25.00 26.50 Slow boring - blowing sands

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:18:48

NK KGB IC	04/09/2014 10/09/2014	Dando 2000 Cable percussion boring to 35.00m. SPT Hammer ID: PBD14 Rods: Whitworth	0.00m	35.00m 150mm 34.00m	+13.23 mOD E 348317.50 N 377971.20

							Level
30.00-30.45 30.00-30.45 30.00-30.45	SPT S D 64 B 65	N=15 (3,4/4,4,4,3)	29.90	20.00	Medium dense brown silty, becoming very silty, fine and medium SAND with locally occasionally clay pockets.	30.00-31.00 m Very silty 30.00-33.45 m Convolute Laminations	
31.00	D 66				Soft to firm very sandy silty CLAY		31.00 -17.77
31.50-31.95	U 67	55 blows 270 mm rec	31.40	20.00			(0.90)
32.00	D 68				Brown clayey SAND		31.90 -18.67
32.70	D 69				Firm to stiff thinly laminated slightly sandy silty CLAY with abundant silt laminae.		(0.70) 32.60 -19.37
33.00-33.45 33.00-33.45 33.00-33.45	SPT S D 70 B 71	N=27 (6,6/7,6,7,7)	32.90	damp			
34.00	D 72					34.00-34.50 m Vertically laminated	(2.40)
34.50-34.95 34.50-34.95 34.50-34.95	SPT S D 73 B 74	N=23 (7,7/6,5,6,6)	34.00 10/09/2014 1700 34.00	damp 20.00			
					EXPLORATORY HOLE ENDS AT 35.00 m		35.00 -21.77

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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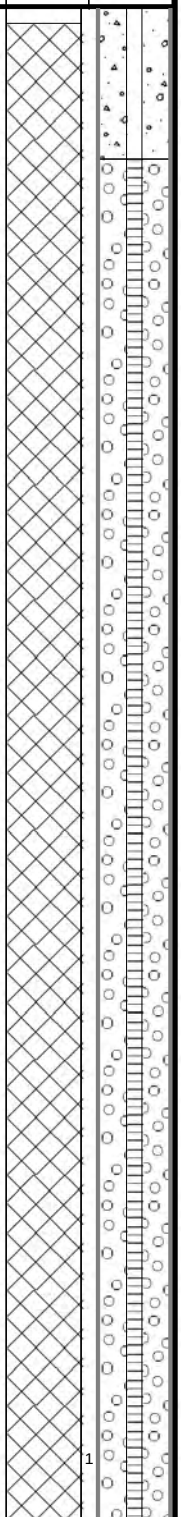
426.4817/12/2014 13:18:49

SC SA IC	20/08/2014 22/08/2014	Dando 2000 Cable percussion boring to 30.45m. SPT Hammer ID: PBD8 Rod type: Whitworth	0.00m	30.45m 150mm 28.50m	+10.42 mOD E 347607.51 N 376954.60

						Level
				MADE GROUND: Grass and Topsoil (drillers description).		0.10 *+10.32*
0.50-1.00	B 1			MADE GROUND: Very soft brown to black mottled slightly sandy silty CLAY with fibrous peaty rootlets and roots up to 10mm diameter. Strong organic odour.		
1.20-1.65 1.20-1.65 1.20-1.65	SPT S B 2 D 2	N=1 (1,0/0,0,1,0)		dry		
1.70	D 3					
2.00-2.45 2.00-2.45 2.00-2.45	SPT S B 4 D NR	N=1 (0,0/0,1,0,0)	1.70	dry		
2.70	D 5				2.45-6.70 m Roots and rootlets absent.	
3.00-3.38 3.00-3.45 3.00-3.45	SPT S B 6 D NR	N=2 (0 for 75mm/1,0,1,0)	2.90	dry		
3.70	D 7					
4.00-4.45 4.00-4.45 4.00-4.45	SPT S B 8 D NR	N=2 (1,0/1,0,0,1)	3.90	dry		
4.70	D 9					
5.00-5.45 5.00-5.45 5.00-5.45	SPT S B 10 D 10	N=1 (1,0/1,0,0,0)	4.50	dry		(10.40)
5.70	D 11					
6.00-6.45 6.00-6.45 6.00-6.45	SPT S B 12 D NR	N=2 (1,0/1,0,1,0)	5.80	dry		
6.80	D 13					
7.50-7.95	U 14	33 blows	7.00	dry		
7.95-8.00	D 15					
9.00-9.45 9.00-9.45 9.00-9.45	SPT S B 16 D 16	N=4 (1,0/1,1,1,1)	8.90	dry		
					9.50-10.50 m Localised light grey fine sand partings up to 10mm thick.	
				Stratum continues to 10.50 m		



Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:18:52

SC SA IC	20/08/2014 22/08/2014	Dando 2000 Cable percussion boring to 30.45m. SPT Hammer ID: PBD8 Rod type: Whitworth	0.00m 30.45m 150mm 28.50m		+10.42 mOD E 347607.51 N 376954.60

						Level		
10.00	D 17				MADE GROUND: Very soft brown to black mottled slightly sandy silty CLAY with fibrous peaty rootlets and roots up to 10mm diameter. Strong organic odour.			1
10.50-10.95	U NR	20 blows No recovery	10.40	dry		10.50	-0.08	
					Dark grey sandy peaty clayey SILT.			
11.50	D 19							
12.00-12.45 12.00-12.45 12.00-12.45	SPT S B 20 D 20	N=3 (1,0/1,0,1,1)	11.90	10.00		(3.10)		
13.00	D 21							
13.50-13.95 13.50-13.95 13.50-13.95	SPT S B 22 D 22	N=16 (1,2/3,3,4,6)	13.40	11.00		13.60	-3.18	
					Medium dense slightly silty fine to coarse SAND.			
14.50	D 23							2
15.00-15.45 15.00-15.45 15.00-15.45	SPT S B 24 D 24	N=17 (2,2/3,5,4,5)	14.90	12.00				
						(3.90)		
16.00	D 25							
16.50-16.95 16.50-16.95	SPT S B 26	N=19 (2,3/4,4,5,6)	16.90	13.50				
17.50	D 27					17.50	-7.08	
					Very stiff brown mottled dark brown CLAY.			
						(0.50)		
18.00-18.45	U 28	82 blows 360 mm rec	17.90	dry		18.00	-7.58	
					Very stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine and medium of sandstone and mudstone.			
19.00	D 29							
19.50-19.95 19.50-19.95 19.50-19.95	SPT S B 30 D 30	N=26 (5,5/5,6,7,8)	19.00	dry				
					Stratum continues to 22.30 m			

1	10.40	Rose to 9.80 m after 20 minutes.	-

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:18:53

SC SA IC	20/08/2014 22/08/2014	Dando 2000 Cable percussion boring to 30.45m. SPT Hammer ID: PBD8 Rod type: Whitworth	0.00m 30.45m 150mm 28.50m	+10.42 mOD E 347607.51 N 376954.60

						Level
20.50	D 31				Very stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine and medium of sandstone and mudstone.	(4.30)
21.00-21.45	U 32	90 blows 225 mm rec	19.50	dry		
21.45-21.50	D 33					
						22.30 -11.88
22.50-22.95 22.50-22.95 22.50-22.95	SPT S B 34 D 34	N=13 (2,2/3,3,3,4)	22.40	15.00	Medium dense brown mottled light brown silty fine to coarse, becoming fine, SAND.	
23.50	D 35					
24.00-24.45 24.00-24.45 24.00-24.45	SPT S B 36 D 36	N=12 (3,4/4,3,3,2)	23.90	16.00		(3.70)
25.00	D 37				25.00-26.00 m Sand becomes fine	
25.50-25.95 25.50-25.95 25.50-25.95	SPT S B 38 D 38	N=13 (2,3/3,3,3,4)	25.40	16.50		
						26.00 -15.58
26.50	D 39				Firm to stiff, becoming stiff to very stiff, brown slightly sandy CLAY. Sand is fine to coarse.	
27.00-27.45	U 40	95 blows	26.50	24.00		
27.45-27.50	D 41				27.45 m Becoming stiff to very stiff	
						(4.45)
28.50-28.95 28.50-28.95 28.50-28.95	SPT S B 42 D 42	N=31 (4,5/5,7,9,10)	28.00	27.00		
29.50	D 43					
					Stratum continues to 30.45 m	

2 22.30 Rose to 15.00 m after 20 minutes. -

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:18:54

SC SA IC	20/08/2014 22/08/2014	Dando 2000 Cable percussion boring to 30.45m. SPT Hammer ID: PBD8 Rod type: Whitworth	0.00m 30.45m 150mm 28.50m		+10.42 mOD E 347607.51 N 376954.60

					Level		
30.00-30.45 30.00-30.45	B 44 U NR	100 blows No recovery	28.50 27.00 22/08/2014 1700 30.45	Firm to stiff, becoming stiff to very stiff, brown slightly sandy CLAY. Sand is fine to coarse.			
				EXPLORATORY HOLE ENDS AT 30.45 m	30.45 -20.03		

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:18:55

IW SA IC	22/08/2014 23/08/2014	Dando 2000 Cable percussion boring to 30.45m. SPT Hammer ID: PBD8 Rod type: Whitworth	0.00m	30.45m 150mm 25.70m	+10.69 mOD E 347849.63 N 377134.13

						Level	
0.30-0.80	B 1				MADE GROUND: Turf over TOPSOIL. (Drillers description)	(0.30) 0.30 +10.39	
1.00-1.45 1.00-1.45 1.00-1.45	SPT S B 2 D 2	N=1 (1,0/0,0,1,0)		dry	MADE GROUND: Soft to firm brown slightly sandy slightly gravelly CLAY with abundant peat material. Gravel is subangular to subrounded of sandstone and mudstone.	(0.50) 0.80 +9.89	
1.70	D 3				MADE GROUND: Very soft to soft brown mottled black silty CLAY with very strong hydrocarbon odour.		1
2.00-2.45 2.00-2.45	SPT S B 4	N=1 (0,0/1,0,0,0)	1.70	1.70			1
2.70	D 5						
3.00-3.45 3.00-3.45 3.00-3.45	SPT S B 6 D 6	N=1 (1,0/1,0,0,0)	2.90	2.00			
3.70	D 7					(6.00)	
4.00-4.45 4.00-4.45 4.00-4.45	SPT S B 8 D 8	N=2 (1,0/1,0,0,1)	3.90	2.50			
4.70	D 9						
5.00-5.45 5.00-5.45 5.00-5.45	SPT S B 10 D 10	N=2 (1,0/1,0,0,1)	4.50	dry			
5.70	D 11						
6.00-6.45 6.00-6.45 6.00-6.45	SPT S B 12 D 12	N=3 (1,0/1,1,0,1)	5.90	dry			
6.80	D 13				Firm to stiff grey mottled orange silty CLAY with very strong hydrocarbon odour.	6.80 +3.89	
7.50-7.95	U 14	23 blows 315 mm rec	7.40	dry		(1.70)	
8.50	D 15				Dark brown PEAT.	8.50 +2.19	
9.00-9.45 9.00-9.45 9.00-9.45	SPT S B 16 D 16	N=5 (1,0/1,1,1,2)	8.90	dry		(2.00)	1 3
					Stratum continues to 10.50 m		

1	2.00	Rose to 1.70 m after 20 minutes.	-

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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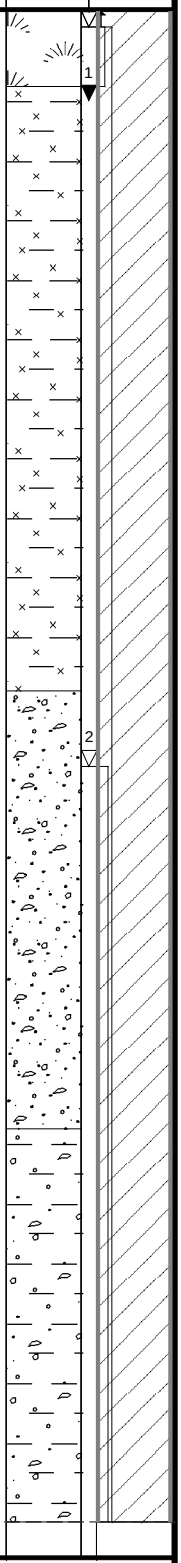
426.4817/12/2014 13:19:00

IW SA IC	22/08/2014 23/08/2014	Dando 2000 Cable percussion boring to 30.45m. SPT Hammer ID: PBD8 Rod type: Whitworth	0.00m	30.45m 150mm 25.70m	+10.69 mOD E 347849.63 N 377134.13

						Level	
10.00	D 17				Dark brown PEAT.		
10.50-10.95 10.50-10.95	B 18 U NR	17 blows No recovery	10.40	10.00	Grey clayey SILT.	10.50 +0.19	
11.50	D 19						
12.00-12.45 12.00-12.45 12.00-12.45	SPT S B 20 D 20	N=6 (1,2/1,1,2,2)	11.90	10.50		(4.00)	
13.00	D 21						
13.50-13.95 13.50-13.95 13.50-13.95	SPT S B 22 D 22	N=7 (1,2/2,2,1,2)	13.40	10.50			
14.50	D 23				Medium dense slightly gravelly fine to coarse SAND. Gravel is subangular to subrounded fine and medium of mudstone and quartz.	14.50 -3.81	
15.00-15.45 15.00-15.45 15.00-15.45	SPT S B 24 D 24	N=18 (2,3/4,4,5,5)	14.90	11.00			
16.00	D 25					(2.90)	
16.50-16.95 16.50-16.95 16.50-16.95	SPT S B 26 D 26	N=20 (2,3/4,4,6,6)	16.40	12.00			
17.60	D 27				Stiff grey mottled reddish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine of sandstone and mudstone.	17.40 -6.71	
18.00-18.45	U 28	87 blows	17.90	16.00			
19.00	D 29						
19.50-19.95 19.50-19.95 19.50-19.95	SPT S B 30 D 30	N=25 (4,4/6,6,6,7)	19.00	dry		(4.60)	
					Stratum continues to 22.00 m		



1 10.50 Rose to 10.00 m after 20 minutes. -

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:19:01

IW SA IC	22/08/2014 23/08/2014	Dando 2000 Cable percussion boring to 30.45m. SPT Hammer ID: PBD8 Rod type: Whitworth	0.00m	30.45m 150mm 25.70m	+10.69 mOD E 347849.63 N 377134.13

						Level	
20.50	D 31				Stiff grey mottled reddish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine of sandstone and mudstone.		
21.00-21.45	U 32	84 blows					
21.45-21.50	D 33						
						22.00	-11.31
22.50-22.95 22.50-22.95 22.50-22.95	SPT S B 34 D 34	N=13 (2,2/3,2,4,4)	22.40	15.00	Medium dense brown slightly gravelly silty fine to coarse SAND. Gravel is fine.		
23.50	D 35						
24.00-24.45 24.00-24.45 24.00-24.45	SPT S B 36 D 36	N=15 (2,3/3,3,4,5)	23.90	15.00		(4.40)	
25.00	D 37						
25.50-25.95 25.50-25.95 25.50-25.95	SPT S B 38 D 38	N=13 (2,3/3,4,3,3)	25.40	16.50			
						26.40	-15.71
26.50	D 39				Firm to stiff brown slightly sandy CLAY. Sand is fine to coarse.		
27.00-27.45	U 40	100 blows 270 mm rec	26.80	dry			
27.45-27.50	D 41					(2.10)	
28.50-28.95 28.50-28.95 28.50-28.95	SPT S B 42 D 42	N=40 (8,8/10,10,10,10)	28.00	10.00		28.50	-17.81
29.50	D 43				Dense to very dense red fine to coarse SAND.	(1.95)	
					Stratum continues to 30.45 m		

2	22.00	Rose to 15.00 m after 20 minutes.	-
3	28.50	Rose to 10.00 m after 20 minutes.	-

29.50 -30.00 60 mins Chisel

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:19:02

IW SA IC	22/08/2014 23/08/2014	Dando 2000 Cable percussion boring to 30.45m. SPT Hammer ID: PBD8 Rod type: Whitworth	0.00m 30.45m 150mm 25.70m		+10.69 mOD E 347849.63 N 377134.13

					Level	
30.00-30.29 30.00-30.45	SPT S D 44	50 (12,13 for 70mm/ 23,27 for 65mm)	29.70 10.00 22/08/2014 1700 25.70 2.50	Dense to very dense red fine to coarse SAND.		
				EXPLORATORY HOLE ENDS AT 30.45 m	30.45 *-19.76*	

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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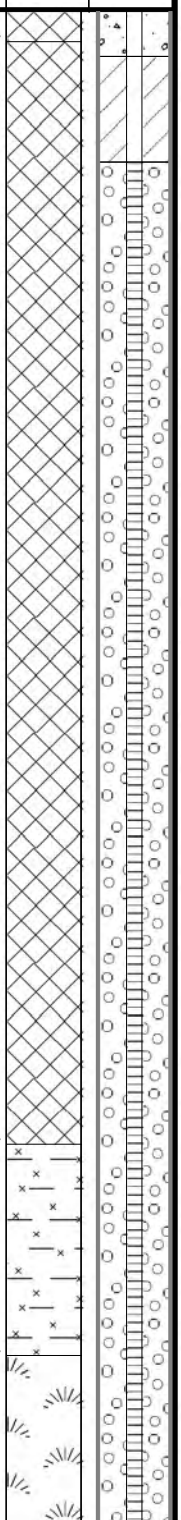
426.4817/12/2014 13:19:03

SS KGB IC	19/08/2014 23/08/2014	Dando 150 Cable percussion boring to 34.45m. SPT Hammer ID: PBD11 Rod Type: Whitworth	0.00m 24.80m 33.90m	24.80m 29.50m 34.45m	150mm 203mm 150mm	21.90m 27.80m 33.90m	+10.87 mOD E 348107.51 N 377289.66		

						Level	
0.30 0.30-1.20	D 2 B 3				MADE GROUND: light grey very sandy SILT with roots and rootlets. (TOPSOIL). MADE GROUND: Dark grey and black slightly sandy SILT with rootlets. Very strong hydrocarbon odour.	0.20	*+10.67*
1.20-1.65 1.20-1.65 1.20-1.65	SPT S B 4 D 4	N=0 (1,0/-,-,-,-)		dry			
2.00-2.45	U NR	6 blows No recovery	1.90	dry			
2.50	D 6				2.50 m Light grey and brown		
3.00-3.30 3.00-3.45	SPT S B 7	N=1 (0 for 0mm/1,0,0,0)	2.90	dry			
4.00-4.45	U 8	7 blows	3.90	dry		(7.30)	
4.50	D 9						
5.00-5.45 5.00-5.45 5.00-5.45	SPT S B 10 D 10	N=0 (0,0/-,-,-,-)	4.90	dry			
6.00-6.45	U NR	7 blows No recovery		dry			
6.50	D 12						
7.00-7.45 7.00-7.45	SPT S B 13	N=0 (0,0/-,-,-,-)	6.90 19/08/2014 1700 6.90	dry dry			
			20/08/2014 0800 7.90	dry	Soft to firm light grey mottled orange silty CLAY with rootlets.	7.50	*+3.37*
8.00-8.45	U NR	8 blows No recovery		dry		(1.40)	
8.50	D 15						
8.90 9.00-9.45 9.00-9.45 9.00-9.45	D 16 SPT S B 17 D 17	N=7 (1,2/1,2,2,2)	8.90	dry	Dark brown fibrous PEAT with occasional pockets of thinly laminated very sandy silt.	8.90	*+1.97*
					Stratum continues to 13.40 m		



Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:19:06

SS KGB IC	19/08/2014 23/08/2014	Dando 150 Cable percussion boring to 34.45m. SPT Hammer ID: PBD11 Rod Type: Whitworth	0.00m 24.80m 33.90m	24.80m 29.50m 34.45m	150mm 203mm 150mm	21.90m 27.80m 33.90m	+10.87 mOD E 348107.51 N 377289.66		

						Level	
10.00-10.45	U 18	34 blows	9.90	dry	Dark brown fibrous PEAT with occasional pockets of thinly laminated very sandy silt.		
10.50	D 19						
11.00	D 20					(4.50)	
11.50-11.95	SPT C	N=1 (1,0/0,1,0,0)	11.40	damp			
11.50-11.95	B 21						
11.50-11.95	D 21						
11.70	D 22						
13.00-13.45	SPT S	N=14 (2,1/3,3,4,4)	12.90	damp			
13.00-13.45	B 23						
13.00-13.45	D 23						
13.40	D 24	*			Light grey very sandy SILT with pockets of peat, plant remains and occasional clayey silt.	13.40 -2.53	
14.50-14.95	SPT C	N=2 (2,1/0,0,1,1)	14.40	10.60			
14.50-14.95	B 25						
14.50-14.95	D 25						
14.70	D 26						
		*				(3.60)	
16.00-16.45	SPT C	N=24 (2,2/3,4,7,10)	15.90	11.00			
16.00-16.45	B 27						
16.00-16.45	D 27						
			20/08/2014	1700			
			15.90	11.00			
			21/08/2014	0800	Medium dense brown gravelly medium and coarse SAND. Gravel is angular to subangular fine and medium of various lilthologies.	17.00 -6.13	
			17.40	14.00			
17.50-17.95	SPT C	N=14 (2,3/2,4,3,5)	17.40	0.00		(1.00)	
17.50-17.95	B 29						
17.50-17.95	D 29						
18.00	D 30				Firm to stiff brown slightly gravelly slightly sandy, locally silty, CLAY. Gravel is angular to subangular fine and medium of various lithologies.	18.00 -7.13	
19.00-19.45	U 31	65 blows 225 mm rec	18.90	dry			
19.70	D 32				19.70-20.00 m Silty		
					Stratum continues to 26.00 m		

1	13.40	Rose to 10.30 m after 20 minutes.	-

13.40	15.00	Water added to assist boring
15.00	18.00	Water added to assist boring

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:19:07

SS KGB IC	19/08/2014 23/08/2014	Dando 150 Cable percussion boring to 34.45m. SPT Hammer ID: PBD11 Rod Type: Whitworth	0.00m 24.80m 33.90m	24.80m 29.50m 34.45m	150mm 203mm 150mm	21.90m 27.80m 33.90m	+10.87 mOD E 348107.51 N 377289.66

						Level	
20.50-20.95 20.50-20.95 20.50-20.95 20.70	SPT S B 33 D 33 D 34	N=19 (3,4/5,3,5,6)	20.40	damp	Firm to stiff brown slightly gravelly slightly sandy, locally silty, CLAY. Gravel is angular to subangular fine and medium of various lithologies.		
22.00-22.45 22.00-22.45	SPT S D 35	N=20 (2,3/6,5,4,5)	21.90	damp		(8.00)	
22.70	D 36		21/08/2014 1700 21.90	damp			
			22/08/2014 0800 21.90	damp			1
23.50-23.95 23.50-23.95 23.50-23.95 23.70	SPT S B 37 D 37 D 38	N=19 (3,4/5,5,6,3)	21.90	damp			
			22/08/2014 1700 21.90	damp			
25.00-25.45	U 39	68 blows 225 mm rec	23/08/2014 0800 24.90	damp			
25.50	D 40						
		*			Medium dense brown slightly gravelly silty fine to coarse SAND. Gravel is angular to subangular fine and medium of various lithologies including basalt and coal.	26.00 -15.13	1
26.50-26.95 26.50-26.95 26.50-26.95 26.70	SPT S B 41 D 41 D 42	N=16 (3,4/5,4,3,4)	26.40	24.00		(2.50)	
28.00-28.45 28.00-28.45 28.00-28.45 28.20	SPT C B 43 D 43 D 44	N=18 (2,3/4,5,5,4)	27.90	23.20			
					Firm thinly laminated lightly brown silty CLAY.	28.50 -17.63	
					Stratum continues to 31.45 m	(2.95)	1

1	26.00	Rose to 23.40 m after 20 minutes.	-	26.00 28.50	Water added to assist boring

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:19:08

SS KGB IC	19/08/2014 23/08/2014	Dando 150 Cable percussion boring to 34.45m. SPT Hammer ID: PBD11 Rod Type: Whitworth	0.00m 24.80m 33.90m	24.80m 29.50m 34.45m	150mm 203mm 150mm	21.90m 27.80m 33.90m	+10.87 mOD E 348107.51 N 377289.66

						Level
					Firm thinly laminated lightly brown silty CLAY.	
31.00-31.45	U 47	89 blows 360 mm rec	30.90	dry		
						31.45 -20.58
31.70	D 48				Firm brown slightly gravelly slightly sandy silty CLAY. Gravel is angular to subangular fine and medium of various lithologies.	
						(1.55)
32.50-32.95 32.50-32.95 32.50-32.95	SPT S D 49 B 50	N=20 (3,4/4,4,6,6)	32.40	dry		
33.00	D 51				Very dense reddish brown sandy GRAVEL. Gravel is angular to subangular fine to coarse of red sandstone.	33.00 -22.13
						(1.45)
34.00-34.44 34.00-34.45	SPT S D 52	50 (10,14/26,24 for 60mm)	33.90 23/08/2014 1700 34.45	30.70 damp		
					EXPLORATORY HOLE ENDS AT 34.45 m	34.45 -23.58

1	33.00	Rose to 30.00 m after 20 minutes.	-

33.50 -34.00 60 mins Chisel

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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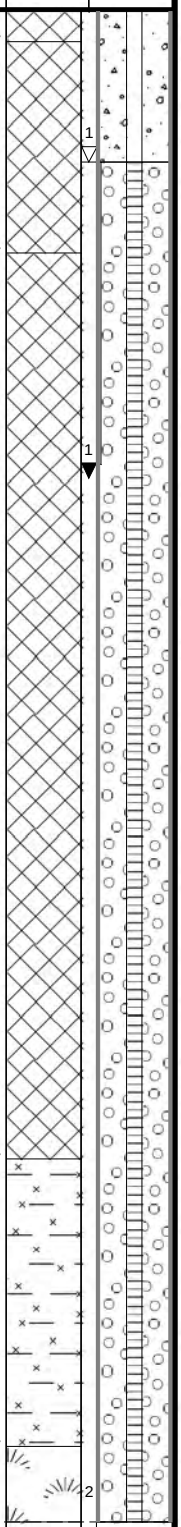
426.4817/12/2014 13:19:10

NK KGB IC	19/08/2014 27/08/2014	Dando 2000 Cable percussion boring to 34.45m. SPT Hammer ID: PBD14 Rod Type: Whitworth	0.00m	34.45m 150mm 33.40m	+11.47 mOD E 348368.89 N 377491.87

							Level
					MADE GROUND: TOPSOIL.		0.20 +11.27
0.50-1.00	B 1				MADE GROUND: Dark brown mottled red and black slightly sandy SILT with rootlets and plant remains. Strong hydrocarbon odour.		
1.00	D 2						(1.40)
1.20-1.65	SPT S	N=2 (1,0/0,0,1,1)		dry			
1.20-1.65	B 3						
1.20-1.65	D 3						
					MADE GROUND: Dark brown and black sandy clayey SILT with a very strong hydrocarbon odour.		1.60 +9.87
2.00-2.45	SPT S	N=3 (1,0/1,1,0,1)	1.90	dry			
2.00-2.45	B 4						
2.00-2.45	D 4						
2.70	D 5						
3.00-3.45	SPT S	N=3 (1,1/1,0,1,1)	2.90	1.00			
3.00-3.45	B 6						
3.00-3.45	D 6						
3.70	D 7						
4.00-4.45	SPT S	N=4 (1,1/2,1,1,0)	3.90	damp		4.00-4.45 m Saturated - hydrocarbon sheen on water and sample	
4.00-4.45	B 8						
4.00-4.45	D 8						
4.70	D 9						(6.00)
5.00-5.45	U 10	5 blows 360 mm rec	4.90	damp			
5.50	D 11						
6.00-6.45	SPT S	N=5 (1,1/1,2,1,1)	5.90	dry			
6.00-6.45	B 12						
6.00-6.45	D 12						
6.70	D 13						
			19/08/2014	1700			
			5.90	dry			
7.00-7.45	SPT S	N=4 (1,0/1,0,1,2)		damp			
7.00-7.45	B 13		20/08/2014	0800			
7.00-7.45	D 13		6.90	damp			
					Firm to stiff locally thinly laminated light grey mottled orange and black silty CLAY with rootlets. Slight hydrocarbon odour.		7.60 +3.87
7.70	D 14						
8.00-8.45	U 15	15 blows	7.90	dry			
8.50	D 16					8.50-9.50 m Thinly laminated	(1.90)
9.00-9.45	SPT S	N=8 (2,2/1,2,3,2)	8.90	dry		9.00-9.50 m Rare pockets of fibrous peat with slight hydrocarbon and organic odour	
9.00-9.45	B 17						
9.00-9.45	D 17						
					Dark brown fibrous PEAT. Organic odour.		9.50 +1.97
9.70	D 18						
					Stratum continues to 11.00 m		



1	3.00	Rose to 1.00 m after 20 minutes.	3.50

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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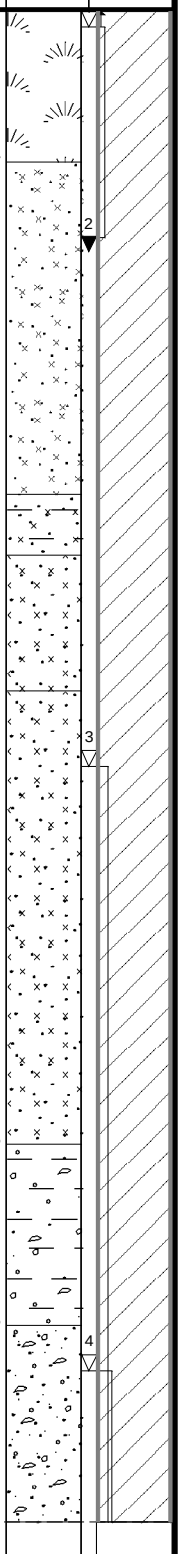
426.4817/12/2014 13:19:13

NK KGB IC	19/08/2014 27/08/2014	Dando 2000 Cable percussion boring to 34.45m. SPT Hammer ID: PBD14 Rod Type: Whitworth	0.00m	34.45m 150mm 33.40m	+11.47 mOD E 348368.89 N 377491.87

						Level	
					Dark brown fibrous PEAT. Organic odour.	(1.50)	
10.50-10.95	U 19	22 blows	10.40	dry			
11.00	D 20				Thinly laminated light grey very sandy SILT with rootlets and plant remains.	11.00 +0.47	
12.00-12.45 12.00-12.45 12.00-12.45	SPT S B 21 D 21	N=4 (1,1/1,0,1,2)	11.90	11.00		(2.20)	
13.30	D 22				Soft to firm thinly laminated dark grey slightly sandy silty CLAY with roots and plant remains.	13.20 -1.74	
13.50-13.95	U NR	30 blows No recovery				(0.40)	
					Dark grey silty SAND.	13.60 -2.14	
14.00	D 24					(0.90)	
15.00-15.45 15.00-15.45 15.00-15.45	SPT C B 25 D 25	N=12 (3,4/3,2,3,4)	14.90	14.00	Medium dense dark grey gravelly silty medium and coarse SAND. Gravel is angular to subangular fine to coarse of various lithologies including basalt and sandstone.	14.50 -3.04	
16.30	D 26					(3.00)	
16.50-16.95 16.50-16.95 16.50-16.95	SPT C B 27 D 27	N=12 (3,3/4,2,3,3)	16.40 20/08/2014 1700 16.40	15.10 15.10			
			21/08/2014 14.00	0800 14.00			
17.70	D 28				Firm to stiff thinly laminated reddish brown slightly gravelly slightly sandy CLAY. Gravel is angular to subrounded fine and medium of various lithologies.	17.50 -6.03	
18.00-18.45	U 29	100 blows	17.70	dry		(1.20)	
18.50	D 30						
18.70	D 31				Medium dense to dense brown slightly gravelly medium and coarse SAND with frequent organic material. Gravel is coal.	18.70 -7.23	
19.50-19.95 19.50-19.95 19.50-19.95	SPT S B 32 D 32	N=25 (6,5/5,7,6,7)	19.40	17.00			
					Stratum continues to 21.50 m		



2 11.50 Rose to 10.00 m after 20 minutes. -

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:19:14

NK KGB IC	19/08/2014 27/08/2014	Dando 2000 Cable percussion boring to 34.45m. SPT Hammer ID: PBD14 Rod Type: Whitworth	0.00m	34.45m 150mm 33.40m	+11.47 mOD E 348368.89 N 377491.87

						Level	
					Medium dense to dense brown slightly gravelly medium and coarse SAND with frequent organic material. Gravel is coal.	(2.80)	
20.70	D 33						
21.00-21.45 21.00-21.45 21.00-21.45	SPT S B 34 D 34	N=22 (4,4/5,4,6,7)	20.90	19.50			
					Firm to stiff reddish brown slightly gravelly slightly sandy CLAY. Gravel is angular to subrounded fine and medium of various lithologies.	21.50 -10.03	
22.00	D 34						
22.50-22.95	U 35	80 blows 360 mm rec	22.40	dry		(1.70)	
23.00	D 36						
					Medium dense orangish brown slightly gravelly silty fine and medium SAND with frequent organic material. Gravel is fine coal.	23.20 -11.73	3
23.70	D 37						
24.00-24.45 24.00-24.45 24.00-24.45	SPT S B 38 D 38	N=11 (4,4/3,2,3,3)	23.90	18.00			
			21/08/2014 23.90	1700 18.00		(3.40)	5
25.00 25.00	D 39 B 40		22/08/2014 25.40	0800 10.00			
25.50-25.95 25.50-25.95 25.50-25.95	SPT S B 41 D 41	N=11 (4,3/3,4,2,2)	25.40	10.00			
26.70	D 42				Firm thinly laminated dark brown slightly sandy silty CLAY.	26.60 -15.13 (0.30)	4
27.00-27.45 27.00-27.45 27.00-27.45	SPT S B 43 D 43	N=13 (3,4/4,3,3,3)	26.90	18.00	Medium dense light brown silty fine SAND.	26.90 -15.43	
28.00	D 44					(2.20)	
28.50-28.95 28.50-28.95 28.50-28.95	SPT S B 45 D 45	N=14 (4,4/4,3,3,4)	28.40	20.00			
29.10	D 46				Firm thinly laminated dark brown slightly sandy silty CLAY.	29.10 -17.63	
					Stratum continues to 31.00 m		

3	23.20	Rose to 15.00 m after 20 minutes.	-
4	26.90	Rose to 19.00 m after 20 minutes.	-

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:19:16

NK KGB IC	19/08/2014 27/08/2014	Dando 2000 Cable percussion boring to 34.45m. SPT Hammer ID: PBD14 Rod Type: Whitworth	0.00m	34.45m 150mm 33.40m	+11.47 mOD E 348368.89 N 377491.87

						Level	
30.00-30.45	U 47	75 blows	29.90	dry	Firm thinly laminated dark brown slightly sandy silty CLAY.	(1.90)	
30.50	D 48						
						31.00 *-19.53*	
31.30	D 49				Firm to stiff reddish brown slightly gravelly slightly sandy CLAY. Gravel is angular to subrounded fine and medium of various lithologies including basalt.		
31.50-31.95	U 50	100 blows 360 mm rec	31.40	28.00			
			22/08/2014	1700		(1.50)	
			31.40	28.00			5
32.00	D 51						
			27/08/2014	0800			
			33.40	14.00			
						32.50 *-21.03*	
					Very dense reddish brown clayey fine and medium SAND.		
33.50-33.69	SPT S	50 (17,8 for 10mm/ 35,15 for 30mm)	33.40	14.00		(1.95)	
33.50-33.95	B 52						
33.50-33.95	D 52						
34.00-34.34	SPT S	50 (25 for 50mm/50 for 60mm)	16.00	dry			
34.00	D 53						
34.00-34.45	D 54						
			27/08/2014	1700			
			16.00	14.00			
						34.45 *-22.98*	
					EXPLORATORY HOLE ENDS AT 34.45 m		

5	32.00	Rose to 25.00 m after 20 minutes.	-

33.70 -34.00 60 mins Chisel

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:19:17

MH / MR KGB IC	19/08/2014 05/09/2014	Dando 2000 Cable percussion boring to 34.54m. SPT Hammer Ref: SM23 Silt gripped casing at 26.80m, pulled casing back to 24.00m to free then redrill.	0.00m 34.55m 150mm 34.50m		+11.72 mOD E 348652.86 N 377646.64

					Level
			19/08/2014 0800	MADE GROUND: Dark brown mottled black and light brown sandy SILT. Slight, becoming very strong, hydrocarbon and organic odour.	
0.50	D 1				
1.20-1.65	SPT S	N=0 (1,0/-,-,-,-)	1.20 damp		
1.20-1.65	D 2		1.20 damp		
1.20-1.65	B 3				
2.20	D 4				
2.50-3.00	B 5				
2.50-2.95	U NR	2 blows No recovery	2.50 damp		
3.20	D 6				
3.50-3.95	SPT S	N=1 (0,0/0,1,0,0)	3.50 damp		
3.50-3.95	D 7				
3.50-4.00	B 8				
4.20	D 9				(8.20)
4.50-5.00	B 10			4.50-8.20 m Becoming clayey. Strong hydrocarbon odour.	
4.50-4.95	U NR	4 blows No recovery	4.50 damp		
5.20	D 11				
5.50-5.95	SPT S	N=1 (0,0/0,0,1,0)	5.50 damp		
5.50-5.95	D 12				
5.50-5.95	B 13				
6.20	D 14				
6.50-6.95	U 15	6 blows 405 mm rec	6.50 damp		
		*			
8.20	D 16				8.20 +3.52
			19/08/2014 1800	Firm to stiff light grey mottled orange silty CLAY with rootlets.	(0.30)
			6.50 damp		
8.50-8.95	SPT S	N=11 (1,2/2,3,3,3)	~~8.50 dry~~		8.50 +3.22
8.50-8.95	D 17		20/08/2014 0800	Locally thinly laminated light grey mottled black slightly sandy clayey SILT with rootlets. Slight organic odour.	
8.50-9.00	B 18		6.50 damp		
9.20	D 19			9.00-9.20 m Thinly laminated.	(1.50)
9.50-9.95	U 20	14 blows			

None observed (see Key Sheet)

7.10 8.20 Driller notes tools dropped. No samples taken at 7.50m.

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:19:21

MH / MR KGB IC	19/08/2014 05/09/2014	Dando 2000 Cable percussion boring to 34.54m. SPT Hammer Ref: SM23 Silt gripped casing at 26.80m, pulled casing back to 24.00m to free then redrill.	0.00m 34.55m 150mm 34.50m		+11.72 mOD E 348652.86 N 377646.64

						Level	
10.00	D 21			Dark brown fibrous PEAT locally with occasional pockets of soft dark brown silt and light brown sand.		10.00 +1.72	
10.50-10.95 10.50-10.95 10.50-11.00	SPT S D 22 B 23	N=6 (1,2/2,1,2,1)	10.50	dry	10.50-11.40 m Occasional pockets of soft dark brown silt and light brown sand.	(1.40)	
11.40	D 24	*			Grey slightly sandy clayey SILT locally with frequent pockets of fibrous peat and plant remains.	11.40 +0.32	
12.00-12.45 12.00-12.45 12.00-12.50	SPT S D 25 B 26	N=8 (1,2/2,2,2,2)	12.00	10.00		(3.10)	
13.20	D 27						
13.50-13.95 13.50-13.95 13.50-14.00	SPT S D 28 B 29	N=5 (1,0/0,2,2,1)	13.50	9.50	13.80-14.50 m Frequent pockets of fibrous peat and plant remains.		
14.50	D 30				Medium dense light grey fine and medium SAND.	14.50 -2.78	
15.00-15.45 15.00-15.45 15.00-15.50	SPT S D 31 B 32	N=9 (1,1/2,2,2,3)	15.00	10.70		(1.30)	
		*					
16.00	D 33				Loose light grey gravelly silty fine to coarse SAND. Gravel is angular to subangular fine to coarse of various lithologies.	15.80 -4.08	
16.50-16.95 16.50-17.00	SPT C B 34	N=8 (1,0/2,2,2,2)	16.50	11.00			
17.50	D 35						
18.00-18.45 18.00-18.50	SPT C B 36	N=6 (1,0/0,2,2,2)	18.00	9.70		(4.70)	
19.00 19.10-20.00	D 37 B 38						
19.50-19.95	SPT C	N=7 (2,0/1,2,2,2)	19.50	11.00			
					Stratum continues to 20.50 m		

None observed (see Key Sheet)

11.40	14.50	Water added to assist boring.
15.50	20.40	5m casing redrill to surge.

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:19:22

MH / MR KGB IC	19/08/2014 05/09/2014	Dando 2000 Cable percussion boring to 34.54m. SPT Hammer Ref: SM23 Silt gripped casing at 26.80m, pulled casing back to 24.00m to free then redrill.	0.00m 34.55m 150mm 34.50m		+11.72 mOD E 348652.86 N 377646.64

						Level	
			20/08/2014 1800 19.50 11.00	Loose light grey gravelly silty fine to coarse SAND. Gravel is angular to subangular fine to coarse of various lithologies.			
20.50	D 39		21/08/2014 0800 19.50			20.50	-8.78
21.00-21.45 21.00-21.45 21.00-21.50	SPT S D 40 B 41	N=11 (1,2/2,3,3,3)	21.00 9.80	Medium dense brown slightly gravelly slightly silty medium and coarse SAND. Gravel is angular to subangular fine and medium of various lithologies.			
22.00	D 42						
22.50-22.95 22.50-22.95 22.50-23.00	SPT S D 43 B 44	N=8 (2,1/2,2,2,2)	22.00 11.00				
23.50	D 45						
24.00-24.45 24.00-24.45 24.00-24.50	SPT S D 46 B 47	N=13 (1,2/3,3,3,4)	24.00 12.70				
25.00	D 48						
25.50-25.95 25.50-25.95 25.50-26.00	SPT S D 49 B 50	N=12 (1,2/3,3,3,3)	25.50 14.80				
26.00	D 51					(11.80)	
27.00-27.45 27.00-27.45 27.00-27.50	SPT S D 52 B 53	N=10 (2,2/2,3,2,3)	27.00 15.90				
28.00	D 54						
28.50-28.95 28.50-28.95 28.50-28.95	SPT S D 55 B 56	N=12 (1,0/2,3,3,4)	25.30 17.10				
29.50	D 57						
				Stratum continues to 32.30 m			

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:19:23

MH / MR KGB IC	19/08/2014 05/09/2014	Dando 2000 Cable percussion boring to 34.54m. SPT Hammer Ref: SM23 Silt gripped casing at 26.80m, pulled casing back to 24.00m to free then redrill.	0.00m 34.55m 150mm 34.50m		+11.72 mOD E 348652.86 N 377646.64

						Level	
30.00-30.45 30.00-30.45 30.00-30.50	SPT S D 58 D 59	N=17 (2,3/4,4,4,5)	30.00	6.50	Medium dense brown slightly gravelly slightly silty medium and coarse SAND. Gravel is angular to subangular fine and medium of various lithologies.		
31.00	D 60						
31.50-31.95 31.50-31.95 31.50-32.00	SPT S D 61 B 62	N=20 (3,4/4,5,6,5)	31.50	8.40			
						32.30	-20.58
32.50	D 63				Firm to stiff reddish brown slightly sandy slightly gravelling silty CLAY. Gravel is angular to subangular fine to coarse of various lithologies.		
33.00-33.45	U 64	100 blows 315 mm rec				(1.50)	
						33.80	-22.08
34.00	D 65				Very weak reddish brown medium and coarse SANDSTONE. Recovered as angular to subangular fine to coarse sandy gravel.	(0.74)	
			05/09/2014	1800			
34.50-34.54	SPT S	50 (25 for 20mm/50 for 20mm)	34.50	10.00			
34.50-34.54	D 66				EXPLORATORY HOLE ENDS AT 34.54 m	34.54	-22.82

None observed (see Key Sheet)

34.30 -34.50 60 mins Chisel

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:19:24

SS KGB IC	04/09/2014 10/09/2014	Dando 2000 Cable percussion boring to 30.45m. SPT Hammer ID: PBD11Rod Type: Whitworth	0.00m 30.45m 150mm 20.90m	+4.93 mOD E 348062.40 N 376774.13

							Level	
0.00-0.20	B 1				Soft dark brown sandy silty CLAY with grass and rootlets. (TOPSOIL).	0.20	+4.73	
0.20-1.20	B 2				Soft to firm, locally thinly laminated,dark brown to light grey mottled orange slightly sandy silty CLAY with rootlets and occasional pockets of peat.			
1.20-1.65	SPT S	N=4 (1,0/1,2,0,1)		dry			(1.80)	
1.20-1.65	D 3							
1.20-1.65	B 4							
2.00-2.45	SPT S	N=1 (1,0/0,1,0,0)	1.90	dry	1.90-2.00 m Thinly laminated	2.00	+2.93	
2.00-2.45	D 5				Laminated black mottled light grey amorphous PEAT with pockets of thinly laminated silty clay.			
2.00-2.45	B 6							
3.00-3.45	U NR	6 blows No recovery	2.90	dry	3.00-4.80 m Rare pockets of silty clay			
3.50	D 8						(2.80)	
4.00-4.45	SPT S	N=4 (2,2/1,0,1,2)	3.90	dry				
4.00-4.45	B 10							
4.00-4.45	D 9							
4.80	D 11				4.80-5.00 m Pockets of peat	4.80	+0.13	1
5.00-5.38	SPT S	N=0 (1,0/-,-,-,-)	4.90	dry	Very loose light grey mottled black , becoming brownish grey, very silty fine and medium SAND locally with pockets of peat.			
5.00-5.45	D 12							
5.00-5.45	B 13							
6.00-6.45	SPT C	N=3 (1,0/0,2,1,0)	5.90	dry				
6.00-6.45	B 15							
6.70	D 16	*					(3.50)	
7.50-7.95	SPT C	N=2 (1,1/1,0,0,1)	7.40	5.50				
7.50-7.95	B 18							
7.70	D 19				7.70-8.30 m Brownish grey			
8.30	D 20					8.30	-3.37	1
9.00-9.45	SPT C	N=14 (2,3/3,4,3,4)	8.90	6.20	Medium dense brownish grey slightly silty medium and coarse SAND.			
9.00-9.45	B 22							
9.70	D 23						(2.40)	
					Stratum continues to 10.70 m			

1	8.30	Rose to 5.00 m after 20 minutes.	-

6.50	8.30	Water added to assist boring

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:19:27

SS KGB IC	04/09/2014 10/09/2014	Dando 2000 Cable percussion boring to 30.45m. SPT Hammer ID: PBD11Rod Type: Whitworth	0.00m	30.45m 150mm 20.90m	+4.93 mOD E 348062.40 N 376774.13

							Level
			04/09/2014	1800	Medium dense brownish grey slightly silty medium and coarse SAND.		
10.50-10.95	SPT S	N=15 (2,3/4,4,3,4)	8.90	6.20			
10.50-10.95	D 24		~~10.40~~	~~5.00~~			
10.50-10.95	B 25						10.70 -5.77
10.70	D 26				Medium dense light brown slightly gravelly medium and coarse SAND. Gravel is angular to subangular fine and medium of various lithologies including basalt. Occasional shell fragments.		
12.00-12.45	SPT S	N=18 (3,3/5,4,4,5)	11.90	7.10			(2.40)
12.00-12.45	D 27						
12.00-12.45	B 28						
12.70	D 29						
13.10	D 30						13.10 -8.17
					Firm to stiff locally thinly laminated brown, slightly sandy silty CLAY.		
13.50-13.95	SPT S	N=27 (5,5/6,7,8,6)	13.40	dry		13.50-14.00 m Abundant silt laminae.	(0.90)
13.50-13.95	D 31						
13.50-13.95	B 32						
14.00	D 33	*					14.00 -9.07
					Medium dense brown slightly silty gravelly medium and coarse SAND with locally low cobble content. Gravel is angular to subangular occasionally tabular fine to coarse of various lithologies including basalt, mudstone and quartz. Cobbles are angular and subangular tabular red sandstone.	15.00-15.45 m Cobble	
15.00-15.45	SPT C	N=18 (3,5/4,3,6,5)	14.90	10.00			
15.00-15.45	B 35						
15.70	D 36						
16.50-16.95	SPT C	N=20 (4,2/4,6,6,4)	16.40	16.95			(6.30)
16.50-16.95	B 38						
16.70	D 39						
18.00-18.45	SPT C	N=19 (3,4/4,4,5,6)	17.90	12.00			
18.00-18.45	B 41						
18.70	D 42						
19.50-19.95	SPT C	N=18 (2,4/5,5,4,4)	19.40	14.30			
19.50-19.95	B 44						
19.70	D 45						
			05/09/2014	1800			
			19.40	14.30			
					Stratum continues to 20.30 m		

14.00 20.00 Water added to assist boring

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:19:29

SS KGB IC	04/09/2014 10/09/2014	Dando 2000 Cable percussion boring to 30.45m. SPT Hammer ID: PBD11Rod Type: Whitworth	0.00m 30.45m 150mm 20.90m		+4.93 mOD E 348062.40 N 376774.13

						Level	
				Medium dense brown slightly silty gravelly medium and coarse SAND with locally low cobble content. Gravel is angular to subangular occasionally tabular fine to coarse of various lithologies including basalt, mudstone and quartz. Cobbles are angular and subangular tabular red sandstone.		20.30 -15.37	
						(0.70)	
21.00-21.45 21.00-21.45 21.00-21.45	SPT S D 46 B 47	N=37 (5,5/6,9,10,12)	20.90 15.00 08/09/2014 1800 20.90 1.50	Brown SAND and medium to large gravels / cobbles. (Drillers description).		21.00 -16.07	
				Stiff locally thinly laminated brown slightly gravelly slightly sandy silty CLAY. Gravel is angular to subangular fine to coarse of various lithologies.			
22.50-22.95 22.50-22.95 22.50-22.95 22.70	SPT S D 48 B 49 D 50	N=32 (5,6/6,6,10,10)	22.40 15.40		22.50-22.95 m Stiff with rare silt laminations		
24.00-24.45 24.00-24.45 24.00-24.45 24.70	SPT S D 51 B 52 D 53	N=35 (4,6/10,8,9,8)	23.90 15.00 09/09/2014 1800 24.70 15.00		24.00-24.45 m Stiff with rare silt laminations	(6.00)	
25.50-25.95 25.50-25.95 25.50-25.95 25.70	SPT S D 54 B 55 D 56	N=34 (4,4/8,7,9,10)	25.40 2.00				
27.00-27.45 27.00-27.45 27.00-27.45 27.70	SPT S D 57 B 58 D 59	N=32 (3,5/6,8,9,9)	26.90 10.00	Stiff to very stiff locally thinly laminated brown slightly sandy silty CLAY.	27.00-27.45 m Locally laminated.	27.00 -22.07	
28.50-28.95 28.50-28.95 28.50-28.95	SPT S D 60 B 61	N=36 (5,5/7,8,11,10)	28.40 8.40			(3.45)	
				Stratum continues to 30.45 m			

20.30 -20.80 60 mins Chisel

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:19:30

SS KGB IC	04/09/2014 10/09/2014	Dando 2000 Cable percussion boring to 30.45m. SPT Hammer ID: PBD11Rod Type: Whitworth	0.00m	30.45m 150mm 20.90m	+4.93 mOD E 348062.40 N 376774.13

					Level	
30.00-30.45 30.00-30.45	SPT S D 62	N=34 (5,6/7,9,9,9)	29.90 13.20 10/09/2014 1800 29.90 13.20	Stiff to very stiff locally thinly laminated brown slightly sandy silty CLAY.	30.45 -25.52	
				EXPLORATORY HOLE ENDS AT 30.45 m		

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:19:31

PL KGB IC	19/09/2014 23/09/2014	Dando 2000 Cable percussion boring to 30.00m. SPT Hammer ID: DB2 Rod Type: Whitworth	0.00m 30.00m 150mm 29.50m		+4.55 mOD E 348517.58 N 377149.11

						Level
0.10-0.40	D 1				MADE GROUND: TOSPOIL. (Drillers description)	0.10 +4.45
						(0.30)
0.40-1.00	D 2				Firm light grey mottled orange and brown slightly sandy CLAY with rootlets.	0.40 +4.15
1.20-1.65	SPT S	N=5 (1,1/1,2,1,1)		dry	Soft thinly laminated light grey mottled brown very sandy silty CLAY with rootlets. Frequent thin lenses of brown silty sand and soft clayey silt.	
1.20-1.65	D 3					(1.40)
1.20-1.70	B 4					
2.00-2.45	U 5	18 blows 405 mm rec	1.70	dry	Dark brown and black slightly clayey amorphous PEAT with plant remains.	1.80 +2.75
2.50	D 6					
						(1.90)
3.00-3.45	SPT S	N=1 (1,0/0,1,0,0)	3.00	dry		
3.00-3.45	D 7					
3.00-3.50	D 8					
4.00-4.45	U 9	12 blows	4.00	dry	Probably very soft to soft light grey mottled black sandy clayey SILT with small pockets of amorphous peat, rootlets, roots and plant remains.	3.70 +0.85
4.50	D 10					
5.00-5.45	SPT S	N=0 (1,1/-,-,-,-)	4.70	dry		
5.00-5.45	D 11					
5.00-5.50	B 12					
						(4.00)
6.00-6.45	U 13	21 blows 270 mm rec	6.00	0.40		
6.50	D 14					
7.00-7.45	SPT S	N=13 (2,2/3,3,3,4)	7.00	1.00		
7.00-7.45	D 15					
7.00-7.50	B 16					
8.00-8.45	SPT S	N=12 (2,3/3,3,3,3)	7.50	1.20	Firm light grey very sandy silty CLAY with rootlets.	7.70 -3.15
8.00-8.45	D 17					
8.00-8.50	B 18					(0.90)
9.00-9.45	SPT S	N=18 (3,3/4,4,5,5)	9.00	3.00	Medium dense brown slightly gravelly silty medium and coarse SAND. Gravel is subangular to subrounded fine and medium of basalt.	8.60 -4.05
9.00-9.45	D 19					
9.00-9.50	B 20					
					Stratum continues to 16.30 m	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:19:34

PL KGB IC	19/09/2014 23/09/2014	Dando 2000 Cable percussion boring to 30.00m. SPT Hammer ID: DB2 Rod Type: Whitworth	0.00m	30.00m 150mm 29.50m	+4.55 mOD E 348517.58 N 377149.11

						Level
10.50-10.95 10.50-10.95 10.50-11.00	SPT S D 21 B 22	N=19 (2,3/4,4,5,6)	10.50	1.70	Medium dense brown slightly gravelly silty medium and coarse SAND. Gravel is subangular to subrounded fine and medium of basalt.	
12.00-12.45 12.00-12.45 12.00-12.50	SPT S D 23 B 24	N=22 (3,3/4,6,6,6)	12.00	2.10		(7.70)
13.50-13.95 13.50-13.95 13.50-14.00	SPT S D 26 B 27	N=24 (3,3/5,6,6,7)	13.50	1.30		
15.00-15.45 15.00-15.45 15.00-15.50	SPT S D 28 B 29	N=26 (3,4/5,6,7,8)	15.00 19/09/2014 1700 15.00 22/09/2014 0800 16.50	1.00 1.00 0.50		16.30 -11.75
16.50-16.95	U NR	70 blows No recovery	16.50	0.50	Firm brown slightly gravelly sandy silty CLAY. Gravel is angular to subangular fine and medium of various lithologies including basalt. Abundant thin sand lenses.	(0.40) 16.70 -12.15
18.00-18.45 18.00-18.45 18.00-18.50	SPT S D 31 B 32	N=26 (4,4/4,5,7,10)	18.00	1.00	Medium dense orangish brown slightly gravelly medium and coarse SAND. Gravel is subangular to subrounded fine and medium of basalt.	(2.50)
19.50-19.95	U 33	100 blows		1.40	Firm brown silty CLAY. (Drillers description). Medium dark orangish brown slightly	19.20 -14.65 (0.30) 19.50 -14.95
					Stratum continues to 20.60 m	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:19:35

PL KGB IC	19/09/2014 23/09/2014	Dando 2000 Cable percussion boring to 30.00m. SPT Hammer ID: DB2 Rod Type: Whitworth	0.00m	30.00m 150mm 29.50m	+4.55 mOD E 348517.58 N 377149.11

							Level
					gravelly medium and coarse SAND. Gravel is subangular to subrounded fine and medium of various lithologies including basalt.		(1.10)
					Firm becoming firm to stiff thinly laminated brown slightly sandy silty CLAY.		20.60 *-16.05*
21.00-21.45 21.00-21.45 21.00-21.50	SPT S D 34 B 35	N=21 (3,4/4,5,7,5)	21.00	3.20			
22.50-22.95	U 36	75 blows 360 mm rec	22.50	4.00			
23.00	D 37						
24.00-24.45 24.00-24.45 24.00-24.50	SPT S D 38 B 39	N=21 (4,4/4,4,5,8)	24.00	5.20			
							(9.40)
25.50-25.95	U 40	80 blows 225 mm rec	25.50	6.20			
			22/09/2014 25.50	1700 6.20			
26.00	D 41					26.00-30.00 m Firm to stiff.	
			23/09/2014 27.00	0800 1.40			
27.00-27.45 27.00-27.45 27.00-27.50	SPT S D 42 B 43	N=19 (3,4/4,5,5,5)	27.00	1.40			
28.50-28.95	U 44	80 blows 405 mm rec	28.50	4.60			
29.00	D 46						
29.50-29.95 29.50-29.95 29.50-30.00	SPT S D 47 B 48	N=23 (3,5/6,7,5,5)	29.50	6.10			
			23/09/2014 29.50	1700 6.10			
					EXPLORATORY HOLE ENDS AT 30.00 m		

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:19:36

PL KGB IC	09/09/2014 11/09/2014	Dando 2000 Cable percussion boring to 30.00m.. SPT Hammer ID: DB2 Rod Type: Whitworth.	0.00m	30.00m 150mm 29.50m	+4.44 mOD E 348860.76 N 377147.79

						Level	
0.20-1.20	B 1				MADE GROUND: Grass over TOPSOIL. (Drillers description).	0.20 +4.24	
					Soft to firm brown mottled grey and orange slightly sandy silty CLAY.	(1.10)	
1.20-1.65	U 2	* 22 blows		dry		1.30 +3.14	
1.70	D 3				Dark brown and black mottled grey amorphous PEAT with pockets of soft grey thinly laminated silty clay.		
2.00-2.45 2.00-2.45 2.00-2.50	SPT S D 4 B 5	N=1 (1,0/0,1,0,0)	1.70	dry		(2.60)	
3.00-3.45	U 6	15 blows	3.00	dry			
4.00-4.45 4.00-4.45 4.00-4.50	SPT S D 8 B 9	N=1 (1,0/0,1,0,0)	4.00	dry	Very soft to soft light grey sandy silty CLAY with roots, rootlets, plant remains and peat.	3.90 +0.54	
5.00-5.45	U 10	15 blows	4.70	1.20			
5.50	D 11					(3.30)	
6.00-6.45 6.00-6.45 6.00-6.50	SPT S D 12 B 13	N=4 (1,1/1,1,1,1)	6.00	2.90			
7.00-7.45	U 14	40 blows 112 mm rec	7.00	2.90		7.20 -2.76	
7.50 7.50	D 15 D 7				Medium dense light greyish brown fine to coarse SAND.		
8.00-8.45 8.00-8.45 8.00-8.50	SPT S D 16 B 17	N=16 (2,3/4,4,4,4)	7.70	3.50			
9.00-9.45 9.00-9.45 9.00-9.30	SPT S D 18 B 19	N=18 (1,2/4,4,4,6)	9.00	4.20		(4.70)	
					Stratum continues to 11.90 m		

1	5.40	Rose to 2.10 m after 20 minutes.	-

1.20	Water added to assist boring	

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:19:39

PL KGB IC	09/09/2014 11/09/2014	Dando 2000 Cable percussion boring to 30.00m.. SPT Hammer ID: DB2 Rod Type: Whitworth.	0.00m	30.00m 150mm 29.50m	+4.44 mOD E 348860.76 N 377147.79

					Level	
				Medium dense light greyish brown fine to coarse SAND.		
10.50-10.95 10.50-10.95 10.50-11.00	SPT S D 20 B 21	N=18 (3,3/3,3,5,7)	10.50 5.10			
				Medium dense light brown slightly gravelly slightly silty medium and coarse SAND. Gravel is angular to subangular fine of various lithologies.	11.90 -7.46	
12.00-12.45 12.00-12.45 12.00-12.50	SPT S D 22 B 23	N=11 (2,2/2,3,3,3)	12.00 7.10			
13.50-13.95 13.50-13.95 13.50-14.00	SPT S D 24 B 25	N=9 (2,1/1,3,2,3)	13.50 8.10 09/09/2014 13.50 8.10		(3.70)	
15.00-15.45 15.00-15.45 15.00-15.50	SPT S D 26 B 27	N=19 (4,4/4,5,5,5)	15.00 2.30			
				Firm to stiff brown slightly gravelly slightly sandy silty CLAY. Gravel is angular to subangular fine to coarse of various lithologies.	15.60 -11.16	
16.50-16.95	U 28	78 blows	16.50 1.50			
17.00	D 29					
18.00-18.45 18.00-18.45 18.00-18.50	SPT S D 30 B 31	N=22 (4,4/4,6,6,6)	18.00 1.50		(6.70)	
19.50-19.95	U NR	82 blows No recovery	19.50 1.70			
				Stratum continues to 22.30 m		

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:19:40

PL KGB IC	09/09/2014 11/09/2014	Dando 2000 Cable percussion boring to 30.00m.. SPT Hammer ID: DB2 Rod Type: Whitworth.	0.00m 30.00m 150mm 29.50m		+4.44 mOD E 348860.76 N 377147.79

							Level
					Firm to stiff brown slightly gravelly slightly sandy silty CLAY. Gravel is angular to subangular fine to coarse of various lithologies.		
21.00-21.45 21.00-21.45 21.00-21.50	SPT S D 33 B 34	N=28 (4,5/6,7,7,8)	19.50	1.70			
					Medium dense becoming thinly laminated orangish brown slightly clayey fine and medium SAND.		22.30 -17.86
22.50-22.95 22.50-22.95 22.50-23.00	SPT S D 35 B 36	N=11 (2,2/2,3,3,3)	22.50	3.00			(0.70)
					Firm to stiff slightly sandy silty CLAY.		23.00 -18.56
			10/09/2014 25.50	5.10			
24.00-24.45 24.00-24.45 24.00-24.50	SPT S D 37 B 38	N=13 (2,3/4,2,2,5)	24.00	3.40			
25.50-25.95	U 39	90 blows	25.50	5.10			
26.00	D 40						(7.00)
27.00-27.45 27.00-27.45 27.00-27.50	SPT S D 41 B 42	N=15 (3,3/3,4,4,4)	27.00	1.40	27.00-30.00 m Thinly laminated with occasional sand lenses		
28.50-28.95	U 43	42 blows	28.50	1.70			
29.00	D 44						
29.50-29.95 29.50-29.95 29.50-30.00	SPT S D 45 B 46	N=17 (4,4/4,4,4,5)	29.50	2.00			
			11/09/2014 29.50	2.00			
					EXPLORATORY HOLE ENDS AT 30.00 m		

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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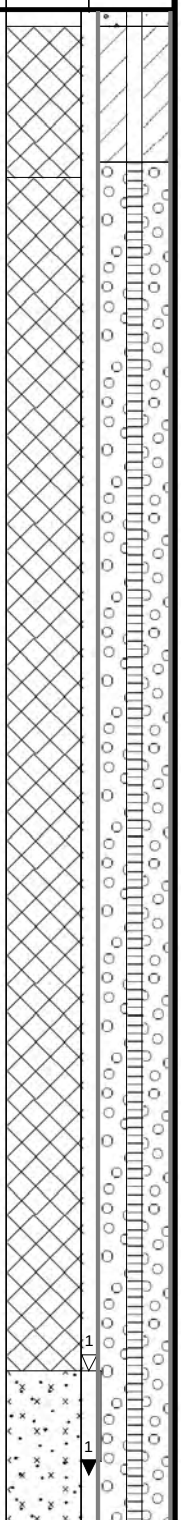
426.4817/12/2014 13:19:41

NK KGB IC	12/09/2014 16/09/2014	Dando 2000 Cable percussion boring to 14.70m. SPT Hammer ID: PBD14 Rod Type: Whitworth.	0.00m	35.00m 150mm 34.40m	+10.42 mOD E 350477.63 N 379273.45

						Level	
					MADE GROUND: TOPSOIL. (Drillers description).	0.10	+10.32
0.50-1.00	B 1				MADE GROUND: Soft to firm dark brown slightly sandy silty CLAY with roots and rootlets.	(1.00)	
1.00	D 2					1.10	+9.32
1.20-1.65 1.20-1.65 1.20-1.65	SPT S D 3 B 4	N=0 (1,0/-,-,-,-)		dry	MADE GROUND: Black mottled brown thinly laminated slightly sandy, becoming very sandy, clayey SILT with rootlets and plant remains. Strong hydrocarbon odour.		
2.00-2.45 2.00-2.45 2.00-2.45	SPT S D 5 B 6	N=0 (0,0/-,-,-,-)	1.50	dry			
2.70	D 7						
3.00-3.45 3.00-3.45 3.00-3.45	SPT S D 8 B 9	N=0 (0,0/-,-,-,-)	2.90	dry			
3.70	D 10						
4.00-4.45	U 11	6 blows 225 mm rec	3.90	dry			
4.50	D 12						
5.00-5.45 5.00-5.45 5.00-5.45	SPT S D 13 B 14	N=1 (0,0/1,0,0,0)	4.90	dry		(7.90)	
5.70	D 15						
6.00-6.45 6.00-6.45 6.00-6.45	SPT S D 16 B 17	N=1 (1,0/0,1,0,0)	5.90	dry			
7.00	D 18						
7.50-7.95 7.50-7.95 7.50-7.95	SPT S D 19 B 20	N=3 (1,0/1,0,1,1)	7.40	dry			
8.70	D 21				8.70-9.00 m Very sandy with abundant rootlets.		
9.00-9.45 9.00-9.45 9.00-9.45	SPT S D 22 B 23	N=15 (1,2/3,2,4,6)	8.90	dry	Medium dense brown mottled grey and black, locally slightly gravelly, silty, becoming very silty, fine SAND. Gravel is angular to subangular fine tabular mudstone	9.00	+1.42
					Stratum continues to 14.70 m		



1	9.60	Rose to 9.00 m after 20 minutes.	-

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:19:44

NK KGB IC	12/09/2014 16/09/2014	Dando 2000 Cable percussion boring to 14.70m. SPT Hammer ID: PBD14 Rod Type: Whitworth.	0.00m 35.00m 150mm 34.40m		+10.42 mOD E 350477.63 N 379273.45

							Level
10.00	D 24				Medium dense brown mottled grey and black, locally slightly gravelly, silty, becoming very silty, fine SAND. Gravel is angular to subangular fine tabular mudstone		
10.50-10.95	SPT S	N=17 (3,4/4,5,4,4)	10.40	9.70			
10.50-10.95	D 25						
10.50-10.95	B 26						
11.70	D 27						(5.70)
12.00-12.45	SPT S	N=14 (4,4/3,3,4,4)	11.90	10.00		12.00-14.70 m Shells and shell fragments, very silty.	
12.00-12.45	D 28						
12.00-12.45	B 29						
13.00	D 30					13.00-13.50 m Slightly gravelly.	
13.50-13.95	SPT S	N=13 (4,3/3,3,4,3)	13.40	11.00			
13.50-13.95	D 31						
13.50-13.95	B 32						
14.70	D 33						14.70 -4.28
			12/09/2014	1800	Soft thinly laminated light grey mottled light brown and orange sandy silty CLAY with frequent laminations of fibrous peat and peat remains.		
15.00-15.45	SPT S	N=32 (7,4/4,8,10,10)	13.40	11.00			(0.70)
15.00-15.45	D 34		~~14.90~~	~~9.00~~			
15.00-15.45	B 35		15/09/2014	0800			
			13.40	8.00			
					Light grey very sandy SILT with plant remains and roots.		15.40 -4.98
16.00	D 36						
16.50-16.95	SPT S	N=22 (4,4/5,6,6,5)	16.00	11.00			(2.30)
16.50-16.95	D 37						
16.50-16.95	B 38						
17.70	D 39						17.70 -7.28
18.00-18.45	SPT S	N=19 (4,5/5,4,4,6)	17.90	11.50	Medium dense light grey, becoming slightly gravelly, very silty fine to coarse, becoming coarse SAND with plant remains. Gravel is angular and subangular fine and medium tabular mudstone		
18.00-18.45	D 40						
18.00-18.45	B 41						
19.00	D 42						
19.50-19.95	SPT S	N=21 (4,5/6,6,5,4)	19.40	13.50			
19.50-19.95	D 43						
19.50-19.95	B 44						
					Stratum continues to 23.50 m		

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:19:45

NK KGB IC	12/09/2014 16/09/2014	Dando 2000 Cable percussion boring to 14.70m. SPT Hammer ID: PBD14 Rod Type: Whitworth.	0.00m	35.00m 150mm 34.40m	+10.42 mOD E 350477.63 N 379273.45

						Level
20.70	D 45				Medium dense light grey, becoming slightly gravelly, very silty fine to coarse, becoming coarse SAND with plant remains. Gravel is angular and subangular fine and medium tabular mudstone	(5.80)
21.00-21.45 21.00-21.45 21.00-21.45	SPT S D 46 B 47	N=19 (3,3/4,6,4,5)	20.90	15.00		
22.00	D 48					
22.50-22.95 22.50-22.95 22.50-22.95	SPT S D 49 B 50	N=12 (3,3/2,3,3,4)	22.40	16.00	22.50-23.50 m Becoming coarse, slightly gravelly.	
						23.50 -13.08
23.70	D 51				Firm brown slightly gravelly sandy silty CLAY. Gravel is angular to subangular fine and medium of quartz and basalt.	(0.60)
24.00	U NR	30 blows No recovery	23.90	13.00		24.10 -13.68
24.50	D 53				Medium dense orangish brown slightly gravelly silty SAND. Gravel is angular to subangular fine and medium of quartz and basalt.	
25.30-25.95	D 54					
25.50-25.95 25.50-25.95	SPT S B 55	N=12 (2,3/3,2,3,4)	25.40	10.00		
26.20	D 56					
27.00-27.45 27.00-27.45 27.00-27.45	SPT S D 57 B 58	N=13 (4,3/3,4,4,2)	26.90 15/09/2014 26.90	12.00 1800 12.00		
			16/09/2014 26.90	0800 8.00		
28.00	D 59					
28.50-28.95 28.50-28.95 28.50-28.95	SPT S D 60 B 61	N=16 (5,4/4,5,3,4)	28.00	12.00		
29.70	D 62					(10.90)
					Stratum continues to 35.00 m	

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:19:46

NK KGB IC	12/09/2014 16/09/2014	Dando 2000 Cable percussion boring to 14.70m. SPT Hammer ID: PBD14 Rod Type: Whitworth.	0.00m	35.00m 150mm 34.40m	+10.42 mOD E 350477.63 N 379273.45

						Level	
30.00-30.45 30.00-30.45 30.00-30.45	SPT S D 63 B 64	N=16 (4,4/5,4,3,4)	29.90	12.50	Medium dense orangish brown slightly gravelly silty SAND. Gravel is angular to subangular fine and medium of quartz and basalt.		
31.00	D 65						
31.50-31.95 31.50-31.95 31.50-31.95	SPT S D 66 B 67	N=17 (3,4/4,5,4,4)	31.40	14.00			
32.70	D 68						
33.00-33.45 33.00-33.45 33.00-33.45	SPT S D 69 B 70	N=16 (5,4/3,4,4,5)	32.90	15.00			
34.00	D 71						
34.50-34.95 34.50-34.95 34.50-34.95	SPT S D 72 B 73	N=14 (3,4/3,4,4,3)	34.10 16/09/2014 34.40	18.00 1800 18.00			
					EXPLORATORY HOLE ENDS AT 35.00 m	35.00	*-24.58*

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:19:47

IW KGB IC	12/09/2014 16/09/2014	Dando 2000 Cable percussion boring to 24.45m. SPT Hammer ID: PBD8 Rods: Whitworth	0.00m	35.00m 150mm 34.40m	+11.20 mOD E 350235.01 N 379063.49

							Level
0.30-0.80	B 1				MADE GROUND: Soft to firm dark brown slightly sandy CLAY with roots and rootlets. (TOPSOIL).		(0.80)
							0.80 *+10.40*
1.00-1.45 1.00-1.45 1.00-1.45	SPT S D 2 B 3	N=1 (1,0/0,0,1,0)		dry	MADE GROUND: Becoming thinly laminated, black mottled dark brown, locally slightly gravelly, slightly sandy clayey SILT with occasional roots. Strong hydrocarbon odour. Gravel is angular and subangular fine of various lithologies.		
1.70	D 4						
2.00-2.45 2.00-2.45	SPT S B 5	N=1 (0,0/0,0,1,0)	1.70	damp			
2.70	D 6						
3.00-3.45 3.00-3.45	SPT S B 7	N=1 (1,0/0,0,1,0)	2.90	damp		3.00-3.90 m Slightly gravelly.	(4.80)
3.70	D 8						
4.00-4.45 4.00-4.45 4.00-4.45	SPT S B 10 D 9	N=2 (1,0/0,0,1,1)	3.90	damp		4.00-5.60 m Thinly laminated.	
4.70	D 11						
5.00-5.45 5.00-5.45	SPT S B 12	N=2 (1,1/0,1,0,1)	4.50	dry			
							5.60 *+5.60*
5.70	D 13				Firm, locally thinly laminated, light brown, locally mottled black, grey and orange sandy, locally silty, CLAY with rootlets locally tending to clayey SILT.		
6.00-6.45	U 14	31 blows 270 mm rec	5.70	dry			
6.45-6.50	D 15					6.45-7.50 m Mottled black with abundant organic material.	
7.50-7.95 7.50-7.95 7.50-7.95	SPT S D 16 B 17	N=8 (1,1/2,2,2,2)	7.00	dry		7.50-8.50 m Thinly laminated mottled grey and orange silty clay.	(4.40)
8.50	D 18					8.50-10.00 m Bands of very sandy clayey silt.	
9.00-9.45 9.00-9.45	B 19 U NR	37 blows No recovery	8.50	dry			
			12/09/2014 8.50	1800 dry			

None observed (see Key Sheet)

10.00 Water added to assist boring

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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IW KGB IC	12/09/2014 16/09/2014	Dando 2000 Cable percussion boring to 24.45m. SPT Hammer ID: PBD8 Rods: Whitworth	0.00m	35.00m 150mm 34.40m	+11.20 mOD E 350235.01 N 379063.49

							Level
10.00	D 20	*			Medium dense light grey, locally slightly gravelly, silty SAND with bands of light grey very sandy silt, locally frequent shell fragments and pockets of soft grey clay. Gravel is angular to subrounded fine to coarse of various lithologies including sandstone and mudstone.		10.00 +1.20
10.50-10.95	SPT S	N=17 (2,2/3,5,4,5)	10.40	2.00			
10.50-10.95	D 21						
10.50-10.95	B 22						
11.50	D 23						
12.00-12.45	SPT S	N=19 (3,4/4,4,5,6)	11.90	2.00			
12.00-12.45	D 24						
12.00-12.45	B 25						
13.00	D 26					13.00-20.80 m Bands of light grey very sandy silt	
13.50-13.95	SPT S	N=18 (2,3/3,5,5,5)	13.40	3.00			
13.50-13.95	D 27						
13.50-13.95	B 28						
14.50	D 29						
15.00-15.45	SPT S	N=18 (2,3/4,4,4,6)	14.90	2.50			
15.00-15.45	D 30						
15.00-15.45	B 31						(10.80)
16.00	D 32					16.00-17.50 m Frequent shell fragments.	
16.50-16.95	SPT S	N=18 (3,4/4,4,5,5)	16.40	3.00			
16.50-16.95	D 33						
16.50-16.95	B 34						
17.50	D 35						
18.00-18.45	SPT S	N=13 (2,3/3,3,4,3)	17.90	3.00		18.00-19.00 m Pockets of soft grey clay with peat and plant remains.	
18.00-18.45	D 36						
18.00-18.45	B 37						
19.00	D 38						
19.50-19.95	SPT S	N=14 (3,4/4,3,3,4)	19.40	5.00		19.50-20.00 m Slightly gravelly.	
19.50-19.95	D 39						
19.50-19.95	B 40						
					Stratum continues to 20.80 m		

None observed (see Key Sheet)

10.00 Water added to assist boring

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:19:52

IW KGB IC	12/09/2014 16/09/2014	Dando 2000 Cable percussion boring to 24.45m. SPT Hammer ID: PBD8 Rods: Whitworth	0.00m	35.00m 150mm 34.40m	+11.20 mOD E 350235.01 N 379063.49

							Level	
20.50	D 41				Medium dense light grey, locally slightly gravelly, silty SAND with bands of light grey very sandy silt, locally frequent shell fragments and pockets of soft grey clay. Gravel is angular to subrounded fine to coarse of various lithologies including sandstone and mudstone.		20.80	-9.60
21.00-21.45	SPT C	N=19 (2,3/3,4,6,6)	20.90	7.50				
21.00-21.45	B 42							
22.00	D 43				Medium dense multicoloured very gravelly slightly silty fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of various lithologies including sandstone, mudstone, basalt, quartzite and quartz.			
22.50-22.95	SPT C	N=21 (5,6/6,5,5,5)	22.40	7.50				
22.50-22.95	B 44						(4.20)	
23.50	D 45							
24.00-24.45	SPT C	N=15 (3,4/3,4,4,4)	23.90	7.50				
24.00-24.45	B 46							
			15/09/2014	1800				
			23.90	7.50				
25.00	D 47				Medium dense brown medium and coarse SAND with occasional pockets of soft grey clay.		25.00	-13.80
25.50-25.95	SPT S	N=27 (3,4/6,6,7,8)	25.40	16.00				
25.50-25.95	D 48						(1.40)	
25.50-25.95	B 49							
26.50	D 50				Stiff thinly laminated brown slightly sandy silty CLAY.		26.40	-15.20
27.20-27.45	U 51	65 blows	26.90	16.00				
27.45-27.50	D 52						(2.10)	
28.50-28.95	SPT S	N=19 (2,4/4,4,5,6)	28.40	16.50			28.50	-17.30
28.50-28.95	D 53				Medium dense to dense orangish brown, becoming slightly gravelly, SAND. Gravel is angular to subangular fine and medium of various lithologies.			
28.50-28.95	B 54							
29.50	D 55							
					Stratum continues to 34.95 m			

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:19:53

IW KGB IC	12/09/2014 16/09/2014	Dando 2000 Cable percussion boring to 24.45m. SPT Hammer ID: PBD8 Rods: Whitworth	0.00m	35.00m 150mm 34.40m	+11.20 mOD E 350235.01 N 379063.49

						Level	
30.00-30.45 30.00-30.45 30.00-30.45	SPT S D 56 B 57	N=31 (3,5/7,8,8,8)	29.90	18.00	Medium dense to dense orangish brown, becoming slightly gravelly, SAND. Gravel is angular to subangular fine and medium of various lithologies.	30.00-34.95 m Slightly gravelly.	
31.00	D 58						
31.50-31.95 31.50-31.95 31.50-31.95	SPT S D 59 B 60	N=19 (2,3/4,4,5,6)	31.40	20.00		(6.45)	
32.50	D 61						
33.00-33.45 33.00-33.45	SPT S D 62	N=24 (3,4/4,6,6,8)	32.90	20.00			
34.00	D 63						
34.50-34.95 34.50-34.95	SPT S D 64	N=29 (4,6/6,7,8,8)	34.40	20.00			
			16/09/2014 34.40	1800 20.00			
					EXPLORATORY HOLE ENDS AT 35.00 m	34.95	-23.75

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:19:54

NK KGB IC	17/09/2014 22/09/2014	Dando 2000 Cable percussion boring to 35.00m. SPT Hammer ID: PBD14 Rods: Whitworth	0.00m	35.00m 150mm 34.40m	+11.16 mOD E 350429.26 N 378527.54

							Level	
					MADE GROUND: Grass over TOPSOIL. (Drillers description).		0.10 +11.06	
0.50-1.00	B 1				MADE GROUND: Firm brown slightly sandy CLAY with abundant roots and rootlets.		(0.90)	
1.00	D 2						1.00 +10.16	
1.20-1.65	SPT S	N=0 (0,0/-,-,-,-)		damp	MADE GROUND: Black mottled brown slightly sandy clayey SILT with a strong hydrocarbon odour. Occasional rootlets and plant remains.			
1.20-1.65	D 3							
1.20-1.65	D 4							
2.00-2.45	SPT S	N=0 (0,0/-,-,-,-)	1.90	damp				
2.00-2.45	D 5							
2.00-2.45	B 6							
2.70	D 7							
3.00-3.45	SPT S	N=0 (0,0/-,-,-,-)	2.90	damp				
3.00-3.45	D 8							
3.00-3.45	B 9							
3.70	D 10							
4.00-4.45	SPT S	N=0 (0,0/-,-,-,-)	3.90	damp				
4.00-4.45	D 11							
4.00-4.45	B 12							
4.70	D 13							
5.00-5.45	SPT S	N=0 (0,0/-,-,-,-)	4.90	damp			(7.70)	
5.00-5.45	D 14							
5.00-5.45	B 15							
5.70	D 16							
6.00-6.45	SPT S	N=0 (0,0/-,-,-,-)	5.90	damp				
6.00-6.45	D 17							
6.00-6.45	D 18							
6.70	D 19							
7.00-7.45	SPT S	N=0 (0,0/-,-,-,-)	6.90	damp				
7.00-7.45	D 20							
7.00-7.45	B 21							
7.70	D 22							
8.00-8.45	SPT S	N=0 (0,0/-,-,-,-)	7.90	damp				
8.00-8.45	D 23							
8.00-8.45	B 24							
8.70	D 25		17/09/2014	1700	Possible MADE GROUND: Black clayey SILT with a slight hydrocarbon odour	8.70-9.00 m Thin lenses of black clayey silt with a slight hydrocarbon odour - possible MADE GROUND.	8.70 +2.46	
			7.90	damp			(0.30)	
9.00-9.45	U 26	10 blows 405 mm rec	8.90	damp			9.00 +2.16	
			18/09/2014	0800	Soft to firm thinly laminated light grey mottled brown and black slightly sandy silty CLAY with abundant roots and plant remains.			
9.50	D 27		8.90	damp			(1.00)	

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:19:58

NK KGB IC	17/09/2014 22/09/2014	Dando 2000 Cable percussion boring to 35.00m. SPT Hammer ID: PBD14 Rods: Whitworth	0.00m	35.00m 150mm 34.40m	+11.16 mOD E 350429.26 N 378527.54

						Level	
10.00	D 28			Thinly laminated dark brown and black slightly clayey fibrous PEAT with occasional small pockets of amorphous peat and soft grey silty clay.	10.00 +1.16		
10.50-10.95 10.50-10.95 10.50-10.95	SPT S D 29 B 30	N=9 (2,2/3,2,2,2)	10.40	damp			
					(2.00)		
11.70	D 31			11.70-12.00 m Pockets of soft grey silty clay.			
12.00-12.45	U 32	19 blows 225 mm rec	11.90	damp	12.00 -0.84		
				Light grey very sandy SILT with roots, rootlets and plant remains.			
12.50	D 33			12.50-13.00 m Pockets of peat and plant remains	(1.00)		
13.00	D 34				13.00 -1.84		
				Medium dense dark grey slightly gravelly silty medium and coarse SAND. Gravel is angular to subangular fine and medium of various lithologies including basalt and quartz.			
13.50-13.95 13.50-13.95 13.50-13.95	SPT S D 35 B 36	N=12 (2,2/3,3,4,2)	13.40	11.00			
14.70	D 37						
15.00-15.45 15.00-15.45 15.00-15.45	SPT S D 38 B 39	N=12 (3,3/2,3,3,4)	14.90	12.00			
16.00	D 40				(6.00)		
16.50-16.95 16.50-16.95 16.50-16.95	SPT S D 41 B 42	N=12 (2,3/3,4,3,2)	16.40	12.50			
17.70	D 43						
18.00-18.45 18.00-18.45 18.00-18.45	SPT S D 44 B 45	N=13 (3,3/4,3,2,4)	17.90	13.00			
19.00	D 46				19.00 -7.84		
				Medium dense brown gravelly medium and coarse SAND locally with pockets of soft brown silty clay. Gravel is angular to subrounded occasionally tabular, fine to coarse of various lithologies including basalt, mudstone, quartz and sandstone.			
19.50-19.95 19.50-19.95 19.50-19.95	SPT S D 47 B 48	N=20 (4,5/5,4,5,6)	19.40	10.00	19.50-20.10 m Pockets of soft brown silty clay.	(1.10)	
			18/09/2014	1700			
					Stratum continues to 20.10 m		

1	13.00	Rose to 11.00 m after 20 minutes.	-
2	19.50	Rose to 10.00 m after 20 minutes.	-

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:19:59

NK KGB IC	17/09/2014 22/09/2014	Dando 2000 Cable percussion boring to 35.00m. SPT Hammer ID: PBD14 Rods: Whitworth	0.00m	35.00m 150mm 34.40m	+11.16 mOD E 350429.26 N 378527.54

					Level	
20.10	D 49		19.40 10.00 19/09/2014 0800 20.50 10.00	Medium dense brown gravelly medium and coarse SAND locally with pockets of soft brown silty clay. Gravel is angular to subrounded occasionally tabular, fine to coarse of various lithologies including basalt, mudstone, quartz and sandstone.	20.10 -8.94 (0.80)	
20.90 21.00-21.45 21.00-21.45 21.00-21.45	D 50 SPT S D 51 B 52	N=16 (4,4/3,4,5,4)	20.90 11.00	Firm brown sandy silty CLAY. Medium dense brown slightly gravelly fine and medium SAND. Gravel is angular to subangular fine and medium of various lithologies including mudstone and basalt.	20.90 -9.74 21.00 -9.84	3
22.00	D 53			Medium dense brown silty fine and medium SAND.	(2.10)	
22.50-22.95 22.50-22.95 22.50-22.95	SPT S D 54 B 55	N=19 (3,4/4,6,5,4)	22.40 11.50			
				Firm thinly laminated brown sandy silty CLAY with thin lenses of sandy silt.	23.10 -11.94	
23.70	D 56					
24.00-24.45	U NR	30 blows No recovery	23.90 17.00			
24.50	D 58				(3.50)	
25.00	D 59					
25.50-25.95 25.50-25.95 25.50-25.95	SPT S D 60 B 61	N=16 (4,4/5,4,3,4)	26.40 19.00			
26.70	D 62			Medium dense orangish brown slightly gravelly silty SAND. Gravel is angular to subangular fine and medium of various lithologies.	26.60 -15.44	4
27.00-27.45 27.00-27.45 27.00-27.45	SPT S D 63 B 64	N=16 (5,4/4,5,3,4)	26.90 12.00			
28.00	D 65					
28.50-28.95 28.50-28.95 28.50-28.95	SPT S D 66 B 67	N=16 (4,4/3,4,5,4)	28.40 12.50 19/09/2014 1700 28.40 12.50 22/09/2014 0800 29.00 8.00			
29.70	D 68				(5.90)	
				Stratum continues to 32.50 m		

3	20.90	Rose to 10.00 m after 20 minutes.	-
4	26.70	Rose to 12.00 m after 20 minutes.	-

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:20:00

NK KGB IC	17/09/2014 22/09/2014	Dando 2000 Cable percussion boring to 35.00m. SPT Hammer ID: PBD14 Rods: Whitworth	0.00m 35.00m 150mm 34.40m	+11.16 mOD E 350429.26 N 378527.54

						Level
30.00-30.45 30.00-30.45 30.00-30.45	SPT S D 69 B 70	N=28 (6,7/6,7,7,8)	29.90	10.00	Medium dense orangish brown slightly gravelly silty SAND. Gravel is angular to subangular fine and medium of various lithologies.	
31.00	D 71					
31.50-31.95 31.50-31.95 31.50-31.95	SPT S D 72 B 73	N=17 (4,3/4,5,4,4)	31.40	14.00		
						32.50 -21.34
32.70	D 74				Stiff thinly laminated dark brown slightly gravelly slightly sandy, becoming very sandy silty, CLAY. Gravel is angular to subangular fine and medium of various lithologies.	
33.00-33.45	U 75	85 blows 180 mm rec	32.90	20.00	33.00-34.50 m Very sandy silty.	
33.50	D 76					(2.00)
34.50-34.95 34.50-34.95	SPT S D 77	N=34 (7,8/8,9,9,8)	34.40	22.00		34.50 -23.34
			22/09/2014 34.40	1700 34.40	Stiff thinly laminated brown slightly sandy silty CLAY.	(0.50)
					EXPLORATORY HOLE ENDS AT 35.00 m	35.00 -23.84

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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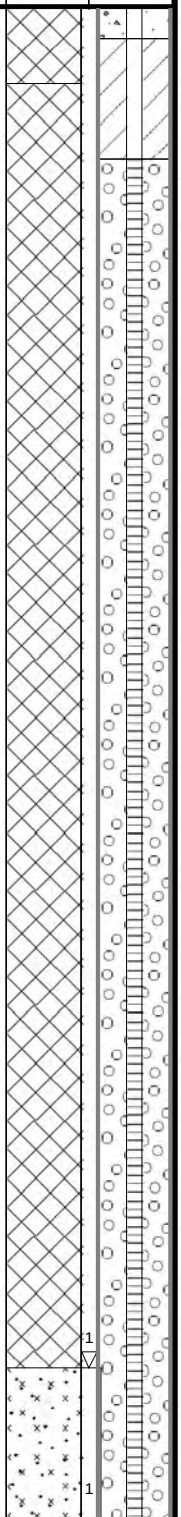
426.4817/12/2014 13:20:01

NK KGB IC	23/09/2014 25/09/2014	Dando 2000 Cable percussion boring to 35.00m. SPT Hammer ID: PBD14 Rods: Whitworth	0.00m	35.00m 150mm 34.40m	+10.74 mOD E 350707.07 N 378678.51

						Level	
					MADE GROUND: Grass over TOPSOIL. (Drillers description).	(0.50)	
0.50-1.00	B 1				MADE GROUND: Black mottled brown clayey SILT with a strong hydrocarbon odour and occasional rootlets.	0.50 +10.24	
1.00	D 2						
1.20-1.65	SPT S	N=0 (0,0/-,-,-,-)	1.00	damp			
1.20-1.65	D 3						
1.20-1.65	B 4						
2.00-2.45	SPT S	N=0 (0,0/-,-,-,-)	1.90	damp			
2.00-2.45	D 5						
2.00-2.45	B 6						
2.70	D 7						
3.00-3.45	SPT S	N=0 (0,0/-,-,-,-)	2.90	damp			
3.00-3.45	D 8						
3.00-3.45	B 9						
3.20	D 10						
4.00-4.45	SPT S	N=0 (0,0/-,-,-,-)	3.90	damp			
4.00-4.45	D 11						
4.00-4.45	B 12						
4.70	D 13					(8.50)	
5.00-5.45	SPT S	N=0 (0,0/-,-,-,-)	4.90	damp			
5.00-5.45	D 14						
5.00-5.45	D 15						
5.70	D 16						
6.00-6.45	SPT S	N=0 (0,0/-,-,-,-)	5.90	damp			
6.00-6.45	D 17						
6.00-6.45	B 18						
6.70	D 19						
7.00-7.45	SPT S	N=0 (0,0/-,-,-,-)	6.90	damp			
7.00-7.45	D 20						
7.00-7.45	B 21						
7.70	D 22						
8.00-8.45	SPT S	N=0 (0,0/-,-,-,-)	7.90	damp			
8.00-8.45	D 23						
8.00-8.45	B 24						
8.70	D 25						
			23/09/2014	1700			
			7.90	damp			
9.00-9.45	SPT S	N=14 (3,4/4,3,4,3)	8.90	damp		9.00 +1.74	
9.00-9.45	D 26		24/09/2014	0800	Medium dense thinly laminated dark grey silty fine SAND. Slight hydrocarbon odour in parts		
9.00-9.45	B 27		8.90	damp			
					Stratum continues to 13.00 m		



Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:20:05

NK KGB IC	23/09/2014 25/09/2014	Dando 2000 Cable percussion boring to 35.00m. SPT Hammer ID: PBD14 Rods: Whitworth	0.00m	35.00m	150mm	34.40m	+10.74 mOD E 350707.07 N 378678.51

						Level
10.00	D 28				Medium dense thinly laminated dark grey silty fine SAND. Slight hydrocarbon odour in parts	
10.50-10.95	SPT S	N=13 (2,3/3,4,3,3)	10.40	9.00		
10.50-10.95	D 29					
10.50-10.95	B 30					
						(4.00)
11.70	D 31					
12.00-12.45	SPT S	N=12 (3,3/3,4,3,2)	11.90	10.00		
12.00-12.45	D 32					
12.00-12.45	B 33					
13.00	D 34					13.00 -2.26
13.50-13.95	SPT S	N=12 (3,3/2,3,4,3)	13.40	10.50	Medium dense light grey gravelly medium and coarse SAND locally with pockets of fibrous peat. Gravel is angular to subangular fine and medium of various lithologies including basalt, sandstone and quartz. 13.50-13.95 m Pockets of fibrous peat.	
13.50-13.95	D 35					
13.50-13.95	B 36					
14.70	D 37					
15.00-15.45	SPT S	N=20 (4,5/4,6,5,5)	14.90	11.00		
15.00-15.45	D 38					
15.00-15.45	B 39					(4.50)
16.00	D 40					
16.50-16.95	SPT S	N=17 (5,5/4,3,4,6)	16.40	12.00		
16.50-16.95	D 41					
16.50-16.95	B 42					
						17.50 -6.76
17.70	D 43				Firm thinly laminated brown slightly sandy slightly gravelly silty CLAY. Gravel is angular to subangular fine and medium of various lithologies including basalt and sandstone.	(0.70)
18.00-18.45	U 44	68 blows				
18.00-18.45	D 45		17.90	12.00		18.20 -7.46
					Dense brown gravelly medium and coarse SAND. Gravel is angular to subangular fine and medium of various lithologies including basalt and quartz.	
19.50-19.95	SPT S	N=34 (7,8/8,9,9,8)	19.40	12.50		(2.40)
19.50-19.95	D 46					
19.50-19.95	B 47					
					Stratum continues to 20.60 m	

1	10.50	Rose to 9.00 m after 20 minutes.	-
2	18.20	Rose to 12.00 m after 20 minutes.	-

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:20:06

NK KGB IC	23/09/2014 25/09/2014	Dando 2000 Cable percussion boring to 35.00m. SPT Hammer ID: PBD14 Rods: Whitworth	0.00m	35.00m 150mm 34.40m	+10.74 mOD E 350707.07 N 378678.51

						Level	
					Dense brown gravelly medium and coarse SAND. Gravel is angular to subangular fine and medium of various lithologies including basalt and quartz.		
20.70	D 48					20.60 -9.86	
21.00-21.45	U 49	90 blows 360 mm rec	20.90	dry	Firm to stiff thinly laminated dark brown slightly sandy silty CLAY.		
21.45	D 50						
22.00	D 51						
22.50-22.95 22.50-22.95 22.50-22.95	SPT S D 52 B 53	N=14 (4,4/4,3,4,3)	24.40	20.00		(3.50)	
23.70	D 54						
24.00-24.45	U NR	65 blows No recovery	23.90	10.00		24.10 -13.36	1
24.50	D 56				Medium dense orangish brown slightly gravelly silty fine to coarse SAND. Gravel is angular to subangular fine and medium of various lithologies including sandstone, quartz, basalt and granite.		
25.50-25.95 25.50-25.95 25.50-25.95	SPT S D 57 B 58	N=20 (4,5/4,6,5,5)	25.40	11.00			
26.70	D 59						
27.00-27.45 27.00-27.45 27.00-27.45	SPT S D 60 B 61	N=17 (5,5/4,4,4,5)	26.90	11.50			
28.00	D 62					(8.40)	
28.50-28.95 28.50-28.95 28.50-28.95	SPT S D 63 B 64	N=17 (4,4/5,3,4,5)	28.40	12.50			
29.70	D 65						
					Stratum continues to 32.50 m		

1 24.10 Rose to 10.00 m after 20 minutes. -

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:20:07

NK KGB IC	23/09/2014 25/09/2014	Dando 2000 Cable percussion boring to 35.00m. SPT Hammer ID: PBD14 Rods: Whitworth	0.00m 35.00m 150mm 34.40m	+10.74 mOD E 350707.07 N 378678.51

						Level
30.00-30.45 30.00-30.45 30.00-30.45	SPT S D 66 B 67	N=19 (5,4/4,5,6,4)	29.90	13.00	Medium dense orangish brown slightly gravelly silty fine to coarse SAND. Gravel is angular to subangular fine and medium of various lithologies including sandstone, quartz, basalt and granite.	
31.00	D 68					
31.50-31.95 31.50-31.95 31.50-31.95	SPT S D 69 B 70	N=18 (4,4/4,5,4,5)	31.40	15.00		
32.50	D 71				Firm locally thinly laminated dark brown sandy silty CLAY.	32.50 -21.76
33.00-33.45	U 72	65 blows 225 mm rec	32.90	20.00		
33.50	D 73				33.50-34.50 m Thin lenses of sand.	(2.50)
34.50-34.95 34.50-34.95	SPT S D 74	N=21 (5,6/6,5,4,6)	34.40	25.00	34.50-34.95 m Thinly laminated.	
					EXPLORATORY HOLE ENDS AT 35.00 m	35.00 -24.26

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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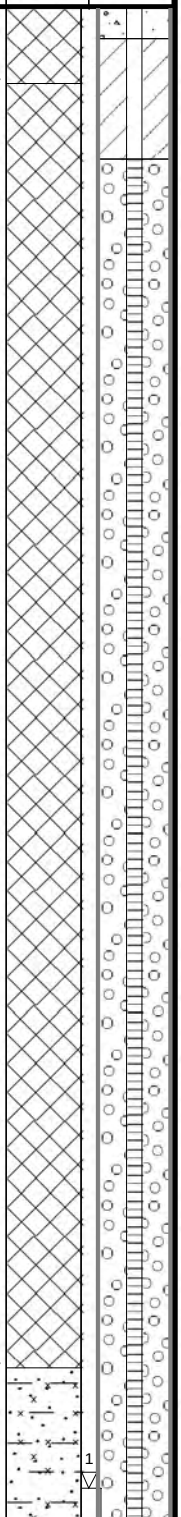
426.4817/12/2014 13:20:08

IW KGB IC	22/09/2014 25/09/2014	Dando 2500 Cable percussion boring to 34.95m. SPT Hammer ID: PBD8 Rods: Whitworth	0.00m	34.95m 150mm 24.00m	+10.97 mOD E 350392.95 N 378230.45

						Level
					MADE GROUND: Grass over TOPSOIL. (Drillers description).	(0.50)
0.50-1.00	B 1				MADE GROUND: Black mottled brown clayey SILT with occasional rootlets. Strong hydrocarbon odour noted.	0.50 +10.47
1.00-1.38	SPT S	1 (1,0/0,0,1,0 for 0mm)		dry		
1.00-1.45	B 2					
1.00-1.45	D 2					
1.70	D 3					
2.00-2.45	SPT S	N=1 (0,0/0,0,1,0)	1.70	dry		
2.00-2.45	D 4					
2.00-2.45	B 5					
2.70	D 6					
3.00-3.45	SPT S	N=0 (0,0/-,-,-,-)	2.80	dry		
3.00-3.45	D 7					
3.00-3.45	B 8					
3.70	D 9					
4.00-4.45	SPT S	N=1 (1,0/0,0,0,1)	3.90	dry		
4.00-4.45	B 10					
4.70	D 11					(8.50)
5.00-5.45	SPT S	N=0 (1,0/-,-,-,-)	4.50	dry		
5.00-5.45	D 12					
5.00-5.45	B 13					
5.70	D 14					
6.00-6.38	SPT S	N=1 (0 for 75mm/0,1,0,0)	5.90	dry		
6.00-6.45	D 15					
6.00-6.45	B 16					
6.70	D 17					
7.00-7.45	SPT S	N=1 (1,0/0,1,0,0)	6.80	dry		
7.00-7.45	D 18					
7.00-7.45	B 19		22/09/2014	1700		
			6.80	dry		
8.00-8.38	SPT S	1 (1,0/0,1,0,0 for 0mm)	7.90	dry		
8.00-8.45	D 19					
8.00-8.45	B 20					
8.70	D 21					
9.00	D 22					9.00 +1.97
9.50-9.95	U 23	10 blows 315 mm rec	9.40	dry	Firm, locally thinly laminated, light grey mottled brown, black and orange slightly sandy silty CLAY with roots and plant remains.	(1.80)
					9.50-10.80 m Thinly laminated with frequent pockets of amorphous and	
					Stratum continues to 10.80 m	



Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:20:12

IW KGB IC	22/09/2014 25/09/2014	Dando 2500 Cable percussion boring to 34.95m. SPT Hammer ID: PBD8 Rods: Whitworth	0.00m	34.95m 150mm 24.00m	+10.97 mOD E 350392.95 N 378230.45

							Level	
10.00	D 24				Firm, locally thinly laminated, light grey mottled brown, black and orange slightly sandy silty CLAY with roots and plant remains.	fibrous peat and black clayey silt with a hydrocarbon odour.		
10.50-10.95 10.50-10.95 10.50-10.95 10.70	SPT S D 25 B 26 D 27	N=7 (1,1/2,2,1,1,2)	10.40	dry			10.80 +0.17	
					Brown and black amorphous and fibrous PEAT.			
12.00-12.45	U NR	12 blows No recovery	11.90	damp			(2.20)	
12.50	D 29							
		*					13.00 -2.03	1
13.50-13.95 13.50-13.95 13.50-13.70	SPT C B 31 D 32	N=22 (2,3/3,6,7,6)	13.40	10.00	Medium dense light grey and brown slightly gravelly slightly clayey medium and coarse SAND. Gravel is angular to subangular fine and medium of basalt, quartz and mudstone. Occasional pockets of brown and locally grey silty clay.			
15.00-15.45 15.00-15.45	SPT C B 34	N=26 (3,4/7,5,6,8)	14.90	11.20				
15.70	D 35							
16.50-16.95 16.50-16.95	SPT S D 36	N=15 (2,3/3,4,4,4)	16.40	9.00		16.50-20.30 m Pockets of grey clayey silt.	(7.30)	
			24/09/2014 16.40	0800 9.00				
17.50	D 37							
18.00-18.45 18.00-18.45 18.00-18.45	SPT S D 38 B 39	N=15 (2,3/3,3,4,5)	17.90	10.00				
19.00	D 40							
19.50-19.95 19.50-19.95 19.50-19.95	SPT S D 41 B 42	N=14 (3,3/3,3,4,4)	19.40	13.50				
					Stratum continues to 20.30 m			

1	13.00	Rose to 9.80 m after 20 minutes.	-

13.00	16.50	Water added to assist boring.

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:20:13

IW KGB IC	22/09/2014 25/09/2014	Dando 2500 Cable percussion boring to 34.95m. SPT Hammer ID: PBD8 Rods: Whitworth	0.00m 34.95m 150mm 24.00m		+10.97 mOD E 350392.95 N 378230.45

					Level	
20.50	D 43			Medium dense light grey and brown slightly gravelly slightly clayey medium and coarse SAND. Gravel is angular to subangular fine and medium of basalt, quartz and mudstone. Occasional pockets of brown and locally grey silty clay.	20.30 -9.33	
21.00-21.45 21.00-21.45 21.00-21.45	SPT S D 44 B 45	N=23 (2,4/4,6,6,7)	19.90	15.00	Medium dense to dense brown gravelly silty SAND. Gravel is angular to subrounded fine and medium of various lithologies including basalt, sandstone, mudstone and quartz.	
22.00	D 46					
22.50-22.95 22.50-22.95 22.50-22.95	SPT S D 47 B 48	N=40 (4,6/6,8,8,18)	22.40	2.00		(4.70)
23.00	D 49					
			24/09/2014 22.40	1700 2.00		
24.00-24.50	B 50					
24.50	D 51					
					Firm thinly laminated brown silty CLAY.	25.00 -14.03
25.50-25.95	U 52	89 blows 360 mm rec	25.30	dry		(1.20)
25.95-26.00	D 53					
					Medium dense brown gravelly silty SAND. Gravel is angular to subrounded fine and medium of various lithologies including basalt, sandstone, mudstone and quartz.	26.20 -15.23
27.00-27.45 27.00-27.45 27.00-27.45	SPT S D 54 B 55	N=18 (3,4/4,5,4,5)	26.90	15.50		
28.00	D 56					
28.50-28.95 28.50-28.95 28.50-28.95	SPT S D 57 B 58	N=24 (3,4/5,6,6,7)	28.40	16.00		
29.50	D 59					
					Stratum continues to 34.95 m	

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:20:14

IW KGB IC	22/09/2014 25/09/2014	Dando 2500 Cable percussion boring to 34.95m. SPT Hammer ID: PBD8 Rods: Whitworth	0.00m	34.95m 150mm 24.00m	+10.97 mOD E 350392.95 N 378230.45

						Level	
30.00-30.45 30.00-30.45 30.00-30.45	SPT S D 60 B 61	N=28 (4,6/7,6,7,8)	29.90	16.00	Medium dense brown gravelly silty SAND. Gravel is angular to subrounded fine and medium of various lithologies including basalt, sandstone, mudstone and quartz.	(8.75)	
31.00	D 62						
31.50-31.95 31.50-31.95 31.50-31.95	SPT S D 63 B 64	N=19 (3,4/4,5,5,5)	31.40	17.50			
32.50	D 65						
33.00-33.45 33.00-33.45 33.00-33.45	SPT S D 66 B 67	N=28 (3,4/6,6,8,8)	32.90	18.00			
34.00	D 68						
34.50-34.95 34.50-34.95 34.50-34.95	SPT S D 69 B 70	N=28 (3,4/7,6,7,8)	34.40 25/09/2014 34.40	20.00 1700 20.00		34.95 *-23.98*	
					EXPLORATORY HOLE ENDS AT 34.95 m		

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:20:15

IW KGB IC	17/09/2014 19/09/2014	Dando 2000 Cable percussion boring to 35.00m. SPT Hammer ID: PBD8 Rods: Whitworth	0.00m	35.00m 150mm 33.90m	+10.54 mOD E 350830.31 N 378309.89

							Level
				MADE GROUND: Grass over TOPSOIL. (Drillers description).			(0.40)
0.50-1.00	B 1			MADE GROUND: black mottled brown slightly sandy clayey SILT with a strong hydrocarbon odour.			0.40 *+10.14*
1.00-0.95 1.00-1.45 1.00-1.45	SPT S D 2 B 3	N=0 (1,0/-,-,-,-)		dry			
1.70	D 4						
2.00-2.45 2.00-2.45 2.00-2.45	SPT S D 5 B 6	N=0 (0,0/-,-,-,-)	1.70	dry			
2.70	D 7						
3.00-3.45 3.00-3.45	SPT S B 8	N=0 (0,0/-,-,-,-)	2.90	dry			
3.70	D 9				3.70-7.20 m Occasional roots and rootlets.		(6.80)
4.00-4.38 4.00-4.45 4.00-4.45	SPT S D 10 B 11	N=1 (1 for 75mm/0,0,1,0)	3.90	dry			
4.70	D 12						
5.00-5.45 5.00-5.45 5.00-5.45	SPT S D 13 B 14	N=2 (1,0/1,0,0,1)	4.50	dry			
5.70	D 15						
6.00-6.45 6.00-6.45 6.00-6.45	SPT S D 16 B 17	N=1 (1,0/0,1,0,0)	5.80	dry			
6.70	D 18						
7.00-7.45 7.00-7.45	SPT S B 19	N=3 (1,0/1,0,1,1)	6.50	dry			7.20 *+3.34*
				Soft to firm, becoming thinly laminated, light grey mottled black slightly sandy silty CLAY with plant remains, rootlets, frequent fibrous peat bands and a slight hydrocarbon odour.			
8.00	D 20						
8.50-8.95 8.50-8.95	U 21 D 22	16 blows 315 mm rec	8.70 17/09/2014 8.20	dry dry	8.50-10.00 m Frequent fibrous peat bands, thinly laminated.		(2.80)

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:20:19

IW KGB IC	17/09/2014 19/09/2014	Dando 2000 Cable percussion boring to 35.00m. SPT Hammer ID: PBD8 Rods: Whitworth	0.00m	35.00m 150mm 33.90m	+10.54 mOD E 350830.31 N 378309.89

						Level	
10.00-10.45 10.00-10.45 10.00-10.45	SPT S D 23 D 24	N=4 (1,0/1,1,1,1)	9.90	dry	Soft to firm dark brown and black amorphous and fibrous PEAT.	10.00	+0.54
		*				(1.00)	
11.00	D 25				Medium dense dark grey slightly gravelly slightly silty fine to coarse SAND. Gravel is angular to subangular fine and medium of various lithologies basalt and quartz.	11.00	-0.46
11.50-11.95 11.50-11.95 11.50-11.95	SPT S D 26 B 27	N=13 (2,2/3,3,3,4)	11.40	2.00			
12.50	D 28						
13.00-13.45 13.00-13.45 13.00-13.45	SPT S D 29 B 30	N=18 (2,3/4,4,4,6)	12.90	2.50		(4.20)	
14.00	D 31						
14.50-14.95 14.50-14.95 14.50-14.95	SPT S B 32 B 33	N=16 (3,3/3,4,4,5)	14.40	4.00			
15.50	D 34				Medium dense light brown medium and coarse SAND.	15.20	-4.66
16.00-16.45 16.00-16.45 16.00-16.45	SPT S D 35 B 36	N=35 (4,6/8,8,9,10)	15.90	5.00		(2.30)	
17.00	D 37						
17.50-17.88 17.50-17.95 17.50-17.95	SPT S D 38 B 39	50 (12,13 for 60mm/ 22,23,5 for 20mm)	17.40	5.00	Very dense light brown gravelly medium and coarse SAND with low cobble content. Gravel is angular to subangular fine to coarse of various lithologies including basalt and quartz. Cobbles are angular of basalt.	17.50	-6.96
						(1.10)	
18.60	D 40				Firm to stiff thinly laminated brown slightly gravelly slightly sandy silty CLAY. Gravel is angular to subangular fine and medium of various lithologies including basalt.	18.60	-8.06
19.00-19.45	U 41	95 blows 360 mm rec	18.90	5.00			
19.45-19.50	D 42						
					Stratum continues to 22.00 m		

None observed (see Key Sheet)

10.50 Water added to assist boring.

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:20:20

IW KGB IC	17/09/2014 19/09/2014	Dando 2000 Cable percussion boring to 35.00m. SPT Hammer ID: PBD8 Rods: Whitworth	0.00m	35.00m 150mm 33.90m	+10.54 mOD E 350830.31 N 378309.89

							Level	
20.50-20.95 20.50-20.95 20.50-20.95	SPT S B 43 D 43	N=20 (3,4/4,4,6,6)	20.40	6.00	Firm to stiff thinly laminated brown slightly gravelly slightly sandy silty CLAY. Gravel is angular to subangular fine and medium of various lithologies including basalt.		(3.40)	
21.50	D 44							
22.00-22.45 22.00-22.45	B 45 U NR	48 blows No recovery	21.90	7.00			22.00 -11.46	
23.00	D 46				Medium dense orangish brown, becoming slightly gravelly, medium and coarse SAND with occasional pockets of brown silty clay. Gravel is angular to subangular fine and medium of various lithologies including basalt.			
23.50-23.95 23.50-23.95 23.50-23.95	SPT S D 47 B 48	N=19 (2,4/4,4,5,6)	23.40	8.00		23.50-29.00 m Slightly gravelly.		
24.50	D 49		18/09/2014 23.40 19/09/2014 24.40	1700 8.00 0800 11.00				
25.00-25.45 25.00-25.45 25.00-25.45	SPT S D 50 B 51	N=27 (4,6/6,7,6,8)	24.90	11.00			(7.00)	
26.00	D 52							
26.50-26.95 26.50-26.95 26.50-26.95	SPT S D 53 B 54	N=20 (2,4/4,5,5,6)	26.40	11.00				
27.50	D 55							
28.00-28.45 28.00-28.45 28.00-28.45	SPT S D 56 B 57	N=26 (3,6/6,7,7,6)	27.80	11.00				
29.00	D 58				Stiff thinly laminated brown sandy, locally very sandy, silty CLAY with rare bands of very sandy clayey silty.		29.00 -18.46	
29.50-29.95	U 59	100 blows	29.40	12.00				
29.95	D 60							
					Stratum continues to 35.00 m			

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:20:21

IW KGB IC	17/09/2014 19/09/2014	Dando 2000 Cable percussion boring to 35.00m. SPT Hammer ID: PBD8 Rods: Whitworth	0.00m	35.00m 150mm 33.90m	+10.54 mOD E 350830.31 N 378309.89

							Level
					Stiff thinly laminated brown sandy, locally very sandy, silty CLAY with rare bands of very sandy clayey silty.		
31.00-31.45 31.00-31.45 31.00-31.45	SPT S D 61 B 62	N=30 (4,6/6,8,8,8)	30.90	13.50	31.00-34.45 m Very sandy. Rare bands of very sandy clayey silt.		
32.00	D 63						(6.00)
32.50-32.95	U 64	73 blows 360 mm rec	32.40	15.50			
32.95-33.00	D 65						
34.00-34.45 34.00-34.45 34.00-34.45	SPT S D 66 B 67	N=32 (5,7/7,8,8,9)	33.90	16.00			
			19/09/2014 33.90	1700 16.00			
					EXPLORATORY HOLE ENDS AT 35.00 m		35.00 *-24.46*

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:20:22

AJL KGB IC	10/09/2014 11/09/2014	Dando 150 Cable percussion boring to 15.50m.SPT Hammer: LCD01. Rod Type: Whitworth Terminated at 15.50m due to casing sticking in gravel.	0.00m	15.50m 150mm 15.00m	+7.05 mOD E 346131.08 N 377377.59

							Level
0.30	D 1				MADE GROUND: Light grey and dark grey sandy clayey GRAVEL. Gravel is angular to subangular fine to coarse of limestone.		
0.50-1.00	B 2						
1.30	D 3						
1.50-1.95	SPT C	N=15 (4,4/4,4,3,4)	1.50	dry	1.50 m Becoming medium dense		
1.50-2.00	B 4						
							(3.90)
2.30	D 5						
2.30	W 6						
2.50-2.95	SPT C	N=15 (3,4/3,4,4,4)	2.50	2.30			
2.50-3.00	B 7						
3.30	D 8						
3.50-3.95	SPT C	N=12 (2,3/4,3,3,2)	3.50	2.50			
3.50-4.00	B 9						
						3.90	+3.15
4.30	D 10				Soft light brown and grey sandy silty CLAY with roots and rootlets.		
4.50-5.00	U 11	6 blows	4.50	3.90			
							(1.90)
5.00	D 12						
5.50	D 13						
5.80	D 14					5.80	+1.25
6.00-6.50	U 15	5 blows	6.00	5.20	Dark brown and black thinly laminated fibrous PEAT with pockets of soft grey silty clay.		
							(0.70)
6.50	D 16				Very soft to soft thinly laminated grey sandy silty CLAY with abundant plant remains and rootlets and locally occasional lenses of silty sand.	6.50	+0.55
7.00	D 17						
7.50-7.95	SPT S	N=2 (1,0/0,0,1,1)	7.50	5.60	7.50-8.00 m Occasional lenses of silty sand.		
7.50-8.00	D 18						
7.50-8.00	B 19		10/09/2014	1800			
			8.00	6.20			
							(3.00)
8.50	D 20						
9.00-9.50	U 21	10 blows	9.00	4.50			
9.50	D 22					9.50	-2.45
					Soft to firm grey mottled orange silty CLAY with abundant peat bands and plant		
					Stratum continues to 12.00 m		

1	2.50	Rose to 2.30 m after 20 minutes.	-

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:20:27

AJL KGB IC	10/09/2014 11/09/2014	Dando 150 Cable percussion boring to 15.50m.SPT Hammer: LCD01. Rod Type: Whitworth Terminated at 15.50m due to casing sticking in gravel.	0.00m	15.50m 150mm 15.00m	+7.05 mOD E 346131.08 N 377377.59

						Level	
10.00	D 23				remains.		
10.50-10.95 10.50-11.00 10.50-11.00	SPT S D 24 B 25	N=5 (1,0/0,1,2,2)	10.50	4.10		(2.50)	
11.50	D 26						
12.00-12.50	U 27	50 blows	12.00	4.30	Light grey very silty medium and coarse SAND with occasional plant remains.	12.00 -4.95	
12.50	D 28					(1.00)	
13.00	D 29				Medium dense dark grey and brown slightly gravelly medium and coarse SAND. Gravel is angular to subangular fine of various lithologies.	13.00 -5.95	
13.50-13.95 13.50-14.00 13.50-14.00	SPT S D 30 B 31	N=21 (2,3/3,4,6,8)	13.50	3.90		(2.50)	
14.50	D 32						
15.00-15.45 15.00-15.50	SPT S D 33	N=27 (3,3/5,6,7,9)	15.00	3.50			
			11/09/2014 15.00	1800 3.50			
					EXPLORATORY HOLE ENDS AT 15.50 m	15.50 -8.45	

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:20:28

IW KGB IC	29/09/2014 29/09/2014	Dando 150 Hand dug inspection pit to 1.20m. Cable percussion boring to 19.95m. SPT Hammer ID: PBD8. Rod Type: Whitworth.	0.00m 19.50m 150mm 19.95m	+6.96 mOD E 346132.74 N 377378.28	

					Level
		*		MADE GROUND: Light grey and dark grey sandy GRAVEL. Gravel is angular to subangular fine to coarse of limestone.	(3.90)
				Soft light brown and grey sandy silty CLAY with roots and rootlets.	3.90 +3.06 (1.90)
				Dark brown and black thinly laminated fibrous PEAT with pockets of soft grey silty clay.	5.80 +1.16 (0.70)
				Soft thinly laminated grey sandy silty CLAY with abundant plant remains and rootlets.	6.50 +0.46 (3.00)
				Firm grey mottled orange silty CLAY with abundant peat bands and plant remains.	9.50 -2.54
				Stratum continues to 12.00 m	

1	2.50	Rose to 2.30 m after 20 minutes.	-

0.00	16.00	Open hole boring from BH20. No samples required.

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:20:30

IW KGB IC	29/09/2014 29/09/2014	Dando 150 Hand dug inspection pit to 1.20m. Cable percussion boring to 19.95m. SPT Hammer ID: PBD8. Rod Type: Whitworth.	0.00m 19.50m 150mm 19.95m		+6.96 mOD E 346132.74 N 377378.28

						Level
				Firm grey mottled orange silty CLAY with abundant peat bands and plant remains.	(2.50)	
				Light grey very silty medium and coarse SAND with occasional plant remains.	12.00 -5.04 (1.00)	
				Dark grey and brown slightly gravelly medium and coarse SAND. Gravel is angular to subangular fine of various lithologies.	13.00 -6.04 (2.50)	
16.00	D 1			Medium dense multicoloured very gravelly slightly clayey fine to coarse SAND with low cobble content. Gravel is angular to subrounded fine to coarse of various lithologies including basalt, quartz, quartzite, sandstone, mudstone and granite. Cobbles are subangular to subrounded of various lithologies including granite and basalt.	15.50 -8.54	
16.50-16.95 16.50-16.95	SPT C B 2	N=27 (3,4/4,7,8,8)	16.40 1.00			
17.50	D 3				(4.45)	
18.00-18.45 18.00-18.45	SPT C B 4	N=22 (3,4/4,5,6,7)				
19.00	B 5					
19.50-19.95	B 6					
			29/09/2014 19.95	EXPLORATORY HOLE ENDS AT 19.95 m	19.95 -12.99	

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:20:31

AJL KGB IC	11/09/2014 15/09/2014	Dando 150 Hand dug inspection pit to 1.20m. Cable percussion boring to 12.50m.SPT Hammer ID: LCD01. Rod Type: Whitworth. Terminated at 12.50m. Unable to surge casing. Redrill as BH21A.	0.00m	12.50m 150mm 12.00m	+7.22 mOD E 346374.98 N 377375.21

						Level	
0.30	D 1				MADE GROUND: Sandy TOPSOIL. (Drillers description).	0.10 +7.12	
0.50-1.00	B 2				MADE GROUND: Light grey very sandy clayey GRAVEL. Gravel is angular to subangular fine to coarse of limestone.	(1.20)	
1.30	D 3				MADE GROUND: Medium dense to dense reddish brown slightly gravelly clayey SAND. Gravel is angular to subangular fine and medium of red sandstone.	1.30 +5.92	
1.50-1.95	SPT S	N=30 (2,3/7,7,7,9)	1.50	dry			
1.50-2.00	D 4						
1.50-2.00	B 5		11/09/2014	1800		(1.00)	
			2.00	dry			
2.30	D 6				Firm thinly laminated grey mottled brown and black silty CLAY with slight organic odour.	2.30 +4.92	
2.50-2.95	SPT S	N=12 (3,2/3,2,3,4)	2.50	dry			
2.50-3.00	D 7						
2.50-3.00	B 8					(1.40)	
3.30	D 9						
3.50-4.00	U 10	10 blows 450 mm rec	3.30	dry			
4.00	D 11				Very soft to soft grey mottled orange and brown silty CLAY with abundant bands of fibrous peat and occasional rootlets and roots.	3.70 +3.52	
4.30	D 12						
4.50-4.95	SPT S	N=3 (1,0/0,1,1,1)	4.50	dry			
4.50-5.00	D 13						
4.50-5.00	B 14					(2.10)	
5.50	D 15						
5.80	D 16					5.80 +1.42	
6.00-6.50	U 17	* 10 blows 450 mm rec	6.00	dry	Dark brown and black fibrous PEAT.		
6.50	D 18					(1.30)	
7.00	D 19						
7.30	D 20				Very soft grey mottled black very sandy silty CLAY with abundant bands of peat.	7.10 +0.12	
7.50-7.95	SPT S	N=2 (1,0/0,1,0,1)	7.50	3.10			
7.50-8.00	D 21						
7.50-8.00	B 22						
8.50	D 23						
9.00-9.50	U 24	10 blows 450 mm rec	9.00	dry			
9.50	D 25					(5.10)	
					Stratum continues to 12.20 m		

None observed (see Key Sheet)

6.00	10.00	Water added to assist boring
10.00	12.50	Water added to assist boring

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:20:33

AJL KGB IC	11/09/2014 15/09/2014	Dando 150 Hand dug inspection pit to 1.20m. Cable percussion boring to 12.50m.SPT Hammer ID: LCD01. Rod Type: Whitworth. Terminated at 12.50m. Unable to surge casing. Redrill as BH21A.	0.00m 12.50m 150mm 12.00m		+7.22 mOD E 346374.98 N 377375.21

						Level
10.00	D 26	*			Very soft grey mottled black very sandy silty CLAY with abundant bands of peat.	
10.50-10.95	SPT S	N=2 (1,0/0,0,1,1)	10.50	2.70		
10.50-11.00	D 27					
10.50-11.00	B 28					
11.50	D 29					
12.00-12.50	U 30	40 blows 360 mm rec	12.00	3.10		
			12/09/2014	1800	Light grey silty medium and coarse SAND.	12.20 -4.98
			15/09/2014	3.10		(0.30)
12.50	D 31		12.00	0.50		12.50 -5.28
					EXPLORATORY HOLE ENDS AT 12.50 m	

None observed (see Key Sheet)

10.00 12.50 Water added to assist boring

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:20:34

AJL KGB IC	15/09/2014 16/09/2014	Dando 150 Cable percussion boring to 20.0m. SPT Hammer ID: LCD01 Rod Type: Whitworth	0.00m 9.00m 200mm 9.00m 9.00m 20.00m 150mm 19.50m		+7.23 mOD E 346369.63 N 377378.90

				Level
		*	MADE GROUND: Sandy TOPSOIL. (Drillers description).	0.10 +7.13
			MADE GROUND: Light grey sandy GRAVEL. Gravel is angular to subangular fine to coarse of limestone.	(1.20)
			MADE GROUND: Reddish brown slightly gravelly clayey SAND locally with pockets of dark grey silty clay. Gravel is angular to subangular fine and medium of red sandstone.	1.30 +5.93
			1.80-2.30 m Pockets of dark grey silty clay	(1.00)
			Firm grey mottled brown and black thinly laminated silty CLAY with a slight organic odour.	2.30 +4.93
				(1.40)
			Soft to firm grey mottled orange and brown silty CLAY with abundant bands of fibrous peat and occasional rootlets and roots.	3.70 +3.53
				(2.10)
			Dark brown and black fibrous PEAT.	5.80 +1.43
				(1.30)
			Very soft, locally thinly laminated, grey mottled black very sandy silty CLAY with abundant bands of peat.	7.10 +0.13
			8.50-10.00 m Thinly laminated	(5.10)
			Stratum continues to 12.20 m	

None observed (see Key Sheet)

0.00 12.50 Open hole boring from BH21. No samples required.

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:20:37

AJL KGB IC	15/09/2014 16/09/2014	Dando 150 Cable percussion boring to 20.0m. SPT Hammer ID: LCD01 Rod Type: Whitworth	0.00m 9.00m 9.00m 20.00m	200mm 9.00m 150mm 19.50m	+7.23 mOD E 346369.63 N 377378.90

						Level	
					Very soft, locally thinly laminated, grey mottled black very sandy silty CLAY with abundant bands of peat.		
					10.50-11.00 m Thinly laminated		
						12.20 -4.97	
					Light grey silty medium and coarse SAND.	(0.30)	
12.50-12.95 12.50-13.00 12.50-13.00	SPT S D 1 B 2	N=21 (2,3/4,5,5,7)	12.50	dry		12.50 -5.27	
					Medium dense brown and grey slightly silty fine SAND.		
13.50	D 3						
			15/09/2014	1800			
			12.50	1.70			
14.00-14.45 14.00-14.50	SPT S B 4	* N=15 (2,2/3,3,4,5)	~~14.00~~	~~1.70~~			
						(4.50)	
15.00 15.00-16.00	D 5 D 6						
15.50-15.95 15.50-16.00	SPT S B 7	N=21 (2,2/3,4,6,8)	15.50	2.00			
16.50	D 8						
17.00-17.45 17.00-18.50 17.00-18.50	SPT S B 10 D 9	N=20 (3,3/4,3,5,8)	17.00	2.30		17.00 -9.77	
					Medium dense grey slightly gravelly clayey fine to coarse SAND. Gravel is angular to subangular fine and medium of various lithologies.		
18.50-18.95 18.50 18.50-19.00 18.50-19.00	SPT S D 11 D 12 B 13	N=19 (2,3/3,4,5,7)	18.50	2.50		(3.00)	
19.50-19.95 19.50 19.50-20.00	SPT S D 14 D 15	N=21 (3,3/4,5,5,7)	19.50	3.10			
			16/09/2014	1800			
			19.50	3.10			
					EXPLORATORY HOLE ENDS AT 20.00 m		

None observed (see Key Sheet)

14.00 20.00 Water added to assist boring

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:20:38

AJL KGB IC	16/09/2014 18/09/2014	Dando 150 Hand dug inspection pit to 1.20m. Cable percussion boring to 20.00m. SPT Hammer ID: LCD01. Rod Type: Whitworth.	0.00m 10.00m 200mm 8.50m 10.00m 20.00m 150mm 19.00m		+5.23 mOD E 346374.82 N 377338.58

						Level	
					MADE GROUND: Sandy TOPSOIL. (Drillers description).	0.05	+5.18
0.30	D 1					(0.40)	
0.50	D 2				MADE GROUND: Light grey angular medium and coarse GRAVEL of limestone.	0.45	+4.78
0.50-0.70	B 3						
0.70-1.20	D 4				MADE GROUND: Firm dark grey mottled reddish brown and grey slightly gravelly slightly sandy CLAY. Gravel is angular to subangular fine to coarse of limestone, quartz and sandstone.	0.70	+4.53
			16/09/2014	1700			
			1.50	dry			
1.50-1.95	SPT S	N=7 (2,1/2,1,2,2)	1.50	dry	1.50 m Loose	(1.50)	
1.50-2.00	B 5		17/09/2014	0800	MADE GROUND: Reddish brown mottled brown and grey gravelly very clayey SAND with frequent pockets of soft to firm grey mottled brown clay. Gravel is angular to subrounded fine to coarse of various lithologies including limestone, sandstone, mudstone and basalt. Occasional wood fragments.		
			1.50	dry			
2.30	D 6					2.20	+3.03
2.50-3.00	U 7	10 blows 225 mm rec	2.50	dry			
					MADE GROUND: Soft to firm dark grey sandy silty CLAY with pockets of red, brown and light grey sand. Occasional pockets of peat.	(1.40)	
3.00	D 8						
3.30	D 9						
3.50-3.95	SPT S	N=1 (1,0/0,0,1,0)	3.30	dry			
3.50-4.00	D 10					3.60	+1.63
3.50-4.00	B 11				Dark brown slightly clayey amorphous PEAT with occasional small pockets of fibrous peat.		
4.30	D 12					(1.30)	
4.50-5.00	U 13	6 blows 450 mm rec	4.50	dry			
						4.90	+0.33
5.00	D 14				Very soft light grey sandy silty CLAY with peat and plant remains. Occasional thin bands of sandy silt.		
5.30	D 15						
5.50-6.00	U 16	6 blows 450 mm rec	5.50	dry			
6.00	D 17	*					
6.50	D 18						
7.00-7.45	SPT S	N=1 (1,0/0,0,1,0)	7.00	2.50			
7.00-7.50	D 19					(4.40)	
7.00-7.50	B 20						
8.00	D 21						
8.50-9.00	U 22	6 blows 360 mm rec	8.50	2.80			
9.00	D 23						
						9.30	-4.07
9.50	D 24				Dark brown and grey sandy clayey fibrous PEAT with frequent sandy clay bands.		
						(1.00)	
					Stratum continues to 10.30 m		

1	2.80	Rose to 2.70 m after 20 minutes.	3.00

6.00	10.00	Water added to assist boring.
10.00	15.00	Water added to assist boring

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:20:41

AJL KGB IC	16/09/2014 18/09/2014	Dando 150 Hand dug inspection pit to 1.20m. Cable percussion boring to 20.00m. SPT Hammer ID: LCD01. Rod Type: Whitworth.	0.00m 10.00m	10.00m 20.00m	200mm 150mm	8.50m 19.00m	+5.23 mOD E 346374.82 N 377338.58

					Level	
10.00-10.45 10.00-10.50 10.00-10.50	SPT S D 25 B 26	* N=25 (2,3/4,6,7,8)	10.00	3.10	Dark brown and grey sandy clayey fibrous PEAT with frequent sandy clay bands.	
					Medium dense light grey silty SAND.	10.30 -5.07
11.00	D 27					
11.50-11.95 11.50-12.00 11.50-12.00	SPT S D 28 B 29	N=18 (4,3/4,4,5,5)	11.50	2.90		
12.50	D 30					
13.00-13.45 13.00-13.50 13.00-13.50	SPT S D 31 B 32	N=18 (3,4/3,4,5,6)	13.00	2.50		(6.60)
14.00	D 33					
14.50-14.95 14.50-15.00	SPT S B 34	N=19 (2,3/5,4,5,5)	14.50	3.10		
			17/09/2014 15.00	1700 3.70		
		*	18/09/2014 15.00	0800 3.50		
15.50	D 35					
16.00-16.45 16.00-16.50 16.00-16.50	SPT S D 36 B 37	N=18 (2,3/3,4,5,6)	16.00	3.10		
17.00	D 38				Medium dense to dense light grey and brown gravelly coarse SAND locally with low cobble content. Gravel is angular to subangular fine and medium, locally fine to coarse of various lithologies including basalt, quartz and sandstone. Cobbles are angular basalt.	16.90 -11.67
17.50-17.95 17.50-18.00 17.50-18.00	SPT S D 39 B 40	N=30 (3,5/5,7,8,10)	17.50	3.30	17.50-18.00 m Gravel is fine to coarse. Low cobble content	(1.80)
18.50	D 41					18.70 -13.47
19.00-19.45 19.00-19.50 19.00-19.50	SPT S D 42 B 43	N=29 (3,4/6,7,7,9)	19.00	2.90	Medium dense brown very gravelly coarse SAND with low cobble content. Gravel is angular to subangular fine to coarse of various lithologies including basalt, quartz and sandstone. Cobbles are angular of basalt.	(1.30)
			18/09/2014 19.00	1700 2.90		
					EXPLORATORY HOLE ENDS AT 20.00 m	

10.00 15.00 Water added to assist boring
15.00 20.00 Water added to assist boring

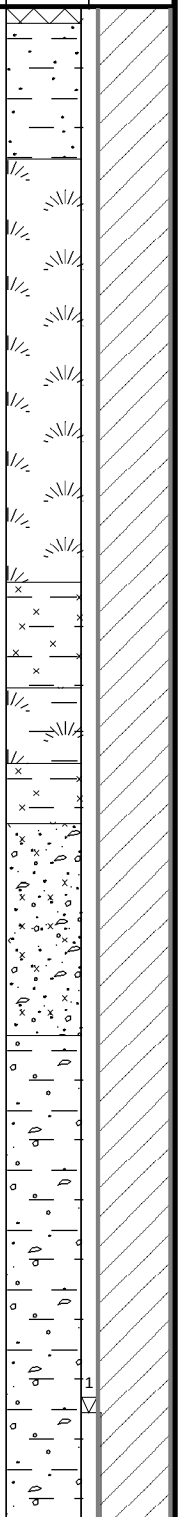
Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:20:42

PL KGB IC	24/09/2014 24/09/2014	Dando 2000 Hand dug inspection pit to 1.20m. Cable percussion boring to 20.00m. SPT Hammer ID: DB02. Rods: Whitworth.	0.00m 20.00m 150mm 19.50m		+3.99 mOD E 346617.32 N 376230.65

						Level	
0.10-1.00	B 1				MADE GROUND: Grass over TOPSOIL. (Drillers description).	0.10 +3.89	
					Firm light grey mottled brown and orange slightly sandy CLAY with abundant roots and rootlets.	(0.90)	
1.20-1.65 1.20-1.65 1.20-1.70	SPT S D 2 B 3	N=1 (1,0/0,0,1,0)		dry	Black mottled brown amorphous PEAT with rare pockets of soft light grey clay.	1.00 +2.99	
2.00-2.45	U 4	7 blows 360 mm rec	1.70	dry			
2.50	D 5					(2.80)	
3.00-3.45 3.00-3.45	SPT S D 6	* N=0 (1,0/-,-,-,-)	3.00	0.50			
4.00-4.45	U 7	15 blows 405 mm rec	4.00	1.00	Light grey clayey SILT with occasional pockets of peat.	3.80 +0.19	
4.50	D 8					(0.70)	
					Dark grey brown and black thinly laminated very clayey fibrous PEAT.	4.50 -0.51	
5.00-5.45 5.00-5.50 5.00-5.45	SPT S B 10 D 9	N=10 (1,1/2,2,3,3)	5.00	3.60	Light grey clayey SILT with occasional pockets of peat.	(0.50) 5.00 -1.01	
					Loose orangish brown and grey slightly gravelly very silty SAND. Gravel is angular to subangular fine of various lithologies including basalt.	(0.40) 5.40 -1.41	
6.00-6.45 6.00-6.45 6.00-6.50	SPT S D 11 B 12	N=8 (1,1/2,2,2,2)	6.00	dry		(1.40)	
					Firm to stiff, becoming very stiff, slightly sandy slightly gravelly silty CLAY. Gravel is angular to subangular fine and medium of various lithologies.	6.80 -2.81	
7.00-7.45 7.00-7.45 7.00-7.50	SPT S D 13 B 14	N=18 (2,2/3,4,5,6)	7.00	dry			
8.00-8.45	U 15	62 blows 225 mm rec	7.50	dry			
8.50	D 16						
9.00-9.45 9.00-9.45 9.00-9.50	SPT S D 17 B 18	N=24 (3,3/5,6,6,7)	9.00	dry			
					Stratum continues to 17.00 m		



3.00 Water added to assist boring.

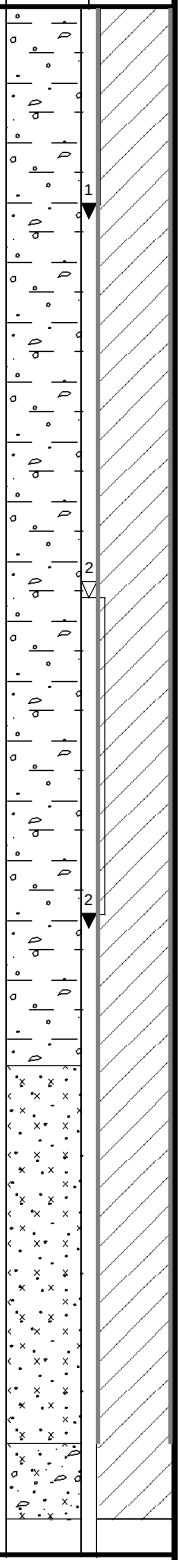
Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:20:46

PL KGB IC	24/09/2014 24/09/2014	Dando 2000 Hand dug inspection pit to 1.20m. Cable percussion boring to 20.00m. SPT Hammer ID: DB02. Rods: Whitworth.	0.00m 20.00m 150mm 19.50m		+3.99 mOD E 346617.32 N 376230.65

						Level	
10.50-10.95	U 19	100 blows 270 mm rec	10.50	dry	Firm to stiff, becoming very stiff, slightly sandy slightly gravelly silty CLAY. Gravel is angular to subangular fine and medium of various lithologies.		
11.00	D 20						
12.00-12.45 12.00-12.45 12.00-12.50	SPT S D 21 B 22	N=36 (3,4/4,9,10,13)	12.00	dry		(10.20)	
13.50-13.95	U 23	100 blows 360 mm rec	13.50	dry			
14.00	D 24						
15.00-15.45 15.00-15.45 15.00-15.50	SPT S D 25 B 26	N=33 (4,7/8,8,8,9)	15.00	dry			
		*					
16.50-16.95 16.50-16.95 16.50-17.00	SPT S D 27 B 28	N=10 (2,2/2,2,3,3)	16.50 24/09/2014 16.50	1.00 1.00			
					Medium dense orangish brown silty SAND with occasional small pockets of silty clay.	17.00	-13.01
18.00-18.45 18.00-18.45 18.00-18.50	SPT S D 29 B 30	N=16 (3,3/3,3,4,6)	18.00	3.20		(2.50)	
19.50-19.95 19.50-19.95 19.50-20.00	SPT S D 31 B 32	N=22 (3,7/9,4,4,5)	19.50 25/09/2014 19.50	4.70 4.70	Medium dense orangish brown slightly gravelly very silty SAND. Gravel is	19.50	-15.51
						(0.50)	



1	11.30	Rose to 9.30 m after 20 minutes.	12.00
2	16.00	Rose to 13.90 m after 20 minutes.	-

16.00 Water added to assist boring.

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:20:47

PL KGB IC	24/09/2014 24/09/2014	Dando 2000 Hand dug inspection pit to 1.20m. Cable percussion boring to 20.00m. SPT Hammer ID: DB02. Rods: Whitworth.	0.00m	20.00m 150mm	19.50m	+3.99 mOD E 346617.32 N 376230.65

					Level		
				angular to subangular fine and medium of various lithologies including basalt and granite. Occasional shell fragments.	20.00	-16.01	
				EXPLORATORY HOLE ENDS AT 20.00 m			

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:20:48

PL KGB IC	12/09/2014 15/09/2014	Dando 150 Hand dug inspection pit to 1.20m. Cable percussion boring to 20.00m. SPT Hammer ID: DB2. Rod Type: Whitworth.	0.00m 20.00m 50mm 19.50m		+6.00 mOD E 347600.42 N 376806.79

							Level	
0.15-1.20	B 1				MADE GROUND: TOPSOIL. (Drillers description).	0.15	+5.85	
					MADE GROUND: Firm brown mottled grey and orange slightly gravelly slightly sandy CLAY. Gravel is angular to subangular fine and medium of limestone.		(1.55)	
1.20-1.65	U 2	29 blows 225 mm rec		dry				
1.70	D 3				Soft thinly laminated brown mottled orange and grey sandy clayey SILT.	1.70	+4.30	
2.00-2.45 2.00-2.45 2.00-2.50	SPT S D 4 B 5	N=1 (1,0/0,1,0,0)	1.70	dry			(1.20)	
3.00-3.45	U 6	20 blows 180 mm rec	3.00	1.00	Soft thinly laminated grey and black sandy SILT locally with occasional pockets of light brown mottled grey clay.	2.90	+3.10	
3.50	D 7							
4.00-4.45 4.00-4.45 4.00-4.50	SPT S D 8 D 9	N=4 (1,1/1,1,1,1)	4.00	0.50				
5.00-5.45	U 10	18 blows	4.70	0.90			(4.00)	
5.50	D 11							
6.00-6.45 6.00-6.45 6.00-6.50	SPT S D 12 B 13	N=2 (1,0/0,0,1,1)	6.00	1.50	6.00-6.45 m Occasional pockets of light brown mottled grey clay.			
7.00-7.45 7.00-7.45	SPT S D 14	N=11 (2,2/2,3,3,3)	7.00	1.90	Light brownish grey very sandy SILT.	6.90	-0.90	
							(1.00)	
8.00-8.45	U 15	40 blows 405 mm rec	7.70	2.60	Thinly laminated dark brown and black fibrous PEAT with pockets of greyish brown silty sand.	7.90	-1.90	
8.50	B 16						(0.90)	
9.00-9.45 9.00-9.45 9.00-9.50	SPT S D 17 B 18	N=11 (2,2/2,3,3,3)	9.00	3.10	Medium dense greyish brown slightly gravelly slightly clayey fine to coarse SAND with rare pockets of dark grey silty clay and peat. Gravel is fine and medium	8.80	-2.80	
			12/09/2014 9.00	3.10				
					Stratum continues to 11.90 m			

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:20:51

PL KGB IC	12/09/2014 15/09/2014	Dando 150 Hand dug inspection pit to 1.20m. Cable percussion boring to 20.00m. SPT Hammer ID: DB2. Rod Type: Whitworth.	0.00m 20.00m 50mm 19.50m		+6.00 mOD E 347600.42 N 376806.79

					Level	
10.50-10.95 10.50-10.95 10.50-11.00	SPT S D 19 B 20	N=17 (2,3/4,4,4,5)	10.50	3.80	Medium dense greyish brown slightly gravelly slightly clayey fine to coarse SAND with rare pockets of dark grey silty clay and peat. Gravel is fine and medium	(3.10)
12.00-12.45 12.00-12.45 12.00-12.50	SPT S D 21 B 22	N=12 (3,3/3,3,3,3)	12.00	4.80	Medium dense brown slightly silty fine to coarse SAND. Gravel is subangular to subrounded fine and medium of various lithologies including basalt and granite. Rare shell fragments.	11.90 -5.90 (2.40)
13.50-13.95 13.50-13.95 13.50-14.00	SPT S D 23 B 24	N=18 (3,3/4,4,5,5)	13.50	1.20		
15.00-15.45	U 25	70 blows 270 mm rec	15.00	dry	Stiff, becoming thickly laminated, reddish brown slightly sandy slightly gravelly CLAY. Gravel is angular to subangular fine to coarse of various lithologies.	14.30 -8.30
15.50	D 26					
16.50-16.95 16.50-16.95 16.50-17.00	SPT S D 27 B 28	N=19 (3,3/4,4,5,6)	16.50	14.90		(5.70)
18.00-18.45	U 29	90 blows 270 mm rec	18.00	15.40		
18.50	D 30				18.45-20.00 m Thickly laminated	
19.50-19.95 19.50-19.95 19.50-20.00	SPT S D 31 B 32	N=21 (4,4/5,3,6,7)	19.50	15.90		
			15/09/2014 19.50	15.90		
					EXPLORATORY HOLE ENDS AT 20.00 m	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:20:52

PL KGB IC	03/09/2014 04/09/2014	Dando 150 Hand dug inspection pit to 1.20m. Cable percussion boring to 20.00m. SPT Hammer ID: DB2 Rod Type: Whitworth.	0.00m 20.00m 150mm 19.50m		+5.85 mOD E 347636.12 N 376828.24

							Level	
					MADE GROUND: Grass over gravelly soil. (Drillers description).		(0.40)	
0.40-1.00	B 1				MADE GROUND: Soft to firm, thinly to thickly laminated grey mottled black, brown and red sandy gravelly silty CLAY with low cobble content. Gravel is angular to subangular fine to coarse of various lithologies including mudstone, limestone, sandstone and concrete. Cobbles are angular of concrete.		0.40 +5.45	
1.20-1.65 1.20-1.65	SPT S B 2	N=7 (4,1/1,2,2,2)	1.20	dry			(0.90)	
2.00-2.45	U 3	14 blows 338 mm rec	1.70		Soft to firm thinly laminated light grey mottled orange silty CLAY.		1.30 +4.55	
2.50	D 4						(1.60)	
3.00-3.45 3.00-3.45 3.00-3.50	SPT S D 5 B 6	N=1 (0,0/0,1,0,0)	3.00	dry	Locally thinly laminated, black mottled brown, becoming sandy to very sandy, clayey SILT locally with occasional pockets of fibrous peat.		2.90 +2.95	
4.00-4.45 4.00	B 7 U NR	12 blows No recovery	4.00	dry				
5.00-5.45 5.00-5.45 5.00-5.50	SPT S D 8 B 9	N=2 (1,2/0,0,1,1)	4.50	dry		5.00-7.00 m Thinly laminated		
6.00-6.45 6.00-6.45	B 10 U NR	9 blows No recovery	6.00	dry			(6.20)	
7.00-7.45 7.00-7.45 7.00-7.50	SPT S D 11 B 12	N=4 (1,1/1,1,1,1)	7.00	dry		7.00-9.00 m Becoming sandy to very sandy		
8.00-8.45 8.00-8.45 8.00-8.50	SPT S D 13 B 14	N=3 (1,1/0,0,1,2)	8.00 03/09/2014 8.00	dry dry		8.00-8.50 m Occasional pockets of fibrous peat		
9.00-9.45 9.00-9.45 9.00-9.50	SPT S D 15 B 16	N=4 (2,1/1,0,1,2)	9.00	dry			9.10 -3.25	
					Black slightly sandy clayey amorphous PEAT.		(0.40)	
					Light brown and grey slightly silty fine to coarse SAND.		9.50 -3.65	
					Stratum continues to 10.50 m			

1	9.45	Rose to 4.80 m after 20 minutes.	14.50

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:20:55

PL KGB IC	03/09/2014 04/09/2014	Dando 150 Hand dug inspection pit to 1.20m. Cable percussion boring to 20.00m. SPT Hammer ID: DB2 Rod Type: Whitworth.	0.00m 20.00m 150mm 19.50m		+5.85 mOD E 347636.12 N 376828.24

							Level
					Light brown and grey slightly silty fine to coarse SAND.	(1.00)	
10.50-10.95 10.50-10.95	SPT S D 17	N=15 (2,2/2,4,4,5)	10.50	5.10	Medium dense light brown and grey slightly gravelly slightly clayey fine to coarse SAND. Gravel is angular to subangular fine and medium of various lithologies including quartz and quartzite.	10.50 -4.65	
10.95-11.00	B 18					(0.90)	
					Medium dense grey slightly gravelly silty fine and medium SAND locally with occasional pockets of soft brown clay. Gravel is angular to subangular fine and medium of various lithologies including quartz and quartzite.	11.40 -5.55	
12.00-12.45 12.00-12.45 12.00-12.50	SPT S D 19 B 20	N=14 (3,3/4,3,3,4)	12.00	7.30			
						(3.10)	
13.50-13.95 13.50-13.95 13.50-14.00	SPT S D 21 B 22	N=19 (3,3/5,5,5,4)	13.50	8.90	13.50-14.50 m Occasional pockets of soft brown clay		
					Firm to stiff, becoming thinly laminated, brown slightly sandy slightly gravelly silty CLAY. Gravel is angular to subangular fine to coarse of various lithologies.	14.50 -8.65	
15.00-15.45	U 23	95 blows 338 mm rec	15.00	dry			
15.50	D 24						
16.50-16.95 16.50-16.95 16.50-17.00	SPT S D 25 B 26	N=27 (4,4/5,5,8,9)	16.50	dry			
						(5.50)	
18.00-18.45	U 27	100 blows 225 mm rec	18.00	dry	18.00-20.00 m Thinly laminated		
18.50	D 28						
19.50-19.95 19.50-19.95 19.50-20.00	SPT S D 29 B 30	N=34 (5,7/8,8,8,10)	19.50 04/09/2014 19.50	dry dry			
					EXPLORATORY HOLE ENDS AT 20.00 m		

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:20:56

PL KGB IC	04/09/2014 06/09/2014	Dando 150 Hand dug inspection pit to 1.20m. Cable percussion boring to 23.50m. SPT Hammer ID: DB2. Rod Type: Whitworth.	0.00m	23.50m 150mm 15.00m	+4.66 mOD E 348795.88 N 377369.07

						Level	
				MADE GROUND: Grass over TOPSOIL. (Drillers description).		(0.40)	
0.40-1.00	D 1			Firm to stiff, becoming thinly laminated, light grey mottled orange and brown slightly silty CLAY with rootlets.		0.40 +4.26	
1.20-1.65	U 2	40 blows			1.20-1.60 m Thinly laminated	(1.20)	
1.70	D 3			Soft to firm grey mottled orange thinly laminated silty CLAY with pockets of peat and strong organic odour.		1.60 +3.06	
2.00-2.45 2.00-2.45 2.00-2.50	SPT S D 4 B 5	N=1 (1,0/0,1,0,0)	1.50 dry			(0.60)	
				Dark black and brown amorphous PEAT with occasional plant remains.		2.20 +2.46	
3.00-3.45 3.00-3.45 3.00-3.50	SPT S D 6 B 7	N=4 (1,1/1,1,1,1)	3.00 dry 04/09/2014 3.00 dry			(1.60)	
				Light grey very sandy clayey SILT locally with plant remains and pockets of brown and orange clay		3.80 +0.86	
4.00-4.45 4.00-4.45 4.00-4.50	SPT S D 7 B 8	N=4 (1,1/1,1,1,1)	4.00 dry				
5.00-5.45 5.00-5.50 5.00-5.45	SPT S B 10 D 9	N=3 (1,0/1,0,1,1)	4.70 dry		5.00-5.50 m Plant remains and pockets of brown and orange clay	(2.50)	
6.00-6.45 6.00-6.45	B 11 U NR	10 blows No recovery	6.00 4.90				
				Lightly grey very sandy clayey SILT and brown peat.		6.30 -1.64	
						(0.50)	
				Loose, becoming medium dense, brown slightly gravelly silty fine to coarse SAND. Gravel is angular to subangular fine and medium of various lithologies including basalt and quartz.		6.80 -2.14	
7.00-7.45 7.00-7.45 7.00-7.50	SPT S D 12 B 13	N=4 (1,1/1,1,1,1)	7.00 7.00				
8.00-8.45 8.00-8.45 8.00-8.50	SPT S D 14 B 15	N=17 (1,2/2,2,5,8)	7.50 6.50		8.00 m Becoming medium dense		
9.00-9.45 9.00-9.45 9.00-9.50	SPT S D 16 B 17	N=10 (1,1/1,1,4,4)	9.00 7.30			(5.30)	
				Stratum continues to 12.10 m			

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:20:58

PL KGB IC	04/09/2014 06/09/2014	Dando 150 Hand dug inspection pit to 1.20m. Cable percussion boring to 23.50m. SPT Hammer ID: DB2. Rod Type: Whitworth.	0.00m 23.50m 150mm 15.00m		+4.66 mOD E 348795.88 N 377369.07

						Level
10.50-10.95 10.50-10.95 10.50-11.00	SPT S D 18 B 19	N=12 (3,3/3,3,3,3)	10.50	9.40	Loose, becoming medium dense, brown slightly gravelly silty fine to coarse SAND. Gravel is angular to subangular fine and medium of various lithologies including basalt and quartz. 10.50-12.00 m Gravelly	
12.00-12.45 12.00-12.45 12.00-12.50	SPT S D 20 B 21	N=13 (2,3/4,3,3,3)	12.00	11.50	Firm brown very sandy silty CLAY.	12.10 -7.44 (0.70)
					Very loose brown slightly silty fine to coarse SAND.	12.80 -8.14
13.50-13.95 13.50-13.95	B 22 U NR	28 blows No recovery	13.50	dry		
						(3.50)
15.00-15.45 15.00-15.45	SPT S D 23	N=2 (1,0/1,0,1,0)	15.00	8.20		
15.50	B 24		05/09/2014 15.00	8.20		
16.50-16.95 16.50-16.95 16.50-17.00	SPT S D 25 B 26	N=26 (6,7/6,7,6,7)	16.50	1.90	Firm to stiff thinly laminated dark brown slightly gravelly slightly sandy, becoming very sandy, CLAY. Gravel is angular to subangular fine and medium of various lithologies. 17.00-19.10 m Very sandy	16.30 -11.64
						(2.85)
18.00-18.45 18.00-18.45 18.00-18.50	SPT S D 27 B 28	N=26 (5,5/6,6,7,7)	18.00	2.30		
19.50-19.95 19.50-19.95 19.50-20.00	SPT S D 29 B 30	N=26 (4,4/5,6,7,8)	19.50	2.20	Medium dense orangish brown, locally slightly silty, becoming gravelly, fine to coarse SAND with locally rare shell fragments. Gravel is angular to	19.15 -14.49
					Stratum continues to 23.50 m	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:20:59

PL KGB IC	04/09/2014 06/09/2014	Dando 150 Hand dug inspection pit to 1.20m. Cable percussion boring to 23.50m. SPT Hammer ID: DB2. Rod Type: Whitworth.	0.00m 23.50m 150mm 15.00m		+4.66 mOD E 348795.88 N 377369.07

					Level
				subangular fine and medium of various lithologies including basalt and quartz.	
21.00 21.00-21.45 21.00-21.50	SPT S D 31 B 32	N=26 (3,4/5,5,7,9)		21.00-21.50 m Slightly silty	(4.35)
22.50 22.50-22.95 22.50-22.95	SPT S D 33 B 34	N=24 (1,4/5,2,7,10)		22.50-23.50 m Gravelly with rare shell fragments.	
			06/09/2014 1700 22.50 7.00		23.50 *-18.84*
				EXPLORATORY HOLE ENDS AT 23.50 m	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:21:01

GP KGB IC	09/09/2014 11/09/2014	Dando 175 Hand dug inspection pit to 1.20m. Cable percussion boring to 30.00m. SPT Hammer ID: SM23Rod Type: B	0.00m	30.00m 150mm 29.50m	+12.66 mOD E 348853.36 N 377454.81

						Level	
0.00-0.50	B 1				MADE GROUND: Soft to firm thinly laminated dark brown mottled light brown and orange slightly gravelly sandy CLAY. Gravel is angular to subrounded fine and medium of various lithologies.		
0.50	D 2						
1.00-1.45	SPT S	N=6 (1,1/1,1,2,2)		dry			
1.00	D 3						
1.00	D 4						
1.00-1.50	B 5					(2.80)	
2.00-2.45	SPT S	N=5 (1,1/1,1,2,1)	1.40	dry			
2.00	D 6						
2.00	D 7						
2.00-2.50	B 8						
						2.80 +9.86	
3.00-3.45	U 9	10 blows	1.40	dry	MADE GROUND: Soft to firm dark grey and dark brown sandy silty CLAY with (probable) lenses of red medium and coarse sand.	(0.40)	
						3.20 +9.46	
3.50	D 10				MADE GROUND: Firm thinly laminated light grey mottled orange and black sandy silty CLAY with pockets of brown fine to coarse sand, locally pockets of organic material and very sandy clayey silty and occasional rootlets.		
3.50-4.00	B 11						
4.00-4.45	SPT S	N=8 (1,0/1,2,2,3)	1.40	dry	4.00-4.50 m Laminations of black silt with strong hydrocarbon odour		
4.00	D 12					(2.40)	
4.00-5.00	B 13						
5.00	D 14				5.00-5.60 m Pockets of organic material very sandy clayey silt with slight hydrocarbon odour		
5.00-5.50	B 15						
5.00-5.50	U NR	10 blows No recovery	1.40	4.80			
						5.60 +7.06	
6.00-6.45	SPT S	N=9 (1,1/2,2,2,3)	6.00	dry	MADE GROUND: Soft to firm, becoming firm, thinly laminated light grey mottled orange brown thinly laminated slightly sandy silty CLAY with locally abundant plant remains.		
6.00	D 16						
6.00	D 17					(2.20)	
6.00-6.50	B 18						
7.00	D 19						
7.00-7.45	U 20	40 blows	6.00	dry			
7.50	D 21				7.50-7.80 m Firm. Abundnant plant remains and rootlets.		
						7.80 +4.86	
8.00-8.45	SPT S	N=14 (1,2/2,3,4,5)	6.00	dry	MADE GROUND: Soft light grey mottled brown thinly laminated very sandy silty CLAY.		
8.00	D 22						
8.00	D 23					(1.60)	
8.00-8.50	B 24						
9.00	D 25						
9.00-9.45	U 26	25 blows	6.00	dry			
						9.40 +3.26	
9.50	D 27				Soft to firm locally soft light grey mottled orange slightly sandy, becoming sandy silty, CLAY with rootlets and		
					Stratum continues to 11.00 m		

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:21:04

GP KGB IC	09/09/2014 11/09/2014	Dando 175 Hand dug inspection pit to 1.20m. Cable percussion boring to 30.00m. SPT Hammer ID: SM23Rod Type: B	0.00m	30.00m 150mm 29.50m	+12.66 mOD E 348853.36 N 377454.81

						Level	
10.00-10.45 10.00 10.00 10.00-10.50	SPT S D 28 D 29 B 30	N=6 (1,0/1,1,2,2)	6.00 dry 09/09/2014 1800 6.00 dry 10/09/2014 0800 6.00 dry	roots.	10.00-11.00 m Sandy silty clay.	(1.60)	
11.00 11.00-11.50	D 31 B 32			Dark brown and black clayey fibrous PEAT with pockets of soft grey clay.		11.00 +1.66	
11.50-11.95	U 33	20 blows	11.50 dry			(0.80)	
12.00 12.05	D 34 D 35			Firm thinly laminated light grey CLAY with abundant roots and plant remains and locally pockets of amorphous peat.		11.80 +0.86	
12.50-13.00	B 36			Soft locally thinly laminated brown and grey very sandy silty CLAY with peat and plant remains.	12.45-12.50 m Pockets of peat	(0.70)	
13.00-13.45 13.00	SPT S D 37	N=7 (1,2/1,2,2,2)	13.00 dry		13.00-13.45 m Grey thinly laminated silty sand band	12.50 +0.16	
14.00	D 38					(2.10)	
14.50 14.50-14.95	D 39 U 40	5 blows	14.50	Loose locally medium dense light brown slightly gravelly slightly clayey fine to coarse SAND. Gravel is angular to subangular fine to coarse of various lithologies including basalt, quartz, mudstone and sandstone		14.60 -1.94	1
15.00 15.00-15.50	D 41 B 42						1
16.00-16.45 16.00	SPT S D 43	N=11 (1,2/1,2,3,5)	16.00 dry		16.00-16.95 m Medium dense		
16.50-17.00	B 44						
17.50-17.95 17.50	SPT S D 45	N=6 (1,0/1,1,2,2)	17.50 dry				
18.00	B 46						
19.00-19.45 19.00	SPT S D 47	N=10 (1,1/2,2,3,3)	19.00 dry			(9.40)	
19.50	B 48						
				Stratum continues to 24.00 m			

1 14.60 Rose to 15.00 m after 20 minutes. -

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:21:05

GP KGB IC	09/09/2014 11/09/2014	Dando 175 Hand dug inspection pit to 1.20m. Cable percussion boring to 30.00m. SPT Hammer ID: SM23Rod Type: B	0.00m 30.00m 150mm 29.50m		+12.66 mOD E 348853.36 N 377454.81

					Level	
20.50-20.95 20.50-21.00	SPT S B 49	N=9 (1,0/2,2,3,2)	20.50 dry	Loose locally medium dense light brown slightly gravelly slightly clayey fine to coarse SAND. Gravel is angular to subangular fine to coarse of various lithologies including basalt, quartz, mudstone and sandstone		
21.50-22.00	B 50					
22.00-22.45 22.00	SPT S D 51	N=6 (1,0/1,1,2,2)	10/09/2014 1800 20.50 dry ~~22.00 8.60~~ 11/09/2014 0800 20.50 8.60			
22.50-23.00	B 52					
23.50-23.95 23.50-24.00	SPT S B 53	N=9 (1,1/2,2,3,2)	23.50 5.00			
24.00-24.50	B 54			Stiff brown slightly sandy slightly gravelly silty CLAY. Gravel is angular to subangular fine and medium of various lithologies.	24.00 *-11.34*	
25.00-25.45 25.00	SPT S D 55	N=24 (3,3/5,5,7,7)	25.00 18.00		(3.50)	
26.00	D 56					
26.50-26.95	U 57	55 blows	25.00 17.60			
27.00	D 58					
27.50-28.00	B 59			Medium dense orangish brown clayey fine and medium SAND.	27.50 *-14.84*	
28.00-28.45 28.00	SPT S D 60	N=10 (2,2/2,2,3,3)	28.00 10.00		(2.50)	
29.00	D 61					
29.50-29.95 29.50 29.50-30.00	SPT S D 62 B 63	N=12 (1,2/2,3,4,3)	29.50 11.00 11/09/2014 1800 29.50 11.00			
				EXPLORATORY HOLE ENDS AT 30.00 m		

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:21:06

PG KGB IC	15/09/2014 18/09/2014	Dando 175 Hand dug inspection pit to 1.20m. Cable percussion boring to 35.00m. SPT Hammer ID: SM23. Rod Type: B	0.00m 35.00m 150mm 34.00m		+9.82 mOD E 349603.26 N 378357.49

						Level
0.80	D 1				MADE GROUND: Firm dark grey mottled black gravelly sandy silty CLAY. Gravel is angular fine and medium of limestone.	(1.50)
1.00-1.45 1.00-1.50	SPT S B 2	N=2 (1,1/0,1,0,1)	1.00	dry		
					MADE GROUND: Thickly laminated black mottled brown sandy clayey SILT with a very strong hydrocarbon odour.	1.50 +8.32
2.00-2.65 2.00-2.50	SPT S B 3	N=2 (0,1/0,1,1,0) SW=200	1.60	dry		
3.00-4.00	B 4					
3.50-3.95	SPT S	N=2 (1,1/0,0,1,1)	3.00	dry		(5.50)
4.50-5.35 4.50-5.35 4.50-5.00	SPT S D 5 B 6	N=2 (1,0/0,1,0,1) SW=100	4.50	dry		
6.00-6.80 6.00-6.50	SPT S B 7	* N=2 (1,0/0,1,0,1) SW=350	15/09/2014 1700 6.00 dry ~~6.00 dry~~ 16/09/2014 0800 6.00 3.20			
7.00-7.65 7.00-7.50	SPT S B 8	N=3 (1,0/1,1,0,1) SW=200	7.00	6.50	Very soft light grey slightly sandy silty CLAY.	7.00 +2.82 (0.70)
7.80-8.25	U 9	12 blows 225 mm rec	7.50	5.50	Black and brown amorphous PEAT with occasional bands of soft light grey sandy clayey silt.	7.70 +2.12 (1.80)
9.00-9.45 9.00-9.45 9.00-9.50	SPT S D 10 B 11	N=9 (1,1/2,2,2,3)	9.00	7.00	Light grey mottled brown sandy clayey SILT with occasional large and medium	9.50 +0.32
					Stratum continues to 13.60 m	

1	9.40	-		-	6.00	8.00	Water added to assist boring

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:21:09

PG KGB IC	15/09/2014 18/09/2014	Dando 175 Hand dug inspection pit to 1.20m. Cable percussion boring to 35.00m. SPT Hammer ID: SM23. Rod Type: B	0.00m 35.00m 150mm 34.00m		+9.82 mOD E 349603.26 N 378357.49

						Level
					pockets of amorphous peat and abundant plant remains.	
10.50-11.19 10.50-10.95 10.50-11.00	SPT S D 12 B 13	N=5 (1,0/1,1,2,1) SW=240	10.40	8.10		(4.10)
12.00-12.45 12.00-12.50	SPT S B 14	N=8 (1,2/2,1,2,3)	11.60	7.30		
13.00-13.95	U NR	18 blows No recovery	13.50	6.10		
13.50-14.00	B 15					13.60 -3.78
14.00-14.45 14.00-14.45 14.00-14.50	SPT S D 16 B 17	N=22 (2,2/4,4,6,8)	14.00	6.00	Medium dense becoming dense dark brown mottled grey slightly gravelly silty fine to coarse SAND.	
15.50-15.95 15.50-15.95 15.50-16.00	SPT S D 18 B 19	N=21 (2,3/3,5,6,7)	15.30	5.90		
17.00-17.45 17.00-17.45 17.00-17.50	SPT S D 20 B 21	N=27 (2,3/4,6,8,9)	17.00	2.30		(7.50)
18.50-18.95 18.50-18.95 18.50-19.00	SPT S D 22 B 23	N=34 (3,3/5,7,10,12) *	18.30 16/09/2014 19.00 17/09/2014 19.00	3.40 1700 3.20 0800 5.70	18.50 m Becoming dense	
					Stratum continues to 21.10 m	

19.00 24.00 Water added to assist boring

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:21:10

PG KGB IC	15/09/2014 18/09/2014	Dando 175 Hand dug inspection pit to 1.20m. Cable percussion boring to 35.00m. SPT Hammer ID: SM23. Rod Type: B	0.00m 35.00m 150mm 34.00m	+9.82 mOD E 349603.26 N 378357.49

						Level	
20.00-20.45 20.00-20.45 20.00-20.50	SPT S D 24 B 25	N=40 (3,4/5,8,12,15)	19.80	2.70	Medium dense becoming dense dark brown mottled grey slightly gravelly silty fine to coarse SAND.		
21.20	D 26				Firm thinly laminated dark brown slightly gravelly slightly sandy silty CLAY. Gravel is angular to subangular fine and medium of various lithologies including basalt.	21.10 -11.28 (0.90)	
21.40-22.00 21.40-21.85	B 27 U NR	35 blows No recovery	21.30	6.40			
					Medium dense brown silty fine and medium SAND with occasional shell fragments.	22.00 -12.18	
22.50-22.95 22.50-22.95 22.50-23.00	SPT S D 28 B 29	N=20 (3,3/4,4,5,7)	22.50	6.90		(3.00)	
24.00-24.45 24.00-24.50	SPT S B 30	N=24 (2,3/3,5,7,9)	24.00	8.00			
25.00-25.45	U 31	58 blows	24.90	8.40	Firm thinly laminated light brown, becoming slightly sandy, silty CLAY with abundant silt laminae.	25.00 -15.18	
25.45-25.55	D 32						
			17/09/2014 26.00	1700 9.30		(1.90)	
			18/09/2014 26.00	0800 5.70			
26.50-26.95 26.50-26.95 26.50-27.00	SPT S D 33 B 34	N=17 (2,3/3,4,5,5)	26.10	2.10	26.50-26.90 m Slightly sandy.		
					Medium dense to dense brown slightly gravelly silty fine to coarse SAND with occasional small and medium pockets of light brown silty clay. Gravel is angular to subangular fine and medium of basalt.	26.90 -17.08	
28.00-28.45 28.00-28.45 28.00-28.50	SPT S D 35 B 36	N=23 (2,3/4,5,7,7)	27.80	3.00			
29.50-29.95 29.50-29.95 29.50-30.00	SPT S D 37 D 38	N=19 (3,3/5,5,6,3)	29.50	4.80			
					Stratum continues to 35.00 m		

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:21:11

PG KGB IC	15/09/2014 18/09/2014	Dando 175 Hand dug inspection pit to 1.20m. Cable percussion boring to 35.00m. SPT Hammer ID: SM23. Rod Type: B	0.00m	35.00m 150mm 34.00m	+9.82 mOD E 349603.26 N 378357.49

					Level	
				Medium dense to dense brown slightly gravelly silty fine to coarse SAND with occasional small and medium pockets of light brown silty clay. Gravel is angular to subangular fine and medium of basalt.		
31.00-31.45 31.00-31.45 31.00-31.50	SPT S D 39 B 40	N=23 (2,4/4,5,7,7)	30.80 5.50		(8.10)	
32.50-32.95 32.50-32.95 32.50-33.00	SPT S D 41 B 42	N=25 (3,3/5,6,7,7)	32.50 4.30			
34.00-34.45 34.00-34.45 34.00-34.50	SPT S D 43 B 44	N=31 (3,4/6,7,9,9)	34.00 5.70			
			18/09/2014 1700 4.80 5.70			
35.00	D 45			EXPLORATORY HOLE ENDS AT 35.00 m	35.00 *-25.18*	

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:21:12

PD KGB IC	16/09/2014 18/09/2014	Dando 2000 Hand dug inspection pit to 1.20m. Cable percussion boring to 35.00m. SPT Hammer ID: DB2. Rod Type: Whitworth	0.00m 35.00m 150mm 34.50m		+13.66 mOD E 349638.93 N 378340.23

							Level
0.00-0.40	B 1				MADE GROUND: Soft dark grey sandy gravelly CLAY. Gravel is angular fine to coarse of limestone.		(0.40)
0.40-0.70	B 2						0.40 *+13.26*
					MADE GROUND: Brown gravelly clayey SAND. Gravel is angular to subangular fine to coarse of limestone. Occasional pockets of dark grey silty clay.		(0.30)
							0.70 *+12.96*
1.20-1.60	U 3	13 blows		dry	MADE GROUND: Soft dark greyish black mottled brown slightly sandy silty CLAY with strong hydrocarbon odour and occasional rootlets.		
1.70	D 4						(2.10)
2.00-2.45 2.00-2.45 2.00-2.50	SPT S D 5 B 6	N=4 (1,1/0,1,1,2)	1.70	dry			
							2.80 *+10.86*
3.00-3.45 3.00-3.45 3.00-3.50	SPT S D 7 B 8	N=11 (2,2/2,3,3,3)	3.00	dry	MADE GROUND: Firm thinly laminated light grey mottled brown and orange slightly sandy slightly gravelly CLAY locally with occasional red and brown sand lenses. Gravel is subangular to subrounded fine to coarse of various lithologies.		
4.00	U 9	56 blows	4.00	dry		4.00-10.00 m Occasional red and brown sand lenses.	
4.50	D 10						
5.00-5.45 5.00-5.45 5.00-5.50	SPT S D 11 B 12	N=18 (2,2/3,4,4,7)	5.00	dry			
6.00-6.45	U 13	71 blows 270 mm rec	6.00	dry		6.00-10.00 m Gravel absent	
6.50	D 14						(7.70)
7.00-7.45 7.00-7.45 7.00-7.50	SPT S D 15 B 16	N=22 (4,5/4,7,7,4)	7.00	dry			
8.00-8.45	U 17	55 blows	7.50	dry			
8.50	D 18						
9.00-9.45 9.00-9.45 9.00-9.50	SPT S D 19 B 20	N=18 (4,4/5,5,5,3)	9.00	dry			
			16/09/2014 1700 9.00	dry			
			17/09/2014 0800 10.50	dry			
					Stratum continues to 10.50 m		

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:21:16

PD KGB IC	16/09/2014 18/09/2014	Dando 2000 Hand dug inspection pit to 1.20m. Cable percussion boring to 35.00m. SPT Hammer ID: DB2. Rod Type: Whitworth	0.00m 35.00m 150mm 34.50m		+13.66 mOD E 349638.93 N 378340.23

						Level	
10.50-10.95 10.50-10.95 10.50-11.00	SPT S D 20 B 21	N=10 (2,2/3,2,2,3)	10.50	dry	MADE GROUND: Firm thinly laminated light grey mottled brown and orange slightly sandy slightly gravelly CLAY locally with occasional red and brown sand lenses. Gravel is subangular to subrounded fine to coarse of various lithologies.	10.50 +3.16	
					MADE GROUND: Soft light grey mottled orange and brown silty CLAY	(1.60)	
12.00-12.45	U 22	48 blows 360 mm rec	12.00	dry			
					Soft to firm light grey mottled black very sandy clayey SILT with pockets of peat and plant remains.	12.10 +1.56 (0.40)	
12.50	D 23					12.50 +1.16	
					Dark brown fibrous PEAT	(0.70)	
					Light grey mottled black very sandy clayey SILT with pockets of peat, plant remains and rootlets.	13.20 +0.46	
13.50-13.95 13.50-13.95 13.50-14.00	SPT S D 24 B 25	N=10 (2,2/3,2,2,3)	13.50	dry			1
15.00-15.45 15.00-15.45 15.00-15.50	SPT S D 26 B 27	N=13 (2,3/4,3,3,3)	15.00	dry		(3.40)	
16.50-16.95	U 28	52 blows	16.50	dry			
					Dark brown fibrous PEAT.	16.60 -2.94	
17.00	D 29					(0.90)	1
					Medium dense brown slightly gravelly coarse SAND. Gravel is angular to subangular fine and medium of various lithologies locally with pockets of dark brown fibrous peat and soft grey clay.	17.50 -3.84	
18.00-18.45 18.00-18.45 18.00-18.50	SPT S D 30 D 31	N=19 (3,3/4,4,5,6)	18.00	14.90			
19.50-19.95 19.50-19.95 19.50-20.00	SPT S D 32 B 33	N=21 (3,3/5,5,5,6)	19.50	16.50			
					Stratum continues to 26.20 m		

1	17.50	Rose to 14.30 m after 20 minutes.	-	
	20.00	Water added to assist boring.		

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:21:17

PD KGB IC	16/09/2014 18/09/2014	Dando 2000 Hand dug inspection pit to 1.20m. Cable percussion boring to 35.00m. SPT Hammer ID: DB2. Rod Type: Whitworth	0.00m 35.00m 150mm 34.50m		+13.66 mOD E 349638.93 N 378340.23

						Level
		*		Medium dense brown slightly gravelly coarse SAND. Gravel is angular to subangular fine and medium of various lithologies locally with pockets of dark brown fibrous peat and soft grey clay.		
21.00-21.45 21.00-21.45 21.00-21.50	SPT S D 34 B 35	N=22 (3,3/4,5,6,7)	21.00	3.10		
						(8.70)
22.50-22.95 22.50-22.95 22.50-23.00	SPT S D 36 B 37	N=14 (2,2/3,3,4,4)	22.50	4.00		
24.00-24.45 24.00-24.45 24.00-24.50	SPT S D 38 B 39	N=15 (2,2/2,4,4,5)	24.00	1.00	24.00-24.50 m Pockets of dark brown fibrous peat.	
25.50-25.95 25.50-25.95 25.50-26.00	SPT S D 40 B 41	N=22 (3,3/4,5,6,7)	25.50	6.00	25.50-26.20 m Pockets of soft grey clay.	
26.20-26.70	B 42					26.20 -12.54
			17/09/2014 25.50	1700 6.00	Firm thinly laminated brown slightly sandy silty CLAY.	(0.50)
						26.70 -13.04
27.00-27.45 27.00-27.45 27.00-27.50	SPT S D 43 B 44	N=18 (3,3/4,4,5,5)	27.00 18/09/2014 27.00	1.00 0800 1.00	Medium dense brown slightly gravelly coarse SAND. Gravel is angular to subangular fine and medium of various lithologies.	
						(2.20)
28.50-28.95 28.50-28.95 28.50-29.00	SPT S D 45 B 46	N=24 (5,5/5,6,6,7)	28.50	1.00		
						28.90 -15.24
					Firm thinly laminated brown silty CLAY.	
					Stratum continues to 32.40 m	

20.00	Water added to assist boring.

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:21:19

PD KGB IC	16/09/2014 18/09/2014	Dando 2000 Hand dug inspection pit to 1.20m. Cable percussion boring to 35.00m. SPT Hammer ID: DB2. Rod Type: Whitworth	0.00m 35.00m 150mm 34.50m		+13.66 mOD E 349638.93 N 378340.23

						Level
30.00-30.45	U 47			Firm thinly laminated brown silty CLAY.		
30.50	D 48					(3.50)
31.50-31.95	SPT S	N=16 (3,3/4,4,4,4)	31.50 1.50			
31.50-31.95	D 49					
31.50-32.00	B 50					
						32.40 *-18.74*
				Medium dense orangish brown medium and coarse SAND.		
33.00-33.45	SPT S	N=23 (2,3/4,5,6,8)	33.00 4.10			
33.00-33.45	D 51					
33.00-33.50	B 52					(2.60)
34.50-34.95	SPT S	N=24 (4,4/4,5,7,8)	34.95 5.00			
34.50-34.95	D 53					
34.50-35.00	B 54					
			18/09/2014 1700 34.50 5.00			
				EXPLORATORY HOLE ENDS AT 35.00 m		35.00 *-21.34*

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:21:20

SS/IW KGB IC	17/09/2014 23/09/2014	Dando 2000 Cable percussion boring to 35.00m. SPT Hammer ID: PBD11 Rods: Whitworth	0.00m 35.00m 150mm 33.90m		+10.88 mOD E 350497.22 N 378243.83

						Level	
0.00-1.20	B 1				MADE GROUND: Soft to firm brown mottled black and orange slightly sandy CLAY with abundant roots and rootlets. (TOPSOIL).	0.20 *+10.68*	
1.20-1.65 1.20-1.65 1.20-1.65	SPT S D 2 B 3	N=0 (0,0/-,-,-,-)		dry	MADE GROUND: Thinly to thickly laminated black mottled brown slightly sandy clayey SILT with a strong hydrocarbon odour and occasional roots and plant remains.		
2.00-2.45 2.00-2.45 2.00-2.45	SPT S D 4 B 5	N=1 (0,0/0,1,0,0)	1.90	dry			
3.00-3.45 3.00-3.45 3.00-3.45	SPT S D 6 B 7	N=3 (1,0/1,1,1,0)	2.90	dry			
4.00-4.45 4.00-4.45 4.00-4.45	SPT S D 8 B 9	N=0 (0,0/-,-,-,-)	3.90	dry			
5.00-5.45 5.00-5.45 5.00-5.45	SPT S D 10 B 11	N=3 (1,1/1,1,0,1)	4.90	dry		(9.90)	
6.00-6.45 6.00-6.45 6.00-6.45	SPT S D 12 B 13	N=7 (1,1/2,2,1,2)	5.90	dry			
7.00-7.45 7.00-7.45 7.00-7.45	SPT S D 14 B 15	N=2 (1,0/1,0,1,0)	6.90	dry			
8.00-8.45 8.00-8.45 8.00-8.45	SPT S D 16 B 17	N=6 (1,1/2,1,2,1)	7.90	dry			
9.00-9.45 9.00-9.45 9.00-9.45	SPT S D 18 B 19	N=7 (1,2/1,2,2,2)	8.90	dry			
					Stratum continues to 10.10 m		

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:21:24

SS/IW KGB IC	17/09/2014 23/09/2014	Dando 2000 Cable percussion boring to 35.00m. SPT Hammer ID: PBD11 Rods: Whitworth	0.00m 35.00m 150mm 33.90m		+10.88 mOD E 350497.22 N 378243.83

						Level	
10.00-10.45 10.00-10.45 10.00-10.45	SPT S D 20 B 21	N=6 (1,2/1,1,2,2)	9.90 dry 18/09/2014 0800 9.90 dry	MADE GROUND: Thinly to thickly laminated black mottled brown slightly sandy clayey SILT with a strong hydrocarbon odour and occasional roots and plant remains.		10.10	+0.78
10.70	D 22			Becoming thinly laminated brown and black fibrous PEAT.	10.70-12.20 m Thin laminations of grey silty clay.		
							(2.10)
11.50-11.95	U NR	37 blows No recovery	11.40 dry				
12.00	D 24						
12.20	D 25			Grey slightly silty SAND. (Drillers description).		12.20	-1.32
							(0.80)
13.00-13.45 13.00-13.45	SPT C B 27	* N=24 (3,2/4,6,6,8)	12.90 1.50	Medium dense to dense dark and light grey slightly gravelly slightly clayey fine to coarse SAND. Gravel is angular to subangular fine and medium of various lithologies including quartz.		13.00	-2.12
13.70	D 28						
							(4.50)
14.50-14.95 14.50-14.95 14.70	SPT C B 30 D 31	N=28 (4,5/6,7,8,7)	14.40 3.40				
16.00-16.45 16.00-16.45	SPT C B 33	N=27 (5,5/5,7,9,6)	15.90 7.60				
16.70	D 34						
17.50-17.95 17.50-17.95 17.70	SPT C B 36 D 37	N=30 (3,6/8,10,7,5)	17.40 2.00	Dense GRAVEL with low cobble content. Gravel is angular to subangular fine to coarse of basalt, mudstone and granite. Cobbles are angular to subangular of mudstone, basalt and granite.		17.50	-6.62
18.00	D 38						
							(1.50)
19.00-19.45 19.00-19.45	SPT C B 40	N=23 (7,3/5,6,6,6)	18.90 4.50	Medium dense to dense dark and light grey slightly gravelly slightly clayey fine to coarse SAND. Gravel is angular to subangular fine and medium of various lithologies including quartz.		19.00	-8.12
19.70	D 41						
				Stratum continues to 23.00 m			

None observed (see Key Sheet)

13.00	20.00	Water added to assist boring.
20.00	24.80	Water added to assist boring.

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:21:26

SS/IW KGB IC	17/09/2014 23/09/2014	Dando 2000 Cable percussion boring to 35.00m. SPT Hammer ID: PBD11 Rods: Whitworth	0.00m 35.00m 150mm 33.90m		+10.88 mOD E 350497.22 N 378243.83

							Level
		*	19/09/2014 0800 18.90 dry				
20.50-20.95 20.50-20.95 20.70	SPT C B 43 D 44	N=26 (3,6/5,7,6,8)	20.40	3.40	Medium dense to dense dark and light grey slightly gravelly slightly clayey fine to coarse SAND. Gravel is angular to subangular fine and medium of various lithologies including quartz.		(4.00)
22.00-22.45 22.00-22.45	SPT C B 46	N=22 (5,5/4,6,6,6)	21.90	5.00			
22.70	D 47						
					Medium dense orangish brown slightly gravelly SAND. Gravel is angular to subangular fine of various litholgies including sandstone, mudstone, basalt and quartz.		23.00 -12.12
23.50-23.95 23.50-23.95 23.70	SPT C B 49 D 50	N=27 (3,4/5,6,8,8)	23.40	7.80			(1.80)
					Firm to stiff thinly laminated brown, locally slightly gravelly, slightly sandy silty CLAY with abundant sandy silt laminae. Gravel is angular to subangular fine of basalt.		24.80 -13.92
25.00-25.45	U 51	86 blows 315 mm rec	24.80 23/09/2014 24.80	10.50 0800 10.50			
25.45-25.50	D 52						
26.50-26.95 26.50-26.95 26.50-26.95	SPT S D 53 B 54	N=25 (3,4/6,6,6,7)	26.00	13.00		26.50-27.00 m Locally vertically laminated.	(3.70)
27.50	D 55					27.50-28.00 m Slightly gravelly.	
28.00-28.45	U 56	91 blows 360 mm rec	27.50	16.00			
28.45-28.50	D 57						
					Medium dense orangish brown slightly silty SAND.		28.50 -17.62
29.50-29.95 29.50-29.95 29.50-29.95	SPT S D 58 B 59	N=27 (3,4/6,6,8,7)	29.40	16.00			
					Stratum continues to 35.00 m		

None observed (see Key Sheet)

20.00 24.80 Water added to assist boring.

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:21:27

SS/IW KGB IC	17/09/2014 23/09/2014	Dando 2000 Cable percussion boring to 35.00m. SPT Hammer ID: PBD11 Rods: Whitworth	0.00m	35.00m 150mm 33.90m	+10.88 mOD E 350497.22 N 378243.83

						Level
30.50	D 60				Medium dense orangish brown slightly silty SAND.	
31.00-31.45 31.00-31.45 31.00-31.45	SPT S D 61 B 62	N=22 (2,4/4,5,6,7)	30.90	11.00		(6.50)
32.00	D 63					
32.50-32.95 32.50-32.95 32.50-32.95	SPT S D 64 B 65	N=27 (3,4/4,6,8,9)	32.40	17.50		
34.00-34.45 34.00-34.45 34.00-34.45	SPT S D 67 B 68	N=27 (4,4/6,6,7,8)	33.90	18.00		
			23/09/2014 33.90	1700 18.00		
					EXPLORATORY HOLE ENDS AT 35.00 m	35.00 -24.12

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:21:28

SS KGB IC	15/09/2014 17/09/2014	Dando 2000 Cable percussion boring to 20.45m. SPT Hammer ID: PBD11. Rod Type: Whitworth.	0.00m	20.45m 150mm 19.90m	+12.30 mOD E 350110.14 N 378816.37

						Level
0.30-1.20	B 1				MADE GROUND: Roadstone FILL. (Drillers description).	(0.30) 0.30 +12.00
					MADE GROUND: Firm dark brown gravelly sandy CLAY. Gravel is angular fine to coarse of limestone.	(0.90)
1.20-1.65	U 2	41 blows 360 mm rec		dry	MADE GROUND: Grey mottled black and brown sandy clayey SILT with abundant peat pockets, plant remains, rootlets and locally occasional pockets of red sand.	1.20 +11.10
1.70	D 3					
2.00-2.45 2.00-2.45 2.00-2.45	SPT S D 4 B 5	N=9 (1,2/1,2,3,3)	1.90	dry		
3.00-3.45	U 6	35 blows	2.90	dry		
3.50	D 7					
4.00-4.45 4.00-4.45 4.00-4.45	SPT S D 8 B 9	N=12 (2,2/3,3,3,3)	3.90	dry		
5.00-5.45	U NR	20 blows No recovery	4.90	dry		
5.50	D 11					
6.00-6.45 6.00-6.45 6.00-6.45	SPT S D 12 B 13	N=10 (2,2/2,3,3,2)	5.90	dry	6.00-12.00 m Occasional pockets of red sand.	(10.80)
7.50-7.95	U 14	30 blows	7.40	dry		
8.00	D 15					
9.50-9.95 9.50-9.95 9.70-9.95 9.70	SPT S D 16 B 17 D 18	N=13 (3,3/2,4,3,4)	9.40 15/09/2014 1700 9.40	dry dry		
					Stratum continues to 12.00 m	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:21:32

SS KGB IC	15/09/2014 17/09/2014	Dando 2000 Cable percussion boring to 20.45m. SPT Hammer ID: PBD11. Rod Type: Whitworth.	0.00m 20.45m 150mm 19.90m		+12.30 mOD E 350110.14 N 378816.37

					Level
			16/09/2014 0800 10.90 dry	MADE GROUND: Grey mottled black and brown sandy clayey SILT with abundant peat pockets, plant remains, rootlets and locally occasional pockets of red sand.	
11.00-11.45	U 19	25 blows 270 mm rec	10.90 dry		
12.00	D 20			Dark brown and black fibrous PEAT.	12.00 +0.30
					(0.40)
12.50-12.95 12.50-12.95 12.50-12.95 12.70	SPT S D 21 B 22 D 23	N=12 (2,3/4,2,3,3)	12.40 dry	Soft to firm thinly laminated light grey sandy silty CLAY with abundant rootlets and plant remains with organic odour.	12.40 -0.10
14.00-14.45	U 24	18 blows 225 mm rec	13.90 dry		
14.50	D 25				
15.50-15.95 15.50-15.95 15.50-15.95	SPT S D 26 B 27	N=9 (2,3/3,2,2,2)	15.40 dry		(8.05)
17.00-17.45	U 28	34 blows 405 mm rec	16.90 dry		
18.00	D 29				
18.50-18.95 18.50-18.95 18.50-18.95 18.70	SPT S D 30 B 31 D 32	N=6 (2,1/1,2,1,2)	18.40 dry		
				Stratum continues to 20.45 m	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:21:33

SS KGB IC	15/09/2014 17/09/2014	Dando 2000 Cable percussion boring to 20.45m. SPT Hammer ID: PBD11. Rod Type: Whitworth.	0.00m	20.45m 150mm 19.90m	+12.30 mOD E 350110.14 N 378816.37

					Level	
20.00-20.45	U 33	13 blows 315 mm rec	19.90 dry 17/09/2014 0800 19.90 dry	Soft to firm thinly laminated light grey sandy silty CLAY with abundant rootlets and plant remains with organic odour.		
					20.45 -8.15	
				EXPLORATORY HOLE ENDS AT 20.45 m		

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:21:33

SS KGB IC	11/09/2014 12/09/2014	Dando 2000 Hand dug inspection pit to 1.20m. Cable percussion boring to 20.45m. SPT Hammer ID: PBD11. Rod Type: Whitworth.	0.00m 20.00m 150mm 19.90m		+11.45 mOD E 350088.90 N 378922.89

						Level
0.10-1.00	B 1			MADE GROUND: Grass over TOPSOIL. (Drillers description).		0.10 +11.35
				MADE GROUND: Soft brown and grey slightly sandy gravelly CLAY with medium cobble content. Gravel is angular to subangular fine to coarse of various lithologies including sandstone, brick and concrete. Cobbles are angular to subangular of concrete.		(0.90)
1.00-1.20	B 2					1.00 +10.45
1.20-1.65	SPT S	N=3 (1,0/0,1,1,1)		dry		
1.20-1.65	D 3					
1.20-1.65	B 4					
				MADE GROUND: Very soft to soft brown mottled black and grey thinly laminated, locally slightly gravelly, sandy silty CLAY with a slight hydrocarbon odour, occasional rootlets and locally pockets of light grey mottled orange sandy clay. Gravel is angular to subangular fine to coarse of various lithologies including red sandstone.	2.00-2.45 m Slightly gravelly with pockets of light grey mottled orange sandy clay.	(3.00)
2.00-2.45	SPT S	N=3 (1,1/0,1,1,1)	1.90	dry		
2.00-2.45	D 5					
2.00-2.45	B 6					
3.00-3.45	SPT S	N=4 (1,1/1,1,1,1)	2.90	dry		
3.00-3.45	D 7					
3.00-3.45	B 8					
4.00-4.45	U 9	12 blows 405 mm rec	3.90	dry		4.00 +7.45
				Firm, locally thinly laminated, light grey mottled orange and black slightly sandy silty CLAY with roots and rootlets.	4.00-5.00 m Thinly laminated	
4.50	D 10					
5.00-5.45	SPT S	N=9 (1,2/3,2,2,2)	4.90	dry		
5.00-5.45	D 11					
5.00-5.45	B 12					
6.00-6.45	SPT S	N=10 (2,2/2,2,3,3)	5.90	dry	6.00-6.45 m Thinly laminated	
6.00-6.45	D 13					
6.00-6.45	B 14					
6.70	D 15				6.70-7.50 m Vertically laminated	(6.00)
7.50-7.95	U 16	16 blows 315 mm rec	7.40	dry	7.50-9.00 m Thinly laminated	
8.00	D 17					
9.00-9.45	SPT S	N=13 (2,3/3,4,3,3)	8.90	dry		
9.00-9.45	D 18					
9.00-9.45	B 19					
			11/09/2014 8.90	dry		

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:21:36

SS KGB IC	11/09/2014 12/09/2014	Dando 2000 Hand dug inspection pit to 1.20m. Cable percussion boring to 20.45m. SPT Hammer ID: PBD11. Rod Type: Whitworth.	0.00m 20.00m 150mm 19.90m		+11.45 mOD E 350088.90 N 378922.89

						Level	
					Soft light grey CLAY with plant remains and roots.	10.00 +1.45	
10.50-10.95	U 20	10 blows 225 mm rec	10.40	dry			
11.00	D 22					(2.00)	
12.00-12.45	SPT S	N=0 (1,0/-,-,-,-)	11.90	dry	Very soft thinly laminated brown sandy silty CLAY.	12.00 -0.55	
12.00-12.45	D 23						
12.00-12.45	D 24						
12.70	D 25						
13.50-13.95	U NR	3 blows No recovery	13.40	dry		(2.90)	
14.00	D 27						
14.90	D 28				Soft to firm thinly laminated light grey sandy silty CLAY with abundant pockets of peat and plant remains.	14.90 -3.45	
15.50-15.95	SPT S	N=17 (2,4/4,5,4,4)	15.40	dry			
15.50-15.95	D 29						
15.50-15.95	B 30						
15.70	D 31					(3.10)	
17.00-17.45	U 32	18 blows 225 mm rec	16.90	dry			
17.50	D 33						
18.00	D 34				Locally thinly laminated light grey very sandy SILT with pockets of peat and plant remains	18.00 -6.55	
18.50-18.88	SPT S	4 (2,-/1,1,1,1 for 0mm)	18.40	dry	18.50-18.70 m Pockets of peat and plant remains 18.70-20.00 m Thinly laminated		
18.50-18.95	B 36						
18.70	D 37					(2.00)	
			12/09/2014 20.45	dry			

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:21:37

SS KGB IC	11/09/2014 12/09/2014	Dando 2000 Hand dug inspection pit to 1.20m. Cable percussion boring to 20.45m. SPT Hammer ID: PBD11. Rod Type: Whitworth.	0.00m 20.00m 150mm 19.90m		+11.45 mOD E 350088.90 N 378922.89

					Level	
20.00-20.45 20.00-20.45	SPT S D 38	N=2 (1,1/0,0,1,1)	19.90 dry	Very soft light grey thinly laminated very sandy silty CLAY.	20.00 -8.55 (0.45)	
				EXPLORATORY HOLE ENDS AT 20.45 m	20.45 -9.00	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:21:38

NK KGB IC	29/09/2014 29/09/2014	Dando 2000 Open hole cable percussion boring to 10.00m. SPT Hammer ID: PBD14. Rod Type: Whitworth.	+9.48 mOD E 348668.51 N 378154.02

					Level	
		*		MADE GROUND: Turf over TOPSOIL. (Drillers description).	0.10 +9.38	
				MADE GROUND: Firm light brown sandy silty CLAY with roots and rootlets.	(1.40)	
				MADE GROUND: Black mottled brown slightly sandy clayey SILT with a strong hydrocarbon odour.	1.50 +7.98	
					(4.50)	
				MADE GROUND: Light grey mottled black and light brown very sandy clayey SILT with a slight hydrocarbon odour.	6.00 +3.48	
					(4.00)	
			29/09/2014			
				EXPLORATORY HOLE ENDS AT 10.00 m		

None observed (see Key Sheet)

0.00 10.00 Open hole boring, no sampling/ insitu testing required.

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:21:41

SA IC	08/09/2014 08/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 3.00 m 130 (Deg)	+4.02 mOD E 346670.47 N 376332.84

			Level
1 MADE GROUND: Brown slightly sandy CLAY. Sand is fine and medium. (TOPSOIL).		0.10	+3.92
2 MADE GROUND: Brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to rounded of sandstone, brick, slate, concrete and limestone.		0.30	+3.72
EXPLORATORY HOLE ENDS AT 0.30 m			

None observed (see Key Sheet)

Good

None

Fine, cloudy

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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426.4817/12/2014 13:36:11

Trial Pit

SA IC	08/09/2014 08/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 3.00 m 180 (Deg)	+4.90 mOD E 346632.29 N 376481.93

			Level
1 MADE GROUND: Brown SAND and GRAVEL. Sand is fine to coarse. Gravel is angular fine and medium of sandstone,limestone and brick.		0.20	+4.70
2 MADE GROUND: Greyish brown slightly sandy GRAVEL. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, limestone, mudstone and brick.		0.30	+4.60
EXPLORATORY HOLE ENDS AT 0.30 m			

None observed (see Key Sheet)

Good

None

Fine, cloudy

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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426.4817/12/2014 13:36:12

Trial Pit

SA IC	09/09/2014 09/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 3.70 m 128 (Deg)	+5.96 mOD E 346910.57 N 376547.05

			Level
1 MADE GROUND: Brown slightly gravelly slightly clayey SAND. Sand is fine to coarse. Gravel is subangular to subrounded of sandstone.		0.20	+5.76
2 MADE GROUND: Light grey, grey to light brown slightly sandy GRAVEL. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse.		0.30	+5.66
EXPLORATORY HOLE ENDS AT 0.30 m			

None observed (see Key Sheet)

Good

None

Fine

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

(c) ESG www.esg.co.uk
426.4817/12/2014 13:36:14

Trial Pit

SA IC	08/09/2014 08/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 2.20 m 170 (Deg)	+5.29 mOD E 347364.79 N 376713.43

			Level	
		1 MADE GROUND: Brown gravelly slightly silty SAND. Sand is fine to coarse. Gravel is subangular to subrounded fine and medium of coal, limestone and sandstone.	0.05 +5.24	
		2 Brown gravelly slightly silty SAND with cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, coal and brick. Cobbles are subangular of sandstone, coal and brick.	0.30 +4.99	
		EXPLORATORY HOLE ENDS AT 0.30 m		

None observed (see Key Sheet)

Good

None

Fine, slightly

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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426.4817/12/2014 13:36:15

Trial Pit

SA IC	08/09/2014 08/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 3.80 m 012 (Deg)	+5.56 mOD E 347746.79 N 376869.48

			Level
		1 MADE GROUND: Brown slightly clayey fine and medium SAND.	
		2 MADE GROUND: Brown slightly gravelly slightly clayey fine and medium SAND. Gravel is subangular to subrounded fine to coarse of brick and coal.	0.25 *+5.31* 0.30 *+5.26*
		EXPLORATORY HOLE ENDS AT 0.30 m	

None observed (see Key Sheet)

Good

None

Fine, cloudy

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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426.4817/12/2014 13:36:16

Trial Pit

SA IC	08/09/2014 08/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 3.00 m 130 (Deg)	+4.66 mOD E 348109.81 N 376758.22

	Level	
1 Brown silty fine SAND.		
2 Brown mottled orange and light brown silty fine and medium SAND.	0.15 *+4.51*	
EXPLORATORY HOLE ENDS AT 0.30 m	0.30 *+4.36*	

None observed (see Key Sheet)

Good

None

Fine, cloudy

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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426.4817/12/2014 13:36:17

Trial Pit

SA IC	08/09/2014 08/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 2.80 m 090 (Deg)	+4.99 mOD E 348438.70 N 376910.65

	Level
1 Brown silty fine and medium SAND.	(0.30)
EXPLORATORY HOLE ENDS AT 0.30 m	0.30 *+4.69*

None observed (see Key Sheet)

Good

None

Fine, slightly

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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426.4817/12/2014 13:36:19

Trial Pit

SA IC	08/09/2014 08/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 3.30 m 116 (Deg)	+4.44 mOD E 348743.48 N 377139.60

			Level
		1 Brown slightly clayey fine and medium SAND. (TOPSOIL).	0.10 +4.34
		2 Soft to firm friable brown mottled orange slightly sandy CLAY. Sand is fine.	0.30 +4.14
		EXPLORATORY HOLE ENDS AT 0.30 m	

None observed (see Key Sheet)

Good

None

Fine, slightly

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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426.4817/12/2014 13:36:20

Trial Pit

SA IC	09/09/2014 09/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 3.30 m 108 (Deg)	+11.63 mOD E 348600.77 N 377603.49

		Level	
1 MADE GROUND: Brown silty fine SAND. (TOPSOIL).	0.08	*+11.55*	
2 MADE GROUND: Brown fine and medium SAND.	0.20	*+11.43*	
3 Brown clayey SILT.	0.30	*+11.33*	
EXPLORATORY HOLE ENDS AT 0.30 m			

None observed (see Key Sheet)

Good

None

Fine, slightly cloudy

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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426.4817/12/2014 13:36:21

Trial Pit

SA IC	09/09/2014 09/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 2.70 m 105 (Deg)	+11.39 mOD E 348424.88 N 377508.24

		Level	
1 MADE GROUND: Brownish black clayey SILT. (TOPSOIL).	0.08	+11.31	
2 MADE GROUND: Brown fine and medium SAND.	0.20	+11.19	
3 Brown clayey SILT.	0.30	+11.09	
EXPLORATORY HOLE ENDS AT 0.30 m			

None observed (see Key Sheet)

Good

None

Hot, cloudy

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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426.4817/12/2014 13:36:23

Trial Pit

SA IC	09/09/2014 09/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 2.80 m 100 (Deg)	+11.05 mOD E 348260.87 N 377395.24

				Level		
			1 MADE GROUND: Brown clayey SILT. (TOPSOIL).	0.10	*+10.95*	
			2 MADE GROUND: Brown mottled orange slightly sandy clayey SILT.	0.30	*+10.75*	
			EXPLORATORY HOLE ENDS AT 0.30 m			

None observed (see Key Sheet)

Good

None

Fine

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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426.4817/12/2014 13:36:25

Trial Pit

SA IC	09/09/2014 09/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 2.90 m 106 (Deg)	+10.83 mOD E 348102.09 N 377273.33

			Level
		1 MADE GROUND: Dark brown clayey SILT. (TOPSOIL).	0.05 +10.78
		2 MADE GROUND: Dark brown slightly sandy clayey SILT with root material. Sand is fine.	
		EXPLORATORY HOLE ENDS AT 0.30 m	0.30 +10.53

None observed (see Key Sheet)

Good

None

Fine

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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426.4817/12/2014 13:36:27

Trial Pit

SA IC	09/09/2014 09/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 2.90 m 099 (Deg)	+10.76 mOD E 347942.01 N 377153.66

				Level	
			1 Dark brown clayey SILT with root material.	(0.30)	
			EXPLORATORY HOLE ENDS AT 0.30 m	0.30 *+10.46*	

None observed (see Key Sheet)

Good

None

Fine

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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Trial Pit

SA IC	09/09/2014 09/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 2.90 m 110 (Deg)	+10.55 mOD E 347777.48 N 377042.88

	Level
1 MADE GROUND: Brown clayey SILT.	(0.30)
EXPLORATORY HOLE ENDS AT 0.30 m	0.30 *+10.25*

None observed (see Key Sheet)

Good

None

Fine, hot

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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426.4817/12/2014 13:36:30

Trial Pit

SA IC	09/09/2014 09/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 2.80 m 187 (Deg)	+10.43 mOD E 347676.66 N 377160.20

	Level
1 MADE GROUND: Brown clayey SILT with root material.	(0.30)
EXPLORATORY HOLE ENDS AT 0.30 m	0.30 *+10.13*

None observed (see Key Sheet)

Good

None

Fine, sunny

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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426.4817/12/2014 13:36:31

Trial Pit

SA IC	09/09/2014 09/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 3.10 m 204 (Deg)	+10.49 mOD E 347559.78 N 377322.21

			Level
		1 MADE GROUND: Brown clayey SILT. (TOPSOIL).	
		2 MADE GROUND: Brown slightly sandy clayey SILT. Sand is fine.	0.15 +10.34
		EXPLORATORY HOLE ENDS AT 0.30 m	0.30 +10.19

None observed (see Key Sheet)

Good

None

Fine

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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Trial Pit

SA IC	09/09/2014 09/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 2.80 m 262 (Deg)	+10.60 mOD E 347478.80 N 377369.29

			Level
1 MADE GROUND: Dark brown clayey SILT. 0.10-0.30 m Mottled brown			(0.30) 0.30 +10.30
EXPLORATORY HOLE ENDS AT 0.30 m			

None observed (see Key Sheet)

Good

None

Fine, sunny

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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426.4817/12/2014 13:36:34

Trial Pit

SA IC	10/09/2014 10/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 2.70 m 176 (Deg)	+10.71 mOD E 347563.28 N 377496.31

			Level
1 Dark brown clayey SILT.		(0.30)	
EXPLORATORY HOLE ENDS AT 0.30 m		0.30 +10.41	

None observed (see Key Sheet)

Good

None

Clear, hot

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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426.4817/12/2014 13:36:35

Trial Pit

SA IC	10/09/2014 10/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 3.20 m 107 (Deg)	+10.88 mOD E 347732.18 N 377600.44

	Level
1 MADE GROUND: Brown clayey SILT.	(0.30)
EXPLORATORY HOLE ENDS AT 0.30 m	0.30 *+10.58*

None observed (see Key Sheet)

Good

None

Clear, hot.

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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426.4817/12/2014 13:36:36

Trial Pit

SA IC	10/09/2014 10/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 3.30 m 289 (Deg)	+11.27 mOD E 347903.18 N 377705.16

	Level
1 MADE GROUND: Brown slightly sandy clayey SILT. Sand is fine and medium.	(0.30)
EXPLORATORY HOLE ENDS AT 0.30 m	0.30 +10.97

None observed (see Key Sheet)

Good

None

Fine, hot

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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426.4817/12/2014 13:36:37

Trial Pit

SA IC	10/06/2014 10/06/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 3.50 m 279 (Deg)	+12.25 mOD E 348069.11 N 377815.86

	Level
1 MADE GROUND: Brown silty SAND with clay lenses.	(0.30)
EXPLORATORY HOLE ENDS AT 0.30 m	0.30 +11.95

None observed (see Key Sheet)

Good

None

Fine, hot

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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426.4817/12/2014 13:36:38

Trial Pit

SA IC	10/09/2014 10/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 3.10 m 293 (Deg)	+13.01 mOD E 348234.97 N 377928.00

			Level
		1 MADE GROUND: Brown fine and medium SAND.	0.05 +12.96
		2 MADE GROUND: Brown mottled orange silty SAND with lenses of clayey silt.	
		EXPLORATORY HOLE ENDS AT 0.30 m	0.30 +12.71

None observed (see Key Sheet)

Good

None

Fine, hot

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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426.4817/12/2014 13:36:40

Trial Pit

SA IC	10/09/2014 10/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 3.20 m 385 (Deg)	+13.28 mOD E 348466.14 N 377986.08

			Level	
		1 MADE GROUND: Brown light brown fine and medium SAND. (TOPSOIL).	0.05 *+13.23*	
		2 MADE GROUND: Brown mottled orange fine to coarse SAND with roots noted.	0.30 *+12.98*	
		EXPLORATORY HOLE ENDS AT 0.30 m		

None observed (see Key Sheet)

Good

None

Clear, hot

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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426.4817/12/2014 13:36:41

Trial Pit

SA IC	10/09/2014 10/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 2.70 m 134 (Deg)	+13.21 mOD E 348811.74 N 377716.12

		Level	
1 MADE GROUND: Brown mottled orange with red staining fine and medium SAND. 0.00-0.05 m Dark brown		(0.30)	
0.25 m Lenses of clayey silt.		0.30 +12.91	
EXPLORATORY HOLE ENDS AT 0.30 m			

None observed (see Key Sheet)		Good None Fine, hot

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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426.4817/12/2014 13:36:42

Trial Pit

SA IC	10/09/2014 10/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 3.00 m 022 (Deg)	+13.02 mOD E 348691.02 N 377867.13

			Level
1 Brown and light brown fine and medium SAND with clayey silt lenses.	0.00-0.05 m Dark brown		
EXPLORATORY HOLE ENDS AT 0.30 m		0.30	+12.72

None observed (see Key Sheet)

Good

None

Fine, hot

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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426.4817/12/2014 13:36:43

Trial Pit

SA IC	10/09/2014 10/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 2.70 m 102 (Deg)	+9.63 mOD E 348791.10 N 377982.82

	Level	
1 MADE GROUND: Brown silty SAND and GRAVEL with low cobble and boulder content. Sand is fine to coarse. Gravel is angular to subrounded of sandstone and limestone. Cobbles and boulders are subangular sandstone and limestone. (Road stone).		
0.25 m Geotextile fabric	0.25	+9.38
2 Brown fine to coarse SAND.	0.30	+9.33
EXPLORATORY HOLE ENDS AT 0.30 m		

None observed (see Key Sheet)

Good

None

Sunny

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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426.4817/12/2014 13:36:45

Trial Pit

SA IC	10/09/2014 10/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 2.72 m 235 (Deg)	+9.75 mOD E 348972.32 N 378115.54

			Level
		1 MADE GROUND: Light grey SAND and GRAVEL. Sand is fine to coarse. Gravel is subangular to subrounded of limestone.	
		2 Brown fine to coarse SAND.	0.25 +9.50
		EXPLORATORY HOLE ENDS AT 0.30 m	0.30 +9.45

None observed (see Key Sheet)

Good

None

Fine, hot

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

(c) ESG www.esg.co.uk
426.4817/12/2014 13:36:46

Trial Pit

SA IC	10/09/2014 10/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 3.00 m 236 (Deg)	+9.85 mOD E 349127.83 N 378216.02

		Level
1 MADE GROUND: Light grey to black SAND and GRAVEL. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of limestone and basalt.		
2 MADE GROUND: Brown fine to coarse SAND.	0.25	+9.60
0.30 m Geotextile fabric	0.30	+9.55
EXPLORATORY HOLE ENDS AT 0.30 m		

None observed (see Key Sheet)

Good

None

Fine, sunny

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

(c) ESG www.esg.co.uk
426.4817/12/2014 13:36:47

Trial Pit

SA IC	11/09/2014 11/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.20 m Length 3.20 m 279 (Deg)	+9.50 mOD E 349311.19 N 378289.59

			Level
1 MADE GROUND: Light grey SAND and GRAVEL. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of limestone and sandstone.		0.20	+9.30
2 MADE GROUND: Brown fine and medium SAND.		0.30	+9.20
EXPLORATORY HOLE ENDS AT 0.30 m			

None observed (see Key Sheet)

Good

None

Fine, hot

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

(c) ESG www.esg.co.uk
426.4817/12/2014 13:36:48

Trial Pit

SA IC	11/04/2014 11/04/2014	360 tracked excavator Cable percussion boring to 0.30m Plate load test undertaken at 0.30m	Width 1.20 m Length 3.30 m 250 (Deg)	+9.43 mOD E 349503.20 N 378340.59

		Level	
1 MADE GROUND: Light grey SAND and GRAVEL. Sand is fine to coarse. Gravel is subangular to subrounded of limestone and sandstone.			
2 MADE GROUND: Brown fine to coarse SAND.	0.25	+9.18	
EXPLORATORY HOLE ENDS AT 0.30 m	0.30	+9.13	

None observed (see Key Sheet)

Good

None

Fine

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

(c) ESG www.esg.co.uk
426.4817/12/2014 13:36:50

Trial Pit

SA IC	11/09/2014 11/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.20 m Length 2.30 m 304 (Deg)	+13.30 mOD E 349677.63 N 378289.21

	Level
1 MADE GROUND: Light grey SAND and GRAVEL. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone and limestone.	0.15 +13.15
2 MADE GROUND: Brown fine and medium SAND. 0.30 m Geotextile fabric.	0.30 +13.00
EXPLORATORY HOLE ENDS AT 0.30 m	

None observed (see Key Sheet)

Good

None

Sunny, hot

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

(c) ESG www.esg.co.uk
426.4817/12/2014 13:36:51

Trial Pit

SA IC	11/09/2014 11/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.20 m Length 3.40 m 338 (Deg)	+13.42 mOD E 349869.66 N 378257.12

		Level
1 MADE GROUND: Light grey gravelly SAND. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone and limestone.	0.15	*+13.27*
2 MADE GROUND: Brown fine and medium SAND.	0.30	*+13.12*
EXPLORATORY HOLE ENDS AT 0.30 m		

None observed (see Key Sheet)

Good

None

Hot, sunny

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

(c) ESG www.esg.co.uk
426.4817/12/2014 13:36:52

Trial Pit

SA IC	11/09/2014 11/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.20 m Length 3.00 m 384 (Deg)	+12.87 mOD E 350064.77 N 378224.68

	Level	
1 MADE GROUND: Light grey gravelly SAND. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone and limestone.	0.10 *+12.77*	
2 MADE GROUND: Brown fine to coarse SAND.	0.30 *+12.57*	
EXPLORATORY HOLE ENDS AT 0.30 m		

None observed (see Key Sheet)		Good None Hot, sunny

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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426.4817/12/2014 13:36:53

Trial Pit

SA IC	12/09/2014 12/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 3.20 m 042 (Deg)	+10.99 mOD E 350265.63 N 378213.71

	Level	
1 MADE GROUND: Brown slightly sandy SILT. (TOPSOIL).	0.05 *+10.94*	
2 MADE GROUND: Brown silty SAND.	0.20 *+10.79*	
3 Light brown mottled orange fine SAND with lenses of clayey silt.	0.30 *+10.69*	
EXPLORATORY HOLE ENDS AT 0.30 m		

None observed (see Key Sheet)

Good

None

Cloudy, chilly

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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Trial Pit

SA IC	12/09/2014 12/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 2.80 m Length 3.50 m 134 (Deg)	+10.76 mOD E 350464.86 N 378254.12

			Level
		1 MADE GROUND: Brown SILT. (TOPSOIL).	0.05 +10.71
		3 MADE GROUND: Brown mottled reddish orange slightly sandy clay SILT. Sand is fine.	
		EXPLORATORY HOLE ENDS AT 0.30 m	0.30 +10.46

None observed (see Key Sheet)

Good

None

Cloudy, cold

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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Trial Pit

SA IC	12/09/2014 12/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 2.80 m Length 4.00 m 146 (Deg)	+10.69 mOD E 350660.58 N 378286.88

		Level
1 MADE GROUND: Brown SILT. (TOPSOIL).	0.05	+10.64
2 MADE GROUND: Brown slightly sandy SILT.	0.30	+10.39
3 MADE GROUND: Brown mottled red silty SAND. Sand is fine and medium.	0.30	+10.39
EXPLORATORY HOLE ENDS AT 0.30 m		

None observed (see Key Sheet)

Good

None

Windy and cloudy

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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Trial Pit

SA IC	11/09/2014 11/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.20 m Length 3.60 m 068 (Deg)	+10.63 mOD E 350796.68 N 378356.07

	Level	
1 MADE GROUND: Brown slightly sandy SILT. (TOPSOIL).	0.05 *+10.58*	
2 MADE GROUND: Brown mottled orange clayey SILT with root material.		
EXPLORATORY HOLE ENDS AT 0.30 m	0.30 *+10.33*	

None observed (see Key Sheet)

Good

None

Sunny, overcast

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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Trial Pit

SA IC	11/09/2014 11/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.20 m Length 3.30 m 012 (Deg)	+10.73 mOD E 350725.62 N 378577.27

			Level
		1 MADE GROUND: Brown slightly sandy SILT. Sand is fine. (TOPSOIL).	0.05 +10.68
		2 MADE GROUND: Brown silty SAND. Sand is fine and medium.	0.30 +10.43
		EXPLORATORY HOLE ENDS AT 0.30 m	

None observed (see Key Sheet)

Good

None

Warm, cloudy

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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Trial Pit

SA IC	11/09/2014 11/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.20 m Length 3.30 m 308 (Deg)	+10.75 mOD E 350586.03 N 378676.95

		Level
1 MADE GROUND: Brown clayey SILT. (TOPSOIL).	0.05	+10.70
2 MADE GROUND: Brown silty fine and medium SAND.		
EXPLORATORY HOLE ENDS AT 0.30 m	0.30	+10.45

None observed (see Key Sheet)

Good

None

Sunny, hot

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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Trial Pit

SA IC	11/09/2014 11/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.20 m Length 3.50 m 348 (Deg)	+11.18 mOD E 350387.15 N 378682.23

			Level
1 MADE GROUND: Brown slightly sandy SILT. Sand is fine. (TOPSOIL).		0.10	*+11.08*
2 MADE GROUND: Brown to light brown mottled orange silty SAND with lenses of dark brown clayey silt.		0.30	*+10.88*
EXPLORATORY HOLE ENDS AT 0.30 m			

None observed (see Key Sheet)

Good

None

Dry, sunny

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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Trial Pit

SA IC	11/09/2014 11/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.20 m Length 3.26 m 317 (Deg)	+11.43 mOD E 350187.77 N 378690.53

	Level	
1 MADE GROUND: Brown slightly sandy SILT. (TOPSOIL).	0.05 *+11.38*	
2 MADE GROUND: Brown silty SAND. Sand is fine and medium.		
EXPLORATORY HOLE ENDS AT 0.30 m	0.30 *+11.13*	

None observed (see Key Sheet)

Good

None

Hot, sunny

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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Trial Pit

SA IC	12/09/2014 12/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 4.00 m 089 (Deg)	+11.20 mOD E 350137.67 N 379029.39

	Level
1 MADE GROUND: Brown slightly sandy SILT. Sand is fine.	(0.30)
2 MADE GROUND: Brown fine and medium SAND.	0.30 *+10.90*
EXPLORATORY HOLE ENDS AT 0.30 m	0.30 *+10.90*

None observed (see Key Sheet)

Good

None

Cloudy, warm

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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Trial Pit

SA IC	12/09/2014 12/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 1.46 m 350 (Deg)	+10.79 mOD E 350304.07 N 378135.11

	Level
1 MADE GROUND: Brown slightly sandy SILT.	(0.30)
2 MADE GROUND: Light brown mottled orange fine and medium SAND.	0.30 *+10.49*
EXPLORATORY HOLE ENDS AT 0.30 m	0.30 *+10.49*

None observed (see Key Sheet)

Good

None

Cloudy, warm

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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Trial Pit

SA IC	12/09/2014 12/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 3.90 m 187 (Deg)	+10.58 mOD E 350450.48 N 379273.42

			Level
MADE GROUND: Brown to light brown slightly sandy SILT. Sand is fine.		(0.30)	
EXPLORATORY HOLE ENDS AT 0.30 m	0.30	*+10.28*	

None observed (see Key Sheet)

Good

None

Cloudy

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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Trial Pit

SA IC	12/09/2014 12/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 4.20 m 057 (Deg)	+11.68 mOD E 350228.70 N 379316.06

			Level
		1 MADE GROUND: Brown slightly sandy SILT. Sand is fine.	(0.30)
		2 MADE GROUND: Light brown fine and medium SAND	0.30 *+11.38*
		EXPLORATORY HOLE ENDS AT 0.30 m	0.30 *+11.38*

None observed (see Key Sheet)

Good

None

Cloudy, warm

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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Trial Pit

SA IC	12/09/2014 12/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 3.00 m 255 (Deg)	+11.94 mOD E 350103.83 N 379470.82

	Level	Depth
1 MADE GROUND: Brown slightly sandy SILT.	(0.30)	
2 MADE GROUND: Light brown fine and medium SAND.	0.30 *+11.64*	0.30 m MADE GROUND: Light brown fine and medium SAND.
EXPLORATORY HOLE ENDS AT 0.30 m	0.30 *+11.64*	

None observed (see Key Sheet)

Good

None

Cloudy

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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Trial Pit

SA IC	08/09/2014 08/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 2.00 m 174 (Deg)	+6.21 mOD E 346069.56 N 377365.22

			Level
		1 MADE GROUND: Brown gravelly slightly clayey fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of limestone, sandstone and coal.	0.15 +6.06
		2 MADE GROUND: Greyish brown sandy slightly clayey GRAVEL. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, limestone, flint, coal and marble.	0.30 +5.91
		EXPLORATORY HOLE ENDS AT 0.30 m	

None observed (see Key Sheet)		Stable Good Fine, cloudy

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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Trial Pit

SA IC	08/09/2014 08/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 2.80 m Length 2.40 m 078 (Deg)	+7.59 mOD E 346122.34 N 377359.08

		Level
1 MADE GROUND: Brown slightly sandy slightly gravelly CLAY. Sand is fine. (TOPSOIL).	0.15	+7.44
2 MADE GROUND: Brownish grey slightly sandy angular to rounded GRAVEL of sandstone, flint, limestone, coal and brick.	0.30	+7.29
EXPLORATORY HOLE ENDS AT 0.30 m		

None observed (see Key Sheet)

Stable

None

Fine, cloudy

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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Trial Pit

SA IC	08/09/2014 08/09/2014	360 tracked excavator Machine excavated trial pit to 0.30m Plate load test undertaken at 0.30m	Width 1.80 m Length 2.30 m 130 (Deg)	+7.66 mOD E 346171.42 N 377366.52

			Level
1 MADE GROUND: Friable brown slightly sandy CLAY. Sand is fine. (TOPSOIL).			
		0.20	+7.46
2 MADE GROUND: Brown slightly sandy clayey angular to rounded GRAVEL of sandstone, flint, coal, concrete and brick. Sand is fine to coarse		0.30	+7.36
EXPLORATORY HOLE ENDS AT 0.30 m			

None observed (see Key Sheet)

Stable

None

Fine, cloudy

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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Trial Pit

KGB IC	30/09/2014 30/09/2014	Hand dug trial pit to 0.90m Thermal resistivity test at 0.90m	Width 0.50 m Length 0.50 m 360 (Deg)	+4.93 mOD E 346651.16 N 376488.70

			Level
1 MADE GROUND: Firm dark brown sandy CLAY with roots and rootlets. (TOPSOIL).	0.10	*+4.83*	
2 MADE GROUND: Soft to firm dark brown and light greyish orange sandy gravelly CLAY with occasional pockets of light grey silty clay. Gravel is angular to subangular fine to coarse of various lithologies including brick, mudstone, tarmac, limestone and slag.	(0.80)		
EXPLORATORY HOLE ENDS AT 0.90 m	0.90	*+4.03*	

None observed (see Key Sheet)

Good

None

Sunny

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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426.4819/12/2014 11:34:53

Trial Pit

KGB IC	30/09/2014 30/09/2014	Hand dug trial pit to 0.90m Thermal resistivity test at 0.90m	Width 0.50 m Length 0.50 m 360 (Deg)	+6.00 mOD E 347562.09 N 376781.95

			Level
		1 MADE GROUND: Soft to firm light brown gravelly sandy CLAY. Gravel is angular to subangular fine to coarse of brick, limestone and concrete.	(0.30)
		2 MADE GROUND: Black and brown slightly gravelly SAND with low cobble content. Gravel is angular to subangular fine to coarse of various lithologies including concrete, slag and limestone. Cobbles are angular of concrete.	0.30 +5.70 (0.60)
		EXPLORATORY HOLE ENDS AT 0.90 m	0.90 +5.10

None observed (see Key Sheet)

Good

None

Sunny

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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426.4819/12/2014 11:34:55

Trial Pit

KGB IC	30/09/2014 30/09/2014	Hand dug trial pit to 0.90m Thermal resistivity test at 0.90m	Width 0.50 m Length 0.50 m 360 (Deg)	+11.47 mOD E 347934.96 N 377724.03

			Level
1 MADE GROUND: Firm light grey and brown slightly sandy CLAY with roots and rootlets. (TOPSOIL).	0.10	+11.37	
2 Firm Light brown very sandy CLAY with roots.	(0.40)		
3 Dark grey and black sandy clayey SILT.	0.50	+10.97	
	(0.40)		
EXPLORATORY HOLE ENDS AT 0.90 m	0.90	+10.57	

None observed (see Key Sheet)

Good

None

Sunny

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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Trial Pit

KGB IC	30/09/2014 30/09/2014	Hand dug trial pit to 0.90m Thermal resistivity test at 0.90m	Width 0.50 m Length 0.50 m 360 (Deg)	+10.95 mOD E 348231.25 N 377373.14

		Level
1 MADE GROUND: Soft to firm orangish brown slightly sandy silty CLAY with roots and rootlets. (TOPSOIL).	0.10	+10.85
2 MADE GROUND: Soft brown and light brown sandy CLAY with occasional rootlets.	(0.30)	
3 MADE GROUND:Black mottled brown sandy clayey SILT with a very strong hydrocarbon odour and occasional rootlets.	0.40	+10.55
	(0.50)	
EXPLORATORY HOLE ENDS AT 0.90 m	0.90	+10.05

None observed (see Key Sheet)

Good

None

Sunny

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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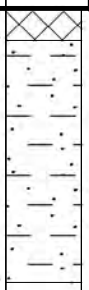
Trial Pit

KGB IC	30/09/2014 30/09/2014	Hand dug trial pit to 0.90m Thermal resistivity test at 0.90m	Width 0.50 m Length 0.50 m 360 (Deg)	+4.68 mOD E 348533.67 N 377030.69

		Level
1 MADE GROUND: Firm grey and orange sandy CLAY with roots and rootlets. (TOPSOIL).	0.10	+4.58
2 Soft light grey mottled orange slightly sandy CLAY with roots.	(0.80)	
EXPLORATORY HOLE ENDS AT 0.90 m	0.90	+3.78



None observed (see Key Sheet)

Good

None

Sunny

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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Trial Pit

KGB IC	30/09/2014 30/09/2014	Hand dug trial pit to 0.90m Thermal resistivity test at 0.90m	Width 0.50 m Length 0.50 m 360 (Deg)	+10.75 mOD E 350673.68 N 378286.64

			Level
1 MADE GROUND: Firm light greyish brown slightly sandy CLAY with roots and rootlets. (TOPSOIL).		0.10	+10.65
2 MADE GROUND: Soft light grey mottled orange sandy CLAY with roots.	(0.30)		
3 MADE GROUND: Dark grey and black slightly sandy clayey SILT with rare rootlets. Hydrocarbon odour.		0.40	+10.35
	(0.50)		
EXPLORATORY HOLE ENDS AT 0.90 m		0.90	+9.85

None observed (see Key Sheet)

Good

None

Part cloudy

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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426.4819/12/2014 11:35:00

Trial Pit

KGB IC	30/09/2014 30/09/2014	Hand dug trial pit to 0.90m Thermal resistivity test at 0.90m	Width 0.50 m Length 0.50 m 360 (Deg)	+11.06 mOD E 350089.11 N 379005.97

			Level
		1 MADE GROUND: Firm greyish brown sandy CLAY with roots and rootlets. (TOPSOIL).	(0.30)
		2 MADE GROUND: Dark greyish black sandy clayey SILT with occasional rootlets. Slight hydrocarbon odour.	0.30 +10.76 (0.60)
		EXPLORATORY HOLE ENDS AT 0.90 m	0.90 +10.16

None observed (see Key Sheet)

Good

None

Part cloudy

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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426.4819/12/2014 11:35:01

Trial Pit

MOR SA IC	15/09/2014 15/09/2014	Dando Terrier Dynamic sampling to 5.45m. SPT Hammer ID: PBWS1	0.00m 1.00m 87mm 1.00m 3.00m 77mm 3.00m 4.00m 67mm 4.00m 5.00m 57mm		+4.50 mOD E 346604.16 N 376524.24

					Level	
0.00-0.20	D 1			Soft brown to dark brown slightly sandy slightly gravelly CLAY. Sand is fine and medium. Gravel is angular fine and medium of coal.	0.20 +4.30	
0.20-1.00	B 2			Very soft brown mottled orange slightly sandy CLAY. Sand is fine.		
1.00-1.45	SPT S	N=0 (0,0/-,-,-,-)	dry	1.00-1.20 m Band of brown fine to coarse sand.	(2.25)	
1.00-1.45	D 3					
1.00-2.00	B 4					
2.00-2.45	SPT S	N=0 (0,0/-,-,-,-)	dry			
2.00-2.45	D 5					
2.00-2.45	B 6					
2.45-3.00	B 7			Black pseudo fibrous PEAT with root material. 2.50-2.80 m Soft to firm grey to light brown slightly sandy clay. Sand is fine to coarse.	2.45 +2.05	
3.00-3.45	SPT S	N=0 (0,0/-,-,-,-)	dry			
3.00-3.45	D 8					
3.45-4.00	B 9				(2.35)	
4.00-4.45	SPT S	N=0 (0,0/-,-,-,-)	dry			
4.00-4.45	D 10					
4.00-4.80	B 11					
4.80-5.00	D 12			Very soft grey silty CLAY.	4.80 -0.30	
5.00-5.45	SPT S	N=0 (0,0/-,-,-,-)	dry		(0.65)	
5.00-5.45	D 13					
				EXPLORATORY HOLE ENDS AT 5.45 m	5.45 -0.95	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:27:51

MOR SA IC	15/09/2014 15/09/2014	Dando Terrier Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1.		0.00m 1.00m 87mm 1.00m 2.00m 77mm	+4.04 mOD E 346655.95 N 376420.98

					Level	
0.00-0.20 0.20-1.00	D 1 B 2			MADE GROUND: Soft brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine and medium of brick. (TOPSOIL).	0.20 +3.84	
1.00-1.45 1.00-1.45 1.00-1.10 1.10-2.00	SPT S D 3 D 4 B 5	N=1 (0,0/0,0,1,0)	dry	Soft brown mottled light brown and grey silty CLAY. (Possible MADE GROUND).	(0.90) 1.10 +2.94	
				Brown pseudo fibrous PEAT.		
2.00-2.45 2.00-2.45	SPT S D 6	N=0 (0,0/-,-,-,-)	dry	1.80 m Predominantly root material.	(1.35)	
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 +1.59	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:27:53

MOR SA IC	15/09/2014 15/09/2014	Dando Terrier Hand dug inspection pit to 1.00m. Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1.		1.00m 2.00m 87mm	+8.48 mOD E 346750.58 N 376516.91

					Level	
0.00-1.00	B 1			MADE GROUND: Very soft to soft slightly sandy slightly gravelly CLAY. Sand is fine to coarse, becoming fine and medium. Gravel is subangular to subrounded of sandstone and brick. Cobbles are rounded of brick.		
1.00-1.45 1.00-1.45 1.00-2.00	SPT S D 2 B 3	N=8 (1,2/2,2,2,2)	dry	1.00-2.45 m Sand becomes fine and medium, gravel content decreases.	(2.45)	
2.00-2.45 2.00-2.45	SPT S D 4	N=0 (0,0/-,-,-,-)	dry			
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 +6.03	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:27:54

MOR SA IC	15/09/2014 15/09/2014	Dando Terrier Hand dug inspection pit to 1.00m. Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1.	0.00m 2.00m 87mm	+4.92 mOD E 346828.96 N 376529.46

						Level
0.00-1.00	B 1			MADE GROUND: Brown slightly gravelly clayey fine to coarse SAND. Gravel is angular to subangular of brick and sandstone.		(0.80)
0.80-2.00	B 3					0.80 +4.12
1.00-1.45 1.00-1.45	SPT S D 2	N=3 (0,0/0,0,1,2)	dry	Very soft grey, locally mottled brown and black slightly sandy silty CLAY. Sand is fine and medium, becoming fine to coarse. (Possible MADE GROUND).	1.20 m Mottled brown and black. 1.50-2.45 m Includes coarse sand.	(1.65)
2.00-2.45 2.00-2.45	SPT S D 4	N=0 (0,0/-,-,-,-)	dry			
				EXPLORATORY HOLE ENDS AT 2.45 m		2.45 +2.47

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:27:56

MOA SA IC	05/09/2014 05/09/2014	Dando terrier Hand dug inspection pit to 1.00m. Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1	0.00m 1.00m 87mm 1.00m 2.00m 77mm		+5.08 mOD E 347085.21 N 376612.42

					Level	
0.05-0.10 0.10-1.20	D 1 B 2			MADE GROUND: Soft brown slightly clayey fine SAND. (TOPSOIL).	0.10	+4.98
				MADE GROUND: Soft brown slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is subangular to subrounded of sandstone, mudstone, brick and coal.	(0.90)	
1.00-1.45 1.00-1.45 1.00-2.00	SPT S D 3 B 4	N=5 (2,1/1,1,1,2)	dry	Soft becoming very soft laminated brown mottled orange sandy CLAY. Sand is fine and medium.	1.00	+4.08
					(1.45)	
2.00-2.45 2.00-2.45	SPT S D 5	N=0 (0,0/-,-,-,-)	dry 05/09/2014			
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45	+2.63

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:27:57

MOR SA IC	15/09/2014 15/09/2014	Dando Terrier Hand dug inspection pit to 1.00m. Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1.	1.00m 2.00m 87mm 2.00m 2.45m 77mm		+4.85 mOD E 347269.48 N 376678.67

					Level	
0.00-1.00	B 1			MADE GROUND: Brown slightly gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of sandstone, brick.. 0.00-0.05 m Gravel includes mudstone		
1.00-1.45	SPT S	N=5 (2,1/1,2,1,1)	dry	1.00 m Loose	(1.60)	
1.00-1.45	D 2					
1.00-1.40	B 3					
1.40-2.00	B 4					
				MADE GROUND: Very soft brown to brownish grey slightly gravelly CLAY. Gravel is subangular to subrounded of sandstone and occasional brick. 1.80 m Stained black (possible organics).	1.60 +3.25	
2.00-2.45	SPT S	N=0 (0,0/-,-,-,-)	dry		(0.85)	
2.00-2.45	D 5					
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 +2.40	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:00

MOA SA IC	05/09/2014 05/09/2014	Dando Terrier Hand dug inspection pit to 1.00m. Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1		0.00m 1.00m 87mm 1.00m 2.00m 77mm	+5.84 mOD E 347459.39 N 376750.15

					Level	
0.05-0.15 0.15-0.85	D 1 B 2			MADE GROUND: Turf over soft brown slightly sandy friable CLAY. Sand is fine. (TOPSOIL).	0.15 +5.69	
				MADE GROUND: Firm brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone, brick, limestone and concrete.	(0.70)	
0.85-1.00	B 3				0.85 +4.99	
1.00-1.45 1.00-1.45	SPT S D 4	N=8 (1,2/2,2,2,2)	dry		1.05 +4.79	
				Soft to firm brown slightly sandy CLAY. Sand is fine and medium.	1.30 +4.54	
1.45-1.50 1.50-2.00	D 5 B 6					
				Brown slightly clayey fine and medium SAND.	(1.15)	
2.00-2.45 2.00-2.45	SPT S D 7	N=1 (1,1/0,0,0,1)	dry			
			05/09/2014	Loose to very loose laminated brown mottled black and grey fine and medium SAND.		
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 +3.39	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:28:01

MOA SA IC	05/09/2014 05/09/2014	Dando Terrier Hand dug inspection pit to 1.00m. Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1	0.00m 1.00m 87mm 1.00m 2.00m 77mm		+5.15 mOD E 347825.15 N 376841.89

					Level	
0.05-0.10 0.10-0.30 0.30-1.00	D 1 D 2 B 3			MADE GROUND: Soft brown mottled orange slightly sandy silty CLAY. Sand is fine. 0.00-0.10 m Brown	(0.30) 0.30 +4.85	
				MADE GROUND: light brown mottled orange silty, becoming clayey, fine SAND. 0.80 m Becoming clayey	(0.80)	
1.00-1.45 1.00-1.45 1.00-1.70 1.10-2.00	SPT S D 4 D 5 B 6	N=1 (0,0/0,0,0,1)	dry	1.00 m Mottled brown MADE GROUND: Very soft grey mottled orange and black slightly sandy CLAY. Sand is fine.	1.10 +4.05	
2.00-2.45 2.00-2.45	SPT S D 7	N=0 (0,0/-,-,-,-)	dry 05/09/2014		(1.35)	
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 +2.70	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:03

MOA SA IC	05/09/2014 05/09/2014	Dando Terrier Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1	0.00m 1.00m 87mm 1.00m 2.00m 77mm		+4.71 mOD E 348012.48 N 376774.45

					Level	
0.05-0.10 0.10-0.30 0.30-1.00	D 1 D 2 B 3			Soft brown slightly sandy silty CLAY. Sand is fine. (TOPSOIL)	(0.80)	
1.00-1.45 1.00-1.45 1.00-1.80	SPT S D 4 B 5	N=3 (0,0/0,1,1,1)	dry	Soft thickly laminated brown slightly sandy silty CLAY. Sand is fine.	0.80 +3.91 1.00 +3.71	
				Soft grey mottled orange and black slightly sandy silty CLAY. Sand is fine.	(0.80)	
1.80-2.00	D 6				1.80 +2.91	
2.00-2.45 2.00-2.45	SPT S D 7	N=0 (0,0/-,-,-,-)	dry	Black fibrous PEAT. Very strong sulphur odour.	(0.65)	
			05/09/2014			
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 +2.26	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:28:04

MOA SA IC	05/09/2014 05/09/2014	Dando Terrier Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1		0.00m 1.00m 87mm 1.00m 2.00m 77mm	+4.99 mOD E 348210.11 N 376743.93

					Level	
0.05-0.10 0.10-0.25 0.30-1.00	D 1 D 2 B 3			Soft to firm brown slightly sandy silty CLAY. Sand is fine. (TOPSOIL)	(0.30) 0.30 +4.69	
				Brown mottled orange clayey fine SAND.	(0.85)	
1.00-1.45 1.00-1.45 1.00-1.15 1.15-2.00	SPT S D 4 D 5 B 6	N=1 (1,0/0,1,0,0)	dry	Very soft brown slightly sandy silty CLAY. Sand is fine and medium.	1.15 +3.84	
2.00-2.45 2.00-2.45	SPT S D 7	N=0 (0,0/-,-,-,-)	dry 05/09/2014		(1.30)	
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 +2.54	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:06

MOA SA IC	05/09/2014 05/09/2014	Dando Terrier Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1	0.00m 1.00m 87mm 1.00m 2.00m 77mm		+4.77 mOD E 348376.14 N 376834.57

					Level	
0.05-0.10 0.10-0.30 0.30-1.00	D 1 B 2 B 3			Soft to firm brown slightly sandy silty CLAY. Sand is fine. (TOPSOIL)	(0.30) 0.30 +4.47	
				Brown clayey fine SAND.	(0.60)	
1.00-1.45 1.00-1.45 1.00-2.00	SPT S D 4 B 5	N=1 (0,0/0,0,0,1)	dry	Soft slightly sandy silty CLAY. Sand is fine.	0.90 +3.87	
					(1.55)	
2.00-2.45 2.00-2.45	SPT S D 6	N=0 (0,0/-,-,-,-)	dry 05/09/2014			
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 +2.32	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:08

MOA SA IC	05/09/2014 05/09/2014	Dando Terrier Dynamic sampling to 2.45m SPT Hammer ID: PBWS1	0.00m 1.00m 87mm 1.00m 2.00m 77mm		+4.56 mOD E 348501.24 N 376990.37

					Level	
0.05-0.10 0.10-0.30 0.30-1.00	D 1 B 2 B 3			Turf over soft brown slightly sandy silty CLAY. Sand is fine. (TOPSOIL).	0.10 +4.46 0.30 +4.26	
				Firm to stiff brown mottled orange slightly sandy silty CLAY. Sand is fine.	0.50 m Soft sandy clay lens.	
				Firm brown mottled orange slightly sandy silty CLAY. Sand is fine.	0.70-0.80 m Band of soft sandy clay.	(0.90)
1.00-1.45 1.00-1.45 1.00-1.20 1.20-2.00	SPT S D 4 D 5 B 6	N=8 (1,1/2,2,2,2)	dry	Very soft to soft grey mottled brown slightly sandy CLAY. Sand is fine to coarse.	1.20 +3.36	
2.00-2.45 2.00-2.45	SPT S D 7	N=2 (0,0/0,0,0,2)	dry 05/09/2014			(1.25)
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 +2.11	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:09

MOA SA IC	05/09/2014 05/09/2014	Dando Terrier Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1	0.00m 1.00m 87mm 1.00m 2.00m 77mm		+4.52 mOD E 348650.53 N 377122.11

					Level	
0.05-0.10 0.10-0.35	D 1 D 2			Firm to stiff friable laminated brown slightly sandy CLAY. Sand is fine.	(0.35)	
0.35-0.80	B 3			(TOPSOIL)	0.35 +4.17	
				Laminated brown mottled orange slightly clayey fine SAND.	(0.45)	
0.80-0.95	D 4				0.80 +3.72	
1.00-1.45 1.00-1.95	SPT S D 5	N=0 (0,0/-,-,-,-)	dry	Very soft laminated brown mottled grey CLAY. Sand is fine and medium.	(1.15)	
1.95 1.95-2.00 2.00-2.45 2.00-2.45	D 6 D 7 SPT S D 8	N=0 (0,0/-,-,-,-)	dry 05/09/2014	Black pseudo fibrous PEAT. Strong sulphur odour.	1.95 +2.57 (0.50)	
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 +2.07	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:10

MOR SA IC	29/08/2014 29/08/2014	Dando Terrier Dynamic sampling to 5.00m. SPT Hammer ID: PBWS1		0.00m 1.00m 87mm 1.00m 2.00m 77mm 2.00m 4.00m 67mm 4.00m 5.00m 57mm			+13.17 mOD E 348828.80 N 377617.73

					Level	
0.20-0.35	D 1			MADE GROUND: Soft dark grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone and mudstone.	0.25 +12.92	
1.00-1.45 1.00-1.45	SPT S D 2	N=15 (1,2/2,3,4,6)	dry	MADE GROUND: Brown fine to coarse SAND. 1.00-1.45 m Medium dense	(1.95)	
2.00-2.45 2.00-2.15 2.00-2.45	SPT S D 3 D 4	N=0 (1,0/-,-,-,-)	dry		2.20 +10.97	
				MADE GROUND: Very soft occasionally soft slightly sandy CLAY. Sand is probably fine to coarse.		
3.00-3.45 3.00	SPT S D 5	N=0 (0,0/-,-,-,-)	dry		(2.80)	
4.00-4.45 4.00 4.00-4.45	SPT S D 6 D 7	N=7 (0,0/2,3,1,1)	dry			
5.00-5.45	SPT S	N=1 (1,0/0,0,1,0)	2.20	EXPLORATORY HOLE ENDS AT 5.00 m	5.00 +8.17	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:12

MOA SA IC	15/09/2014 15/09/2014	Dando Terrier Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1	0.00m 1.00m 87mm 1.00m 2.00m 77mm		+11.54 mOD E 348513.21 N 377556.22

					Level	
0.00-0.25	D 1			MADE GROUND: Brown to dark brown clayey SILT. (TOPSOIL).	0.25 *+11.29*	
0.25-0.65	D 2			MADE GROUND: Brown mottled orange fine and medium SAND.	(0.40)	
0.65-1.00	B 3			MADE GROUND: Very soft brown slightly sandy CLAY. Sand is fine to coarse.	0.65 *+10.89*	
1.00-1.45	SPT S	N=0 (0,0/-,-,-,-)	dry	1.00 m Sand is predominantly coarse.	(1.80)	
1.00-1.45	D 4					
1.00-2.00	B 5					
2.00-2.45	SPT S	N=0 (0,0/-,-,-,-)	dry		2.45 *+9.09*	
2.00-2.45	D 6					
				EXPLORATORY HOLE ENDS AT 2.45 m		

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:13

PRELIMINARY

MOA SA	15/09/2014 15/09/2014	Dando Terrier Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1	0.00m 1.00m 87mm 1.00m 2.00m 77mm		+11.14 mOD E 348339.84 N 377456.33

					Level
0.00-1.00	B 1			MADE GROUND: Soft brown mottled black and light brown slightly sandy CLAY. Sand is fine to coarse. 0.00-0.25 m With rootlets 0.25 m Root material ceases.	(1.00)
1.00-1.45 1.00-1.45 1.00-2.00	SPT S D 2 B 3	N=0 (0,0/-,-,-,-)	dry	MADE GROUND: Very soft black slightly sandy silty CLAY with rootlets. Sand is fine to coarse. Strong hydrocarbon odour.	1.00 *+10.14* (1.45)
2.00-2.45 2.00-2.45	SPT S D 4	N=0 (0,0/-,-,-,-)	dry		
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 *+8.69*

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:15

MOA SA IC	15/09/2014 15/09/2014	Dando Terrier Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1		0.00m 1.00m 87mm 1.00m 2.00m 77mm	+10.90 mOD E 348181.20 N 377334.24

					Level
0.00-0.05 0.05-0.70	D 1 B 2			MADE GROUND: Brown mottled black clayey SILT. 0.00-0.05 m Brown	(0.70)
0.70-1.00	D 3			MADE GROUND: Very soft black slightly sandy silty CLAY. Sand is fine and medium.	0.70 +10.20
1.00-1.45 1.00-1.45 1.00-1.90	SPT S D 4 B 5	N=0 (0,0/-,-,-,-)	dry		(1.20)
1.90-2.00 2.00-2.45 2.00-2.45	D 6 SPT S D 7	N=0 (0,0/-,-,-,-)	1.00	MADE GROUND: Very soft brown slightly sandy CLAY. Sand is fine to coarse.	1.90 +9.00 (0.55)
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 +8.45

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:16

MOA SA IC	16/09/2014 16/09/2014	Dando Terrier Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1	0.00m 1.00m 87mm 1.00m 2.00m 77mm		+10.66 mOD E 348022.00 N 377213.00

					Level
0.00-1.00	B 1			MADE GROUND: Very soft brown slightly sandy silty CLAY. Sand is fine. 0.00-0.05 m Sandy	
1.00-1.45 1.00-1.45 1.00-2.00	SPT S D 2 B 3	N=0 (0,0/-,-,-,-)	dry		(2.20)
2.00-2.45 2.00-2.45	SPT S D 4	N=0 (0,0/-,-,-,-)	dry		
				MADE GROUND: Very soft black to dark grey mottled brown silty CLAY.	2.20 *+8.46*
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 *+8.21*

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:18

MOA SA IC	16/09/2014 16/09/2014	Dando Terrier Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1	0.00m 1.00m 87mm 1.00m 2.00m 77mm		+10.45 mOD E 347699.04 N 376992.69

					Level	
0.00-0.05 0.05-1.00	D 1 B 2			MADE GROUND: brown clayey SILT with root material. (TOPSOIL).	0.05 *+10.40*	
				MADE GROUND: Firm, becoming soft to very soft, brown silty CLAY. 0.60 m Becoming soft to very soft.	(1.05)	
1.00-1.45 1.00-1.45 1.00-2.00	SPT S D 3 B 4	N=0 (0,0/-,-,-,-)	dry	MADE GROUND: Very soft black silty CLAY.	1.10 *+9.35*	
					(1.35)	
2.00-2.45 2.00-2.45	SPT S D 5	N=0 (0,0/-,-,-,-)	dry	2.00-2.45 m Becoming peaty.		
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 *+8.00*	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:19

MOA SA IC	16/09/2014 16/09/2014	Dando Terrier Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1		0.00m 1.00m 87mm 1.00m 2.00m 77mm	+10.53 mOD E 347735.12 N 377079.32

					Level
0.00-1.00	B 1			MADE GROUND: Brown clayey SILT. 0.00-0.10 m With root material	(1.20)
1.00-1.45 1.00-1.45 1.00-1.90	SPT S D 2 B 3	N=0 (0,0/-,-,-,-)	dry		
				MADE GROUND: Black to grey clayey SILT. Hydrocarbon odour noted.	1.20 +9.33 (0.70)
1.90-2.00 2.00-2.45 2.00-2.45	D 4 SPT S D 5	N=0 (0,0/-,-,-,-)	0.90	MADE GROUND: Brown mottled black SILT.	1.90 +8.63 (0.55)
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 +8.08

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:28:21

MOA SA IC	16/09/2014 16/09/2014	Dando Terrier Dynamic sampling to 5.45m. SPT Hammer ID: PBWS1	0.00m 2.00m 87mm 2.00m 3.00m 77mm 3.00m 4.00m 67mm 4.00m 5.00m 57mm		+10.46 mOD E 347618.07 N 377241.32

					Level
0.00-0.05 0.05-1.00	D 1 B 2			MADE GROUND: Brown clayey SILT. 0.00-0.10 m Brownish grey	(0.70)
					0.70 +9.76
1.00-1.45 1.00-1.45 1.00-2.00	SPT S D 3 B 4	N=0 (0,0/-,-,-,-)	dry	MADE GROUND: Dark grey to black clayey SILT.	
2.00-2.45 2.00-2.45 2.00-3.00	SPT S D 5 B 6	N=0 (0,0/-,-,-,-)	dry		
3.00-3.45 3.00-3.45 3.00-4.00	SPT S D 7 B 8	N=0 (0,0/-,-,-,-)	dry		(4.75)
4.00-4.45 4.00-5.00 4.00-4.45	SPT S B 10 D 9	N=0 (0,0/-,-,-,-)	dry		
5.00-5.45 5.00-5.45	SPT S D 11	N=0 (0,0/-,-,-,-)	dry		
				EXPLORATORY HOLE ENDS AT 5.45 m	5.45 +5.01

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:23

MOA SA IC	16/09/2014 16/09/2014	Dando Terrier Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1	0.00m 1.00m 87mm 1.00m 2.00m 77mm		+10.66 mOD E 347512.78 N 377408.17

					Level	
0.00-0.05 0.05-0.60	D 1 B 2			MADE GROUND: Brown clayey SILT.		
0.60-1.00	B 3			0.60 m Becoming firm to soft.	(0.80)	
1.00-1.45 1.00-1.45 1.00-1.50	SPT S D 4 B 5	N=0 (0,0/-,-,-,-)	dry	MADE GROUND: black to dark grey clayey SILT. Strong hydrocarbon odour noted.	0.80 +9.86 (0.70)	
1.50-2.00	D 6			MADE GROUND: brown clayey SILT.	1.50 +9.16	
2.00-2.45 2.00-2.45	SPT S D 7	N=0 (0,0/-,-,-,-)	1.80		(0.95)	
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 +8.21	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk
426.4817/12/2014 13:28:24

MOA SA IC	16/09/2014 16/09/2014	Dando Terrier Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1	0.00m 1.00m 87mm 1.00m 2.00m 77mm		+11.85 mOD E 347986.34 N 377759.76

					Level	
0.00-0.10 0.10-0.62	D 1 B 2			MADE GROUND: brown slightly sandy SILT with root material. Sand is fine. (TOPSOIL).	0.10 *+11.75*	
				0.20-0.45 m Lenses of soft to firm brown mottled orange clayey silt.	(0.52)	
0.62-1.00	D 3			MADE GROUND: Brown fine and medium SAND.	0.62 *+11.23*	
1.00-1.45 1.00-1.45 1.00-2.00	SPT S D 4 D 5	N=0 (0,0/-,-,-,-)	dry	MADE GROUND: Very loose black to grey silty fine to coarse SAND.	(1.83)	
2.00-2.45 2.00-2.45	SPT S D 6	N=0 (0,0/-,-,-,-)	dry			
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 *+9.40*	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:26

MOA SA IC	16/09/2014 16/09/2014	Dando Terrier Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1	0.00m 1.00m 57mm 1.00m 2.00m 77mm		+12.56 mOD E 348151.98 N 377871.73

					Level	
0.00-0.05 0.05-0.60	D 1 B 2			MADE GROUND: Dark brown slightly sandy SILT. Sand is fine. (TOPSOIL).	0.05 *+12.51*	
					(0.55)	
0.60-1.00	B 3			MADE GROUND: Brown silty fine to coarse SAND.	0.60 *+11.96*	
1.00-1.45 1.00-1.45 1.00-2.00	SPT S D 4 B 5	N=0 (0,0/-,-,-,-)	dry	MADE GROUND: Very loose grey silty fine to coarse SAND.		
					(1.85)	
2.00-2.45 2.00-2.45	SPT S D 6	N=0 (0,0/-,-,-,-)	dry			
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 *+10.11*	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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MOA SA IC	16/09/2014 16/09/2014	Dando Terrier Dynamic sampling to 5.45m. SPT Hammer ID: PBWS1	0.00m 2.00m 87mm 1.00m 3.00m 77mm 3.00m 4.00m 67mm 4.00m 5.00m 57mm

+12.89 mOD
E 348590.25
N 377926.28

					Level	
0.00-0.10 0.10-0.75	D 1 B 2			MADE GROUND: Brown clayey SILT. (TOPSOIL).	0.10 +12.79	
				MADE GROUND: Brown fine to coarse SAND.	(0.65)	
0.75-1.00	D 3			MADE GROUND: Dark grey silty fine to coarse SAND. Slight hydrocarbon odour noted.	0.75 +12.14	
1.00-1.45 1.00-1.45 1.00-1.20 1.20-1.40 1.40-2.00	SPT S D 4 D 5 D 6 B 7	N=4 (1,1/1,0,0,3)	dry		(0.45) 1.20 +11.69 1.40 +11.49	
				MADE GROUND: Brown to black sandy SILT. Sand is fine to coarse.		
				MADE GROUND: Black to grey fine to coarse SAND.	(0.70)	
2.00-2.45 2.00-2.45 2.05-3.70 2.20-3.00	SPT S D 8 B 10 B 9	N=1 (1,2/1,0,0,0)	dry	2.00 m Hydrocarbon odour noted. MADE GROUND: Very loose brown to black clayey silty fine to coarse SAND. Hydrocarbon odour noted.	2.10 +10.79	
3.00-3.45	SPT S	N=0 (0,0/-,-,-,-)	dry			
3.70-4.00	B 11			3.70-4.00 m Band of silty sandy clay. Sand is fine and coarse.	(3.35)	
4.00-4.45 4.00-4.45 4.00-5.00	SPT S D 12 D 13	N=2 (0,0/0,0,0,2)	dry			
5.00-5.45 5.00-5.45	SPT S D 14	N=1 (0,0/0,0,0,1)	1.00			
				EXPLORATORY HOLE ENDS AT 5.45 m	5.45 +7.44	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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MOR SA IC	29/08/2014 29/08/2014	Dando Terrier Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1		0.00m 1.00m 87mm 1.00m 2.00m 77mm	+13.12 mOD E 348785.78 N 377796.52

					Level
0.20-0.35 0.30-0.45 0.30-1.00	D 1 D 2 B 3			MADE GROUND: Soft, becoming firm to stiff, grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded of sandstone.	
1.00-1.45 1.00-1.45	SPT S D 4	N=17 (2,3/4,4,5,4)	dry	0.90 m Geotextile membrane 1.00 m Becoming firm to stiff	(1.90)
1.45-2.00	B 5				
					1.90 *+11.22*
2.00-2.45 2.00-2.45 2.00-2.45	SPT S D 6 D 7	N=1 (0,0/0,0,0,1)	dry	MADE GROUND: Very soft very dark grey slightly sandy silty CLAY. Sand is fine. Hydrocarbon odour noted.	(0.55)
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 *+10.67*

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:30

MOR SA IC	29/08/2014 29/08/2014	Dando Terrier Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1		0.00m 1.00m 87mm 1.00m 2.00m 77mm		+11.44 mOD E 348696.84 N 377937.98

						Level
0.01-0.20 0.20-1.00	D 1 B 2			MADE GROUND: Soft to firm grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded of sandstone and mudstone.		0.20 *+11.24*
1.00-1.45 1.00-1.45 1.45-2.00	SPT S D 3 B 4	N=6 (0,0/0,2,2,2)	dry	MADE GROUND: Stiff, becoming soft to firm, brown, becoming dark grey, slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine and medium of sandstone and mudstone.	1.00-2.45 m Becomes soft to firm 1.50-2.45 m Dark grey	(2.25)
2.00-2.45 2.00-2.45	SPT S D 5	N=10 (2,3/2,3,2,3)	dry			2.45 *+8.99*
				EXPLORATORY HOLE ENDS AT 2.45 m		

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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MOR SA IC	29/08/2014 29/08/2014	Dando Terrier Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1	0.00m 1.00m 87mm 1.00m 2.00m 77mm		+9.68 mOD E 348881.93 N 378044.97

					Level	
0.05-0.10 0.10-0.20	D 1 D 2			MADE GROUND: Soft brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded of sandstone and mudstone. (TOPSOIL).	0.10 +9.58 0.20 +9.48	
					(0.60)	
0.80-1.00	D 3			MADE GROUND: Light grey SAND and GRAVEL. Sand is fine to coarse. Gravel is subangular to subrounded of limestone, sandstone and flint.	0.80 +8.88	
1.00-1.45 1.00-1.50 1.00-1.45	SPT S B 4 D 5	N=0 (0,0/-,-,-,-)	dry	1.00 m Becoming brown to black		
				MADE GROUND: Brown fine to coarse SAND.		
				MADE GROUND: Very soft brown to dark grey / black, locally sandy, silty CLAY. Strong hydrocarbon odour.	(1.65)	
2.00-2.45 2.00-2.45	SPT S D 6	N=0 (0,0/-,-,-,-)	dry	2.00 m Contains coarse sand		
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 +7.23	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:33

MOR SA IC	29/08/2014 29/08/2014	Dando Terrier Dynamic sampling to 2.45m SPT Hammer ID: PBWS1		0.00m 1.00m 87mm 1.00m 2.00m 77mm	+9.63 mOD E 349036.93 N 378168.13

					Level
0.05-0.10 0.10-0.20	D 1 D 2			MADE GROUND: Grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of mudstone, limestone and sandstone.	0.10 +9.53 (0.30)
0.40-1.00	B 3			0.40 m Geotextile fabric	0.40 +9.23
				MADE GROUND: Brown fine to coarse SAND.	(0.60)
1.00-1.45 1.00-1.45	SPT S D 4	N=0 (0,0/-,-,-,-)	dry	MADE GROUND: Soft brown slightly sandy silty CLAY. Sand is fine to coarse.	1.00 +8.63
1.50-2.00	B 5			Very soft brown mottled black silty sandy CLAY. Sand is fine to coarse. Strong hydrocarbon odour.	(1.45)
2.00-2.45	SPT S	N=0 (0,0/-,-,-,-)	dry		
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 +7.18

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:35

MOR SA IC	29/08/2014 29/08/2014	Dando Terrier Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1	0.00m 1.00m 87mm 1.00m 2.00m 77mm		+9.73 mOD E 349218.29 N 378251.96

					Level	
0.05-0.10 0.10-0.20 0.20-0.95	D 1 D 2 B 3			MADE GROUND: Slightly sandy CLAY. (TOPSOIL).	0.10 +9.63 0.20 +9.53	
				MADE GROUND: Light grey to black SAND and GRAVEL. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone, mudstone and limestone. 0.50 m Geotextile fabric	(0.80)	
1.00-1.45 1.00-2.00	SPT S B 4	N=0 (0,0/-,-,-,-)	dry	MADE GROUND: Brown fine to coarse SAND.	1.00 +8.73	
				MADE GROUND: Very soft brown and black silty CLAY. Strong hydrocarbon odour.	(1.00)	
2.00-2.45 2.00-2.45	SPT S D 5	N=0 (0,0/-,-,-,-)	dry	MADE GROUND: Very loose slightly gravelly fine to coarse SAND. Gravel is subangular to subrounded sandstone, mudstone and brick.	2.00 +7.73 (0.45) 2.45 +7.28	
				EXPLORATORY HOLE ENDS AT 2.45 m		

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:36

MOR SA IC	01/09/2014 01/09/2014	Dando Terrier Dynamic sampling to 2.00m. SPT Hammer ID: PBWS1	0.00m 1.00m 87mm 1.00m 2.00m 77mm		+9.66 mOD E 349408.91 N 378321.74

					Level	
0.05-0.10 0.10-0.20 0.20-1.00	D 1 B 2 B 3			MADE GROUND: Soft grey sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone and limestone.	0.10 +9.56 0.20 +9.46	
				MADE GROUND: Soft brown slightly sandy CLAY. Sand is fine to coarse.	(1.00)	
1.00-1.45 1.00-1.45	SPT S D 4	N=0 (0,0/-,-,-,-)	dry	MADE GROUND: Soft brown silty CLAY.		
				MADE GROUND: Very soft black silty CLAY. Strong hydrocarbon odour.	1.20 +8.46	
					(1.25)	
2.00-2.45 2.00-2.45	SPT S B 5	N=0 (0,1/-,-,-,-)	dry			
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 +7.21	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:37

MOR SA IC	01/09/2014 01/09/2014	Dando Terrier Dynamic sampling to 2.45m SPT Hammer ID: PBWS1		0.00m 1.00m 87mm 1.00m 2.00m 77mm	+13.68 mOD E 349767.35 N 378271.26

					Level	
0.10-0.15 0.15-2.00 0.20-1.00	D 1 D 2 B 3			MADE GROUND: Grey slightly sandy GRAVEL. Gravel is subangular to subrounded fine to coarse of limestone and sandstone.	0.20 +13.48	
1.00-1.45 1.00-1.45 1.20-2.00	SPT S D 4 B 5	N=6 (2,1/1,1,2,2)	dry	MADE GROUND: Soft brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded of sandstone, brick, slate and coal. 1.20 m Strong hydrocarbon odour	(2.25)	
2.00-2.45 2.00-2.45	SPT S D 6	N=7 (1,1/1,2,2,2)	dry			
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 +11.23	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:39

MOR SA IC	29/08/2014 29/08/2014	Dando Terrier Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1		0.00m 1.00m 87mm 1.00m 2.00m 77mm	+13.14 mOD E 349971.27 N 378240.43

					Level
0.05-0.10 0.10-0.30 0.30-0.80	D 1 D 2 B 3			MADE GROUND: Grey clayey SAND and GRAVEL. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of limestone, sandstone and mudstone.	0.20 *+12.94* 0.30 *+12.84* (0.50)
				MADE GROUND: Brown fine to coarse SAND.	0.80 *+12.34*
0.95-1.00 1.00-1.45 1.00-1.45	D 4 SPT S D 5	N=11 (2,2/3,3,2,3)	dry	MADE GROUND: Soft brown slightly sandy silty CLAY. Sand is fine.	0.95 *+12.19* 1.00 *+12.14*
1.50-2.00	B 6			MADE GROUND: Brown clayey slightly gravelly SAND. Sand is fine to coarse. Gravel is subangular to subrounded fine of sandstone, mudstone and brick. Hydrocarbon odour noted.	(1.45)
2.00-2.45	SPT S	N=12 (5,3/3,2,4,3)	dry		
				MADE GROUND: Grey brown slightly gravelly silty fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of sandstone, mudstone and brick.	2.45 *+10.69*
				MADE GROUND: Soft to firm brown slightly sandy silty CLAY with roots. Sand is fine.	
				EXPLORATORY HOLE ENDS AT 2.45 m	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:41

MOR SA IC	01/09/2014 01/09/2014	Dando terrier Dynamic sampling to 2.00m. SPT Hammer ID: PBWS1	0.00m 1.00m 87mm 1.00m 2.00m 77mm		+12.96 mOD E 350167.16 N 378206.94

					Level	
0.05-0.10 0.10-0.20 0.20-1.00	D 1 D 2 B 3			MADE GROUND: Grey slightly clayey subangular to subrounded fine to coarse GRAVEL of limestone and sandstone. 0.25 m Geotextile fabric.	0.20 +12.76 0.25 +12.71	
				MADE GROUND: Brown fine to coarse SAND.		
1.00-1.45 1.00-1.45 1.20-2.00	SPT S D 4 B 5	N=9 (2,3/2,2,2,3)	dry	MADE GROUND: Soft to firm brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, sandstone, mudstone and coal.	(2.20)	
2.00-2.45	SPT S	N=12 (3,2/3,3,3,3)	dry			
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 +10.51	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:42

MOR SA IC	01/09/2014 01/09/2014	Dando Terrier Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1	0.00m 1.00m 87mm 1.00m 2.00m 77mm		+10.85 mOD E 350364.33 N 378235.21

					Level
0.05-0.10 0.10-0.65	D 1 B 2			MADE GROUND: Soft to firm brown slightly sandy silty CLAY. Sand is fine.	
				0.50 m Becoming soft.	(0.65)
0.65-1.00	B 3			MADE GROUND: Very soft black slightly sandy silty CLAY. Sand is fine.	0.65 *+10.20*
1.00-1.45 1.00-1.45 1.20-2.00	SPT S D 4 B 5	N=0 (0,0/-,-,-,-)	dry		
				1.20 m Becoming very soft.	(1.80)
2.00-2.45 2.00-2.45	SPT S D 6	N=0 (0,0/-,-,-,-)	dry		
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 *+8.40*

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:44

MOR SA IC	01/09/2014 01/09/2014	Dando Terrier Dynamic sampling to 2.45m SPT Hammer ID: PBWS1	0.00m 1.00m 87mm 1.00m 2.00m 77mm		+10.88 mOD E 350561.87 N 378270.85

					Level
0.05-0.10 0.10	D 1 B 2			MADE GROUND: Soft brown slightly sandy silty CLAY. Sand is fine.	(0.65)
0.65	B 3			MADE GROUND: Very soft black to dark grey slightly sandy silty CLAY. Sand is fine, becoming fine to coarse.	0.65 *+10.23*
1.00-1.45	SPT S	N=0 (0,0/-,-,-,-)	dry		
1.20	D 5				
1.45	D 4				(1.80)
2.00-2.45 2.00-2.45	SPT S D 6	N=0 (0,0/-,-,-,-)	dry	2.00-2.45 m Sand is fine to coarse	
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 *+8.43*

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:45

MOR SA IC	01/09/2014 01/09/2014	Dando Terrier Dynamic sampling to 2.45m SPT Hammer ID: PBWS1	0.00m 1.00m 87mm 1.00m 2.00m 77mm		+10.61 mOD E 350757.96 N 378303.92

					Level
0.05-0.10 0.10-0.65	D 1 B 2			MADE GROUND: Soft brown, becoming mottled black, slightly sandy silty CLAY. Sand is fine.	(0.65)
				0.45 m Becomes mottled black	
0.65-1.00	B 3			MADE GROUND: Very soft black to dark grey slightly sandy silty CLAY. Sand is fine. Strong hydrocarbon odour.	0.65 +9.96
1.00-1.45	SPT S	N=0 (0,0/-,-,-,-)	dry		
1.20-2.00	D 4				(1.80)
2.00-2.45	SPT S	N=0 (0,0/-,-,-,-)	dry		
2.00-2.45	D 5				2.45 +8.16
				EXPLORATORY HOLE ENDS AT 2.45 m	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:47

MOR SA IC	03/09/2014 03/09/2014	Dando Terrier Dynamic sampling to 2.45m SPT Hammer ID: PBWS1	0.00m 1.00m 87mm 1.00m 2.00m 77mm		+10.62 mOD E 350757.34 N 378481.92

					Level	
0.05-0.10 0.10-1.00	D 1 B 2			MADE GROUND: Very soft brown mottled black slightly sandy silty CLAY. Sand is fine.	0.00-0.10 m Brown 0.60-2.45 m Strong hydrocarbon odour	
1.00-1.45 1.00-1.45 1.00-2.00	SPT S D 3 B 4	N=0 (0,0/-,-,-,-)	dry		(2.45)	
2.00-2.45 2.00-2.45	SPT S D 5	N=0 (0,0/-,-,-,-)	dry			
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 *+8.17*	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:49

MOR SA IC	01/09/2014 01/09/2014	Dando Terrier Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1	0.00m 1.00m 87mm 1.00m 2.00m 77mm		+11.09 mOD E 350484.40 N 378679.56

					Level	
0.05-0.10 0.20-0.60	D 1 B 2			MADE GROUND: Soft brown slightly sandy silty CLAY. Sand is fine. 0.00-0.10 m Sand absent	(0.60)	
0.60-0.85	D 3			MADE GROUND: Very soft black to grey slightly sandy silty CLAY. Sand is fine. Strong hydrocarbon odour.	0.60 *+10.49*	
1.00-1.45 1.00-1.45 1.00-2.00	SPT S D 4 B 5	N=0 (0,0/-,-,-,-)	dry		(1.85)	
2.00-2.45 2.00-2.45	SPT S D 6	N=0 (0,0/-,-,-,-)	dry			
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 *+8.64*	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:50

MOR SA IC	01/09/2014 01/09/2014	Dando Terrier Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1		0.00m 1.00m 87mm 1.00m 2.00m 77mm		+11.20 mOD E 350287.63 N 378685.47

					Level
0.05-0.10 0.20-0.80	D 1 B 2			MADE GROUND: Soft brown slightly sandy silty CLAY. Sand is fine. Hydrocarbon odour noted.	(0.85)
				0.50 m Mottled black	
0.80-1.00	D 3			0.80 m Black staining	0.85 *+10.35*
1.00-1.45 1.00-1.45 1.20-2.00	SPT S D 4 B 5	N=0 (0,0/-,-,-,-)	dry	MADE GROUND: Very soft black to brown silty CLAY. Strong hydrocarbon odour.	(1.60)
2.00-2.45 2.00-2.45	SPT S D 6	N=0 (0,0/-,-,-,-)	dry		
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 *+8.75*

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:52

MOR SA IC	01/09/2014 01/09/2014	Dando Terrier Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1	0.00m 1.00m 87mm 1.00m 2.00m 77mm		+11.56 mOD E 350121.51 N 378760.03

					Level
0.10-0.15 0.20-1.00	D 1 B 2			MADE GROUND: Brown slightly gravelly SAND. Gravel is subangular to subrounded fine to coarse of limestone. (TOPSOIL).	0.10 *+11.46*
1.00-1.45 1.00-1.45 1.00-2.00	SPT S D 3 B 4	N=0 (0,0/-,-,-,-)	dry	MADE GROUND: Very soft brown slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine of sandstone.	(2.35)
2.00-2.45 2.00-2.45	SPT S D 5	N=0 (0,0/-,-,-,-)	dry		
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 *+9.11*

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:54

MOA SA IC	02/09/2014 02/09/2014	Dando Terrier Hand dug inspection pit to 1.00m. Dynamic sampling to 5.45m. SPT Hammer ID: PBWS1. Redrill of WS42.	0.00m 2.00m 87mm 2.00m 3.00m 77mm 3.00m 4.00m 67mm 4.00m 5.00m 57mm				+11.65 mOD E 350081.77 N 378953.73

						Level	
0.05-0.10 0.10-0.25 0.30-0.45	D 1 D 2 D 3			MADE GROUND: Soft brown slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine of sandstone and mudstone. (TOPSOIL).		0.05 +11.60 0.30 +11.35	
0.60-1.00	B 4					(0.30) 0.60 +11.05	
1.00-1.45 1.00-1.45 1.00-2.00	SPT S D 5 B 6	N=1 (1,0/0,0,1,0)	dry	MADE GROUND: Brown slightly clayey SAND and GRAVEL. Sand is fine to coarse and includes ash. Gravel is subangular to subrounded fine to coarse of brick, mudstone, sandstone and coal.		(0.50) 1.10 +10.55	
2.00-2.45 2.00-2.45 2.00	SPT S D 7 B 8	N=0 (0,0/-,-,-,-)	dry	MADE GROUND: Black clayey SAND and GRAVEL. Sand is fine to coarse and includes ash. Gravel is subangular to subrounded of sandstone and mudstone. MADE GROUND: Soft friable brown sandy silty CLAY. Sand is fine to coarse.		(1.90)	
3.00-3.45 3.00	SPT S D 9	N=1 (0,0/0,1,0,0)	dry	MADE GROUND: Very soft dark grey to black slightly sandy silty CLAY. Sand is fine. Strong hydrocarbon odour. MADE GROUND: Very soft to soft grey to greenish grey slightly sandy silty CLAY. Sand is fine.		3.00 +8.65	
3.50	D 10						
4.00-4.45 4.00-4.45	SPT S D 11	N=10 (2,2/2,2,2,4)	dry		4.10-5.45 m Hydrocarbon odour noted	(2.45)	
4.50	D 12						
5.00-5.45 5.00-5.45	SPT S D 13	N=8 (1,1/2,2,2,2)	2.80				
				EXPLORATORY HOLE ENDS AT 5.45 m		5.45 +6.20	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:56

MOR SA IC	02/09/2014 02/09/2014	Dando Terrier Hand dug inspection pit to 1.00m. Dynamic sampling to 2.45m. Hole to be extended to 5.45m. Redrill as WS42A. SPT Hammer ID: PBWS1	0.00m 2.00m 87mm		+11.65 mOD E 350081.77 N 378953.73

					Level
				MADE GROUND: TOPSOIL (Drillers description)	0.10 +11.55
				MADE GROUND: Brick, clay and ash fill (drillers description)	(0.90)
1.00-1.45	SPT S	N=1 (1,-/-,-,1,-)	dry	MADE GROUND: Very soft grey silty CLAY (Drillers description)	1.00 +10.65
2.00-2.45	SPT S	() SW=450	dry		(1.45)
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 +9.20

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:57

MOA SA IC	02/09/2014 02/09/2014	Dando Terrier Hand dug inspection pit to 1.00m. Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1	0.00m 1.00m 87mm 1.00m 2.00m 77mm		+10.81 mOD E 350376.37 N 379204.14

						Level	
0.05-0.10 0.10-0.35	D 1 D 2			MADE GROUND: Soft brown slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone.	0.00-0.10 m Gravel absent	(0.40)	
0.40	B 3					0.40 *+10.41*	
				MADE GROUND: Soft friable brown slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse.	0.90-2.00 m Hydrocarbon odour	(0.50)	
1.00-1.45 1.00-1.45 1.00	SPT S D 4 B 5	N=0 (0,0/-,-,-,-)	dry	MADE GROUND: Very soft slightly sandy silty CLAY. Sand is fine.		0.90 *+9.91*	
						(1.55)	
2.00-2.45 2.00-2.45	SPT S D 6	N=0 (0,0/-,-,-,-)	dry 02/09/2014				
				EXPLORATORY HOLE ENDS AT 2.45 m		2.45 *+8.36*	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:28:59

MOA SA IC	02/09/2014 02/09/2014	Dando Terrier Hand dug inspection pit to 1.00m. Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1	0.00m 1.00m 87mm 1.00m 2.00m 77mm		+11.01 mOD E 350298.52 N 379241.89

					Level	
0.10-0.25	D 1			MADE GROUND: Soft brown slightly sandy silty CLAY. Sand is fine.	(0.30)	
0.30-0.45	D 2				0.30 *+10.71*	
0.50-0.95	B 3			MADE GROUND: Brown fine to coarse SAND.	0.50 *+10.51*	
				MADE GROUND: Soft brown slightly sandy silty CLAY. Sand is fine.	(0.45)	
1.00-1.45	SPT S	N=0 (0,0/-,-,-,-)		MADE GROUND: Very soft brown mottled black slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse of sandstone. Locally with very strong hydrocarbon odour.	0.95 *+10.06*	
1.00-1.45	D 4			1.10 m Very strong hydrocarbon odour.		
1.00-2.00	B 5				(1.50)	
2.00-2.45	SPT S	N=0 (0,0/-,-,-,-)				
2.00-2.45	D 6					
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 *+8.56*	

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:29:02

MOA SA IC	02/09/2014 02/09/2014	Dando Terrier Hand dug inspection pit to 1.00m. Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1	0.00m 1.00m 87mm 1.00m 2.00m 77mm		+12.10 mOD E 350161.69 N 379390.50

					Level		
0.10-0.20 0.20-0.30 0.30-0.45	D 1 D 2 D 3			MADE GROUND: Soft friable brown slightly sandy silty CLAY. Sand is fine to coarse.	(0.30) 0.30 *+11.80*		
0.50	B 4			MADE GROUND: Brown slightly gravelly slightly clayey SAND. Gravel is subangular to subrounded fine to coarse of mudstone and sandstone.	0.50 *+11.60*		
1.00-1.45 1.00-1.45 1.00-2.00	SPT S D 5 B 6	N=0 (0,0/-,-,-,-)	dry	MADE GROUND: Soft friable brown slightly sandy silty CLAY.	(0.50) 1.00 *+11.10*		
2.00-2.45 2.00-2.45	SPT S D 7	N=0 (0,0/-,-,-,-)	dry	MADE GROUND: Very soft brown slightly sandy slightly gravelly silty CLAY. Sand is fine and medium. Gravel is of mudstone and sandstone.	(1.45)		
				EXPLORATORY HOLE ENDS AT 2.45 m 2.45 m Hydrocarbon odour	2.45 *+9.65*		

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:29:03

MOA SA IC	02/09/2014 02/09/2014	Dando Terrier Dynamic sampling to 2.45m. SPT Hammer ID: PBWS1		0.00m 1.00m 87mm 1.00m 2.00m 77mm	+11.33 mOD E 350160.28 N 379549.72

					Level
0.05 0.05-0.70	D 1 B 2			MADE GROUND: Soft friable brown slightly sandy CLAY. Sand is fine to coarse.	(0.70)
0.70-1.00	B 3			MADE GROUND: Soft brown slightly sandy silty CLAY. Sand is fine.	0.70 *+10.63* (0.30)
1.00-1.45 1.00-2.00	SPT S B 4	N=0 (0,0/-,-,-,-)	dry	MADE GROUND: Very soft black grey slightly sandy silty CLAY. Sand is fine to coarse. Strong hydrocarbon odour.	1.00 *+10.33* (1.45)
2.00-2.45 2.00-2.45	SPT S D 5	N=0 (0,0/-,-,-,-)	dry		
				EXPLORATORY HOLE ENDS AT 2.45 m	2.45 *+8.88*

None observed (see Key Sheet)

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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426.4817/12/2014 13:29:05

Groundwater Installation Details

Hole No	Instrument ID	Installation Type	Date of Installation	Reference depth (mBGL)	Piezometer Diameter (mm)	Top of response zone (mBGL)	Base of response zone (mBGL)	Tubing Completion Details	Headworks	Remarks
BHMM	1	SP	11 Sep 2014	0.00	50	1.00	10.00	Gas tap	Stop cock cover	
BH02	1	SP	1 Sep 2014	0.00	50	1.00	10.00	Gas tap	Stop cock cover	
BH03	1	SP	3 Sep 2014	0.00	50	1.00	10.00	Gas tap	Stop cock cover	
BH04	1	SP	5 Sep 2014	0.00	50	1.00	10.00	Gas tap	Stop cock cover	
BH05	1	SP	10 Sep 2014	0.00	50	1.00	10.00	Gas tap	Stop cock cover	
BH06	1	SP	22 Aug 2014	0.00	50	1.00	10.00	Gas tap	Stop cock cover	
BH07	1	SP	22 Aug 2014	0.00	50	1.00	10.00	Gas tap	Stop cock cover	
BH08	1	SP	22 Aug 2014	0.00	50	1.00	10.00	Gas tap	Stop cock cover	
BH09	1	SP	27 Aug 2014	0.00	50	1.00	10.00	Gas tap	Stop cock cover	
BH10	1	SP	9 Sep 2014	0.00		1.00	10.00	Gas tap	Stop cock cover	
BH11	1	SP	10 Sep 2014	0.00	50	1.00	10.00	Gas tap	Stop cock cover	
BH12	1	SP	23 Sep 2014	0.00	50	1.00	10.00	Gas tap	Stop cock cover	
BH13	1	SP	11 Sep 2014	0.00	50	1.00	10.00	Gas tap	Stop cock cover	
BH14	1	SP	17 Sep 2014	0.00	50	1.00	10.00	Gas tap	Stop cock cover	
BH15	1	SP	16 Sep 2014	0.00	50	1.00	10.00	Gas tap	Stop cock cover	
BH16	1	SP	22 Sep 2014	0.00	50	1.00	10.00	Gas tap	Stop cock cover	
BH17	1	SP	26 Sep 2014	0.00	50	1.00	10.00	Gas tap	Stop cock cover	
BH18	1	SP	26 Sep 2014	0.00	50	1.00	10.00	Gas tap	Stop cock cover	
BH19	1	SP	22 Sep 2014	0.00	50	1.00	10.00	Gas tap	Stop cock cover	
BH20A	1	SP	29 Sep 2014	0.00	50	1.00	10.00	Gas tap	Stop cock cover	
BH24	1	SP	15 Sep 2014	0.00	50	1.00	10.00	Gas tap	Stop cock cover	
BH25	1	SP	4 Sep 2014	0.00	50	1.00	10.00	Gas tap	Stop cock cover	
BH26	1	SP	6 Sep 2014	0.00	50		10.00	Gas tap	Stop cock cover	

Notes: Type: SP - Standpipe, SPIE - Standpipe Piezometer, HPIE - Hydraulic Piezometer, PPIE - Pneumatic Piezometer, EPIE - Electronic Piezometer Prepared: 17/12/2014 13:51

Project: Frodsham Wind Farm
Project No.: F4036-14
Carried out for: Peel Wind Farms (Frodsham) Limited

Table C1

Groundwater Installation Details

Hole No	Instrument ID	Installation Type	Date of Installation	Reference depth (mBGL)	Piezometer Diameter (mm)	Top of response zone (mBGL)	Base of response zone (mBGL)	Tubing Completion Details	Headworks	Remarks
BH27	1	SP	11 Sep 2014	0.00	50	1.00	10.00	Gas tap	Stop cock cover	
BH28	1	SP	19 Sep 2014	0.00	50	1.00	10.00	Gas tap	Stop cock cover	
BH29	1	SP	18 Sep 2014	0.00	50	1.00	10.00	Gas tap	Stop cock cover	
BH30	1	SP	23 Sep 2014	0.00	50	1.00	10.00	Gas tap	Stop cock cover	
BH31	1	SP	17 Sep 2014	0.00	50	1.00	10.00	Gas tap	Stop cock cover	
BH32	1	SP	15 Sep 2014	0.00	50	1.00	10.00	Gas tap	Stop cock cover	
BH33	1	SP	29 Sep 2014	0.00	50	1.00	10.00	Gas tap	Stop cock cover	

Notes: Type: SP - Standpipe, SPIE - Standpipe Piezometer, HPIE - Hydraulic Piezometer, PPIE - Pneumatic Piezometer, EPIE - Electronic Piezometer Prepared: 17/12/2014 13:51

Project Frodsham Wind Farm
Project No. F4036-14
Carried out for Peel Wind Farms (Frodsham) Limited

Table C1

Hole ID	Instrument ID	Instrument Type	Base of Instrument (mBGL)	Reference Depth (mBGL)	Reading				
					Date	Time (hhmmss)	Water Level (mBGL) * calculated	Head (m above Tip) * calculated	Comments
BHMM	1	SP	10	0.00	30 Sep 2014	130200	6.27		
BH11	1	SP	10	0.00	1 Oct 2014	092300	1.00		
BH12	1	SP	10	0.00	1 Oct 2014	100000	0.72		
BH13	1	SP	10	0.00	1 Oct 2014	094300	0.52		
BH20A	1	SP	10	0.00	1 Oct 2014	083200	2.34		
BH24	1	SP	10	0.00	1 Oct 2014	090200	1.96		
BH25	1	SP	10	0.00	1 Oct 2014	091200	1.90		
BH26	1	SP	10	0.00	1 Oct 2014	093600	0.67		
BH27	1	SP	10	0.00	1 Oct 2014	110000	6.49		
BH30	1	SP	10	0.00	30 Sep 2014	140700	4.03		
BH31	1	SP	10	0.00	30 Sep 2014	134300	3.57		
BH32	1	SP	10	0.00	30 Sep 2014	133600	4.72		
BH33	1	SP	10	0.00	30 Sep 2014	151300	3.21		

Notes: Type: SP - Standpipe, SPIE - Standpipe Piezometer, HPIE - Hydraulic Piezometer, PPIE - Pneumatic Piezometer, EPIE - Vibrating Wire Piezometer, PWEL - Pumping Well

								Detection Limit							
								Unit	%vol	ppm	ppm	%LEL	%vol	%vol	%vol
Hole No	Date	Reading Depth, mBGL	Air Temperature, oC	Barometric Pressure, mbar	Groundwater Level, mBGL	Gas Differential Pressure, Pa	Gas Flow Rate, l/hr	Gas	Carbon dioxide	Carbon monoxide	Hydrogen sulphide	Methane	Methane	Nitrogen	Oxygen
BH11	1 Oct 2014	9.67		1021	1.00	0	0.0		1.3	ND	ND	ND	ND	78.2	20.4
BH12	1 Oct 2014	9.45		1021	0.72	0	0.0		1.1	ND	ND	ND	ND	79.5	19.3
BH13	1 Oct 2014	9.70		1021	0.52	0	0.0		ND	ND	ND	ND	ND	79.1	20.8
BH20A	1 Oct 2014	9.90		1020	2.34	0	0.0		0.4	ND	ND	ND	ND	79.2	20.3
BH24	1 Oct 2014	10.23		1020	1.96	0	0.0		1.9	ND	ND	ND	ND	79.9	18.1
BH25	1 Oct 2014	9.50		1020	1.90	0	0.0		1.6	ND	ND	ND	ND	79.1	19.2
BH26	1 Oct 2014	9.70		1021	0.67	0	0.0		ND	ND	ND	ND	ND	79.1	20.8
BH27	1 Oct 2014	10.05		1021	6.49	0	0.0		31.0	ND	ND	46.4	5.8	60.2	2.9
BH30	30 Sep 2014	9.90		1018	4.03	7	2.6		40.0	ND	ND	>>>>	60.0	ND	ND
BH31	30 Sep 2014	10.06		1018	3.57	1	0.5		40.0	ND	ND	>>>>	53.0	5.8	1.1
BH32	30 Sep 2014	9.70		1019	4.72	1	0.4		33.0	ND	ND	>>>>	44.5	21.3	1.1
BH33	30 Sep 2014	9.40		1018	3.21	0	0.0		21.0	ND	ND	>>>>	13.5	52.4	13.0
BHMM	30 Sep 2014	9.70		1019	6.27	0	0.0		ND	ND	ND	>>>>	61.0	ND	ND

Notes: ND - not detected

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UKAS TESTING
0001

TEST REPORT

DETERMINATION OF EQUIVALENT CBR VALUE
PLATE LOADING TEST

In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

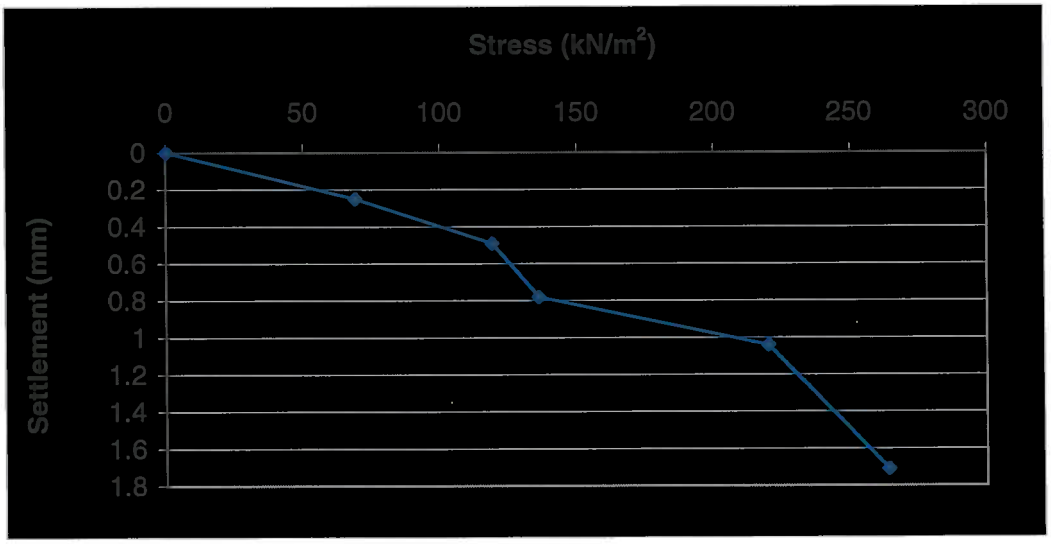
Report No:	**WA6966/14/01**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	1
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**1**
	Manchester		
	M17 8PL		
		Date tested	**08/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Overcast
		Kentledge:	10 Ton Excavator
Material Description:	**Crushed Concrete & Fines**	Plate size (mm):	450
Test location:	**Position CBR 47**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	2.5

Results

Stress kN/m²	Settlement mm
0	0
69	0.25
119	0.49
136	0.78
220	1.04
264	1.71

Max stress kN/m²
264
Max deflection mm
1.71



K_{762} value (kN/m²/mm)	116.5

EQUIVALENT CBR VALUE (%)	37

Remarks:
Tested 230mm Below Surface

Si [redacted]

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UKAS TESTING 0001

TEST REPORT

DETERMINATION OF EQUIVALENT CBR VALUE
PLATE LOADING TEST

In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

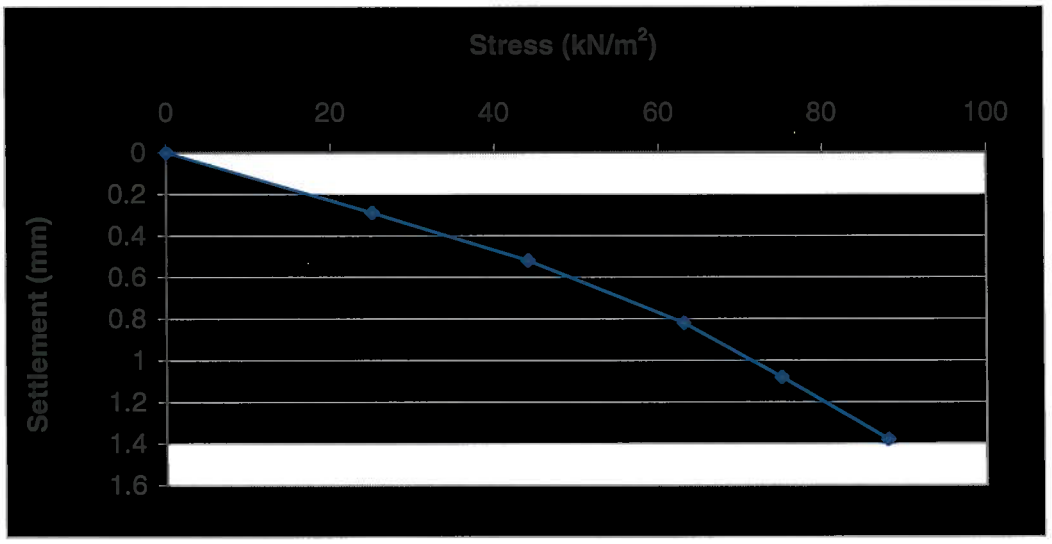
Report No:	**WA6966/14/02**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	2
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**2**
	Manchester		
	M17 8PL		
		Date tested	**08/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Overcast
		Kentledge:	10 Ton Excavator
Material Description:	**Crushed Concrete, Brownish Clay, Fines & Sand**	Plate size (mm):	450
Test location:	**Position CBR 48**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	16

Results

Stress kN/m²	Settlement mm
0	0
25	0.29
44	0.52
63	0.82
75	1.08
88	1.38

Max stress kN/m²
88
Max deflection
1.38



K_{762} value (kN/m²/mm)	41.1

EQUIVALENT CBR VALUE (%)	6

Remarks:
Tested 300mm Below Surface

Signe

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UKAS TESTING
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TEST REPORT

DETERMINATION OF EQUIVALENT CBR VALUE
PLATE LOADING TEST

In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

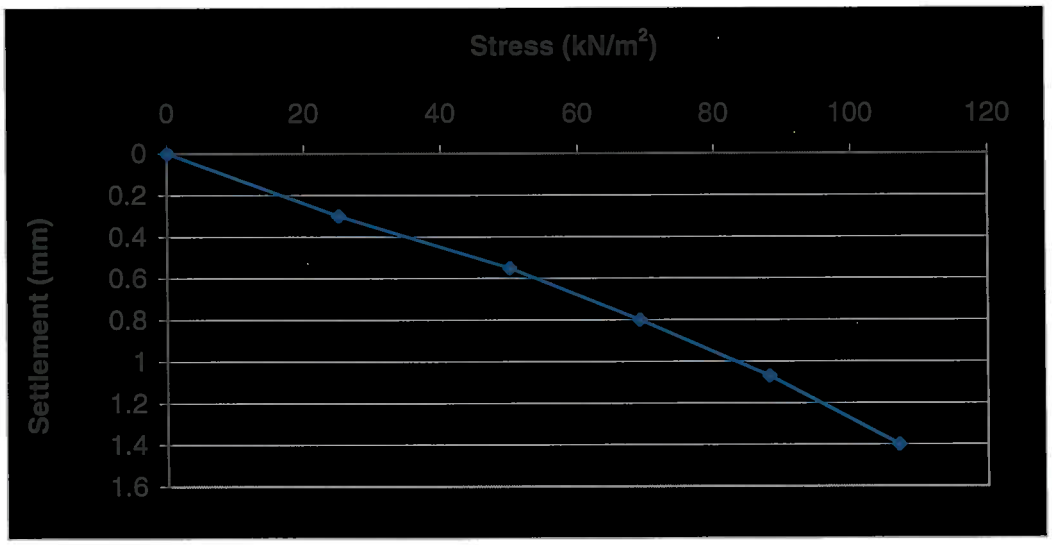
Report No:	**WA6966/14/03**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	3
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**3**
	Manchester		
	M17 8PL		
		Date tested	**08/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Crushed Concrete, Brownish Clay, Fines & Sand**	Plate size (mm):	450
Test location:	**Position CBR 49**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	10

Results

Stress kN/m²	Settlement mm
0	0
25	0.30
50	0.55
69	0.80
88	1.07
107	1.40

Max stress kN/m²
107
Max deflection mm
1.4



K_{762} value (kN/m²/mm)	49

EQUIVALENT CBR VALUE (%)	8.2

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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UKAS TESTING 0001

TEST REPORT

DETERMINATION OF EQUIVALENT CBR VALUE
PLATE LOADING TEST

In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

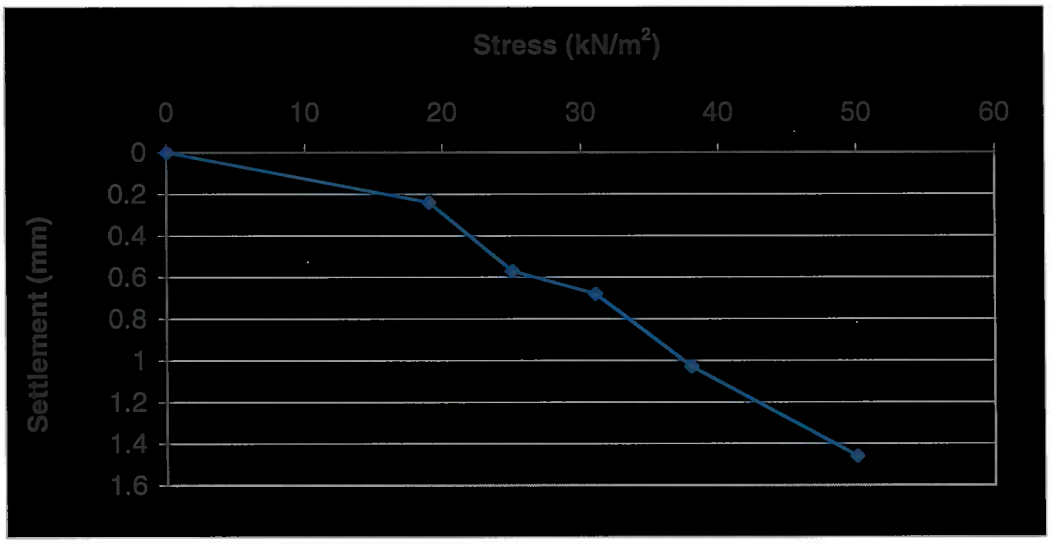
Report No:	**WA6966/14/04**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	4
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**4**
	Manchester		
	M17 8PL		
		Date tested	**08/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Overcast
		Kentledge:	10 Ton Excavator
Material Description:	**Crushed Concrete, Brownish Clay, Fines & Sand**	Plate size (mm):	450
Test location:	**Position CBR 1**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	34

Results

Stress kN/m²	Settlement mm
0	0
19	0.24
25	0.57
31	0.68
38	1.03
50	1.46

Max stress kN/m²
50
Max deflection mm
1.46



K_{762} value (kN/m²/mm)	22

EQUIVALENT CBR VALUE (%)	2

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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TEST REPORT

DETERMINATION OF EQUIVALENT CBR VALUE
PLATE LOADING TEST

In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

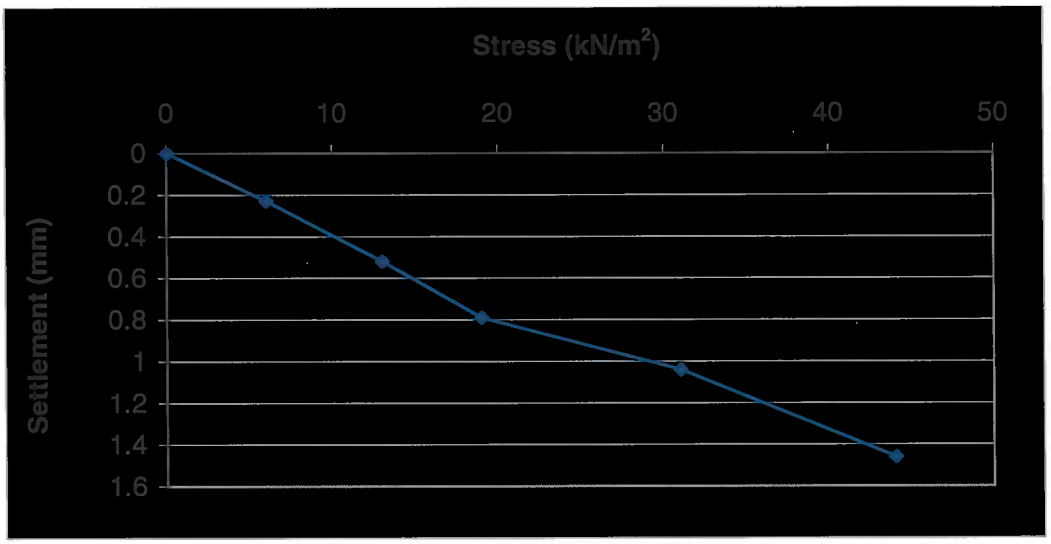
Report No:	**WA6966/14/05**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	5
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**5**
	Manchester		
	M17 8PL		
		Date tested	**08/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Organic Soil, Crushed Concrete & Fines**	Plate size (mm):	450
Test location:	**Position CBR 2**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	14

Results

Stress kN/m²	Settlement mm
0	0
6	0.23
13	0.52
19	0.79
31	1.04
44	1.46

Max stress kN/m²
44
Max deflection mm
1.46



K_{762} value (kN/m²/mm)	18.7

EQUIVALENT CBR VALUE (%)	1.5

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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DETERMINATION OF EQUIVALENT CBR VALUE
PLATE LOADING TEST

In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

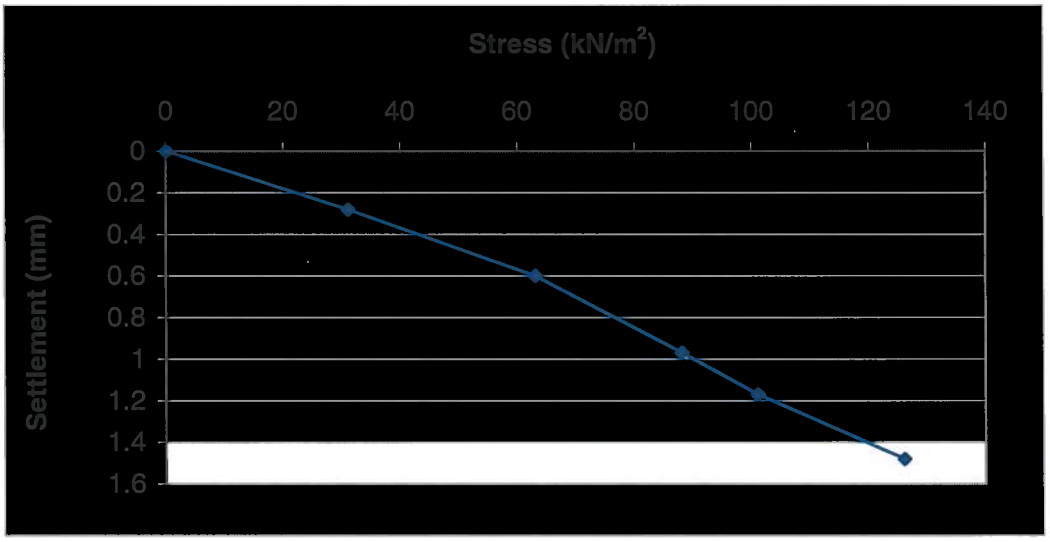
Report No:	**WA6966/14/06**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	6
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**6**
	Manchester		
	M17 8PL		
		Date tested	**08/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Fine Sand with some Crushed Concrete**	Plate size (mm):	450
Test location:	**Position CBR 4**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	6.1

Results

Stress kN/m²	Settlement mm
0	0
31	0.28
63	0.60
88	0.97
101	1.17
126	1.48

Max stress kN/m²
126
Max deflection mm
1.48



K_{762} value (kN/m²/mm)	53.6

EQUIVALENT CBR VALUE (%)	9.6

Remarks:
Tested 300mm Below Surface

Sig[redacted]

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DETERMINATION OF EQUIVALENT CBR VALUE
PLATE LOADING TEST

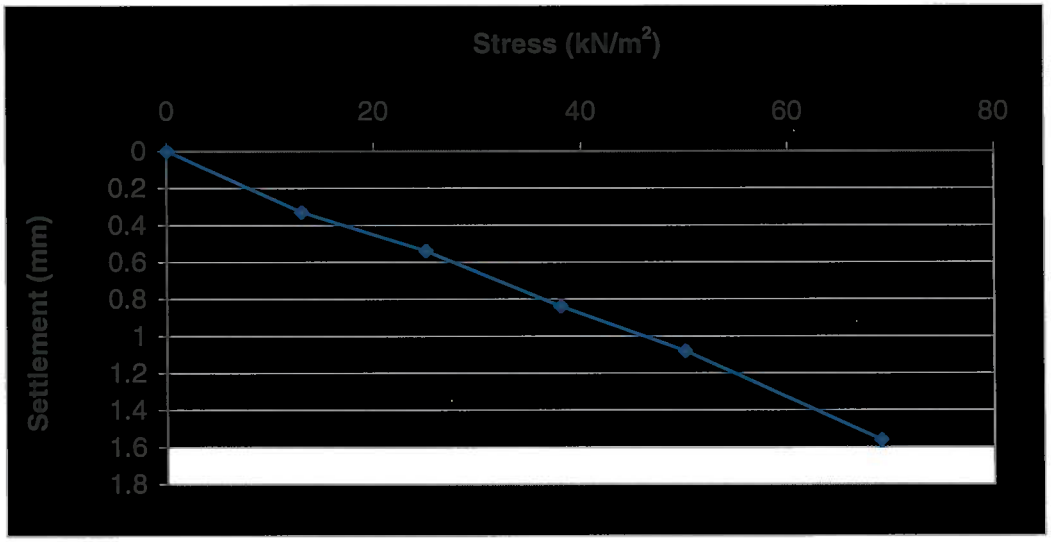
In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

Report No:	**WA6966/14/07**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	7
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**7**
	Manchester		
	M17 8PL		
		Date tested	**08/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Organic Soil & Sand**	Plate size (mm):	450
Test location:	**Position CBR 5**	Moisture content % (BS 1377-2:1990 Clause 3.2)	17

Results

Stress kN/m²	Settlement mm
0	0
13	0.33
25	0.54
38	0.84
50	1.08
69	1.56

Max stress kN/m²
69
Max deflection m
1.56



K_{762} value (kN/m²/mm)	28.3

EQUIVALENT CBR VALUE (%)	3.2

Remarks:
Tested 300mm Below Surface

Signed [redacted]

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PLATE LOADING TEST

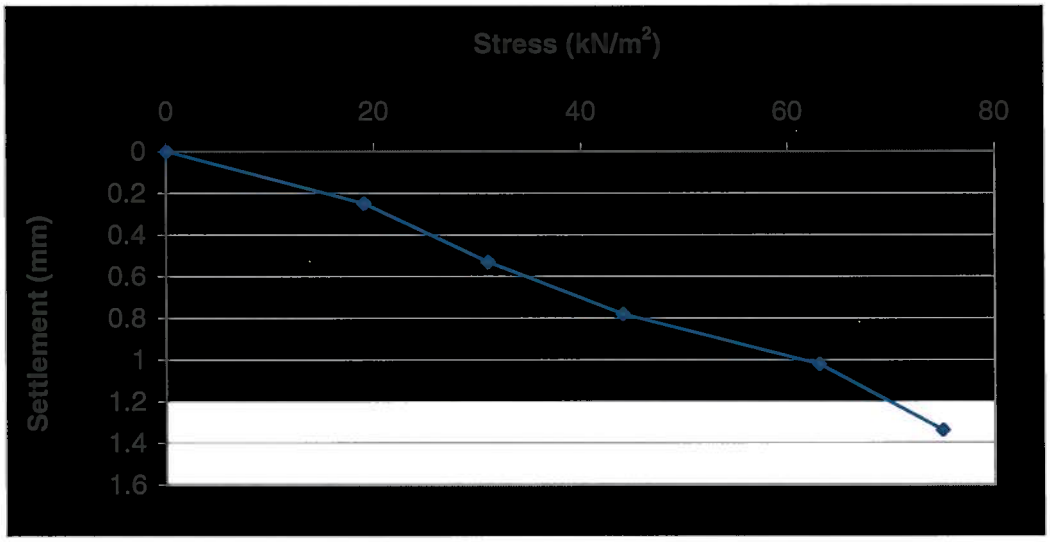
In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

Report No:	**WA6966/14/08**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	8
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**8**
	Manchester		
	M17 8PL		
		Date tested	**08/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Topsoil & Organic Sand**	Plate size (mm):	450
Test location:	**Position CBR 6**	Moisture content % (BS 1377-2:1990 Clause 3.2)	17

Results

Stress kN/m²	Settlement mm
0	0
19	0.25
31	0.53
44	0.78
63	1.02
75	1.34

Max stress kN/m²
75
Max deflection mm
1.34



K_{762} value (kN/m²/mm)	35.7

EQUIVALENT CBR VALUE (%)	4.7

Remarks:
Tested 300mm Below Surface

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PLATE LOADING TEST

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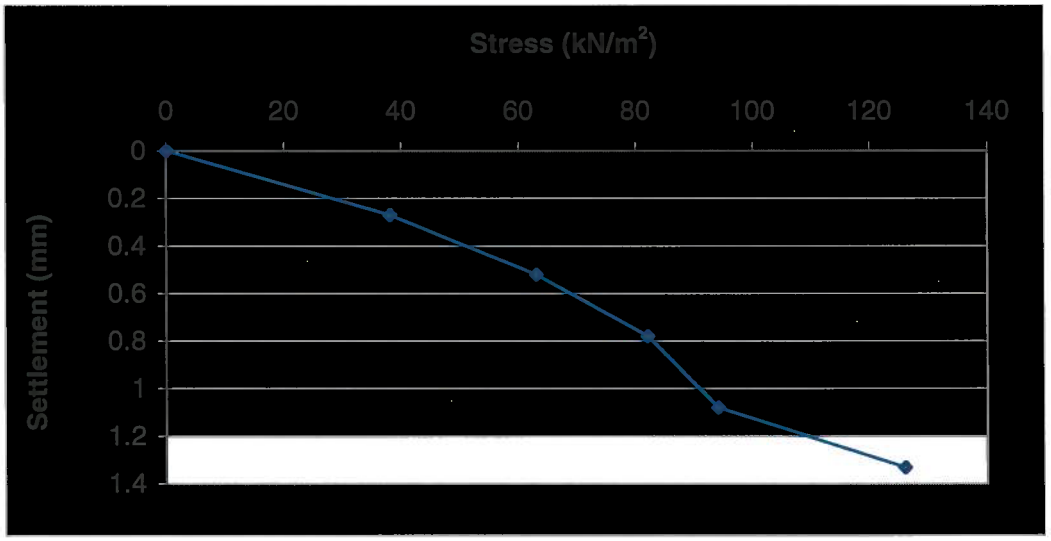
Report No:	**WA6966/14/09**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	9
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**9**
	Manchester		
	M17 8PL		
		Date tested	**08/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Clay, Crushed Rock & Fines**	Plate size (mm):	450
Test location:	**Position CBR 7**	Moisture content % (BS 1377-2:1990 Clause 3.2)	15

Results

Stress kN/m²	Settlement mm
0	0
38	0.27
63	0.52
82	0.78
94	1.08
126	1.33

Max stress kN/m²
126
Max deflection mm
1.33



K_{762} value (kN/m²/mm)	57.7

EQUIVALENT CBR VALUE (%)	11

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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PLATE LOADING TEST

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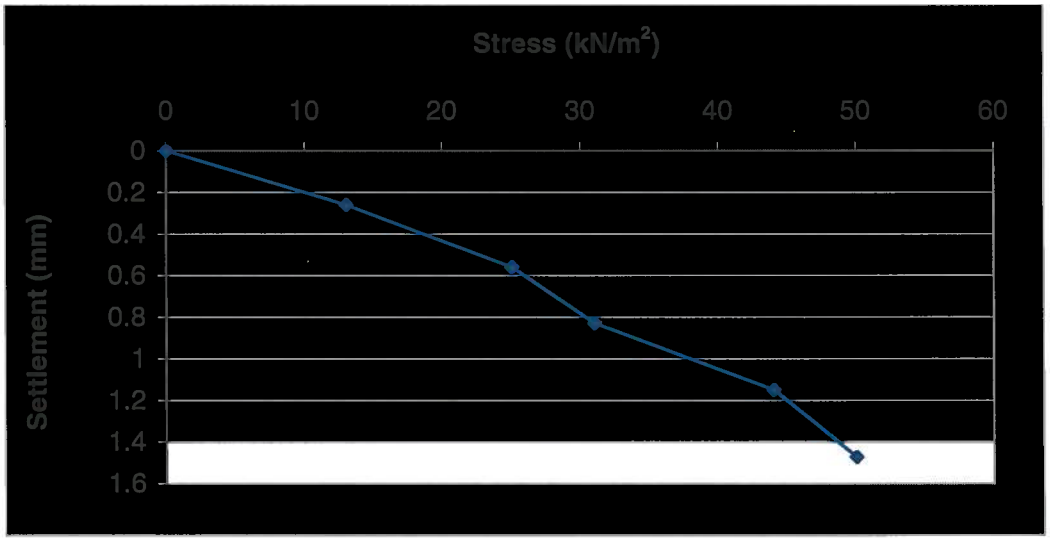
Report No:	**WA6966/14/10**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	10
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**10**
	Manchester		
	M17 8PL		
		Date tested	**08/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Clay & Sand**	Plate size (mm):	450
Test location:	**Position CBR 8**	Moisture content % (BS 1377-2:1990 Clause 3.2)	25

Results

Stress kN/m²	Settlement mm
0	0
13	0.26
25	0.56
31	0.83
44	1.15
50	1.47

Max stress kN/m²
50
Max defle
1.4



K_{762} value (kN/m²/mm)	22.9

EQUIVALENT CBR VALUE (%)	2.2

Remarks:
Tested 300mm Below Surface

[redacted]

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DETERMINATION OF EQUIVALENT CBR VALUE
PLATE LOADING TEST

In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

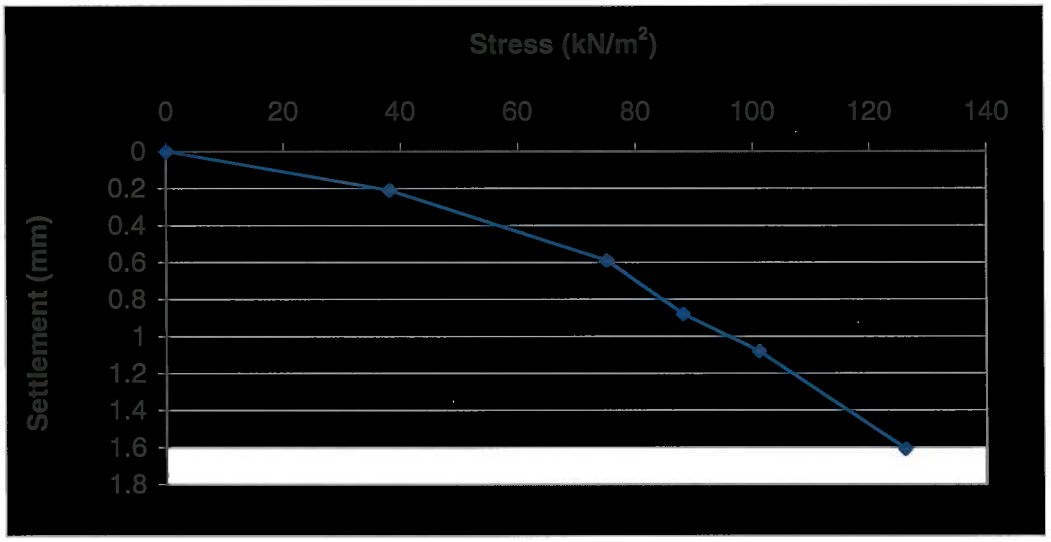
Report No:	**WA6966/14/11**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	1
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**1**
	Manchester		
	M17 8PL		
		Date tested	**09/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Overcast
		Kentledge:	10 Ton Excavator
Material Description:	**Crushed Rock, Crushed Concrete, Fines & Sand**	Plate size (mm):	450
Test location:	**Position CBR 3**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	10

Results

Stress kN/m²	Settlement mm
0	0
38	0.21
75	0.59
88	0.88
101	1.08
126	1.61

Max stress kN/m²
126
Max deflection mm
1.61



K_{762} value (kN/m²/mm)	54.3

EQUIVALENT CBR VALUE (%)	9.8

Remarks:
Tested 300mm Below Surface

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DETERMINATION OF EQUIVALENT CBR VALUE
PLATE LOADING TEST

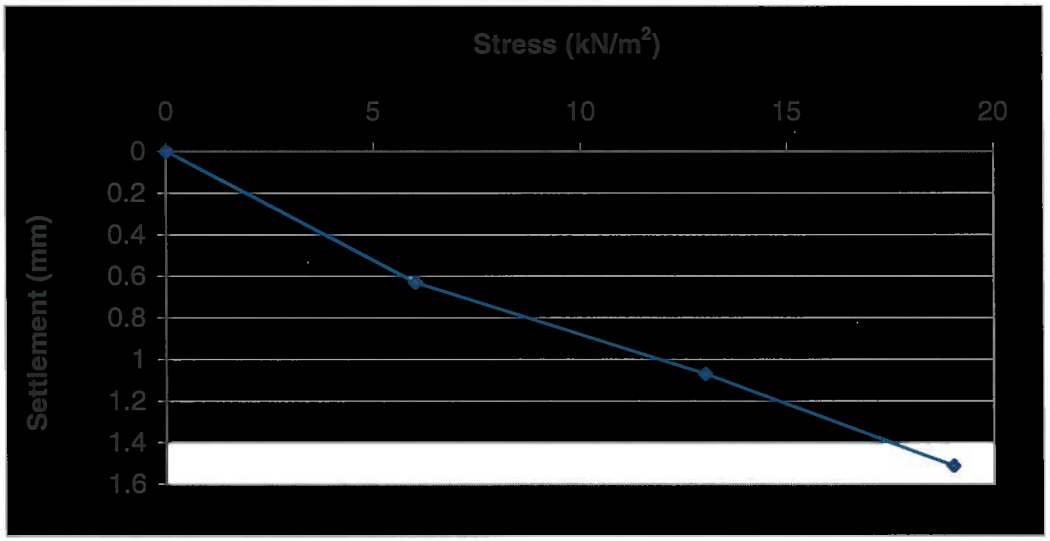
In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

Report No:	**WA6966/14/12**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	2
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**2**
	Manchester		
	M17 8PL		
		Date tested	**09/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Silty Clay**	Plate size (mm):	450
Test location:	**Position CBR 9**	Moisture content % (BS 1377-2:1990 Clause 3.2)	56

Results

Stress kN/m²	Settlement mm
0	0
6	0.63
13	1.07
19	1.51

Max stress kN/m²
19
Max deflection mm
1.51



K_{762} value (kN/m²/mm)	7.7

EQUIVALENT CBR VALUE (%)	0.3

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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PLATE LOADING TEST

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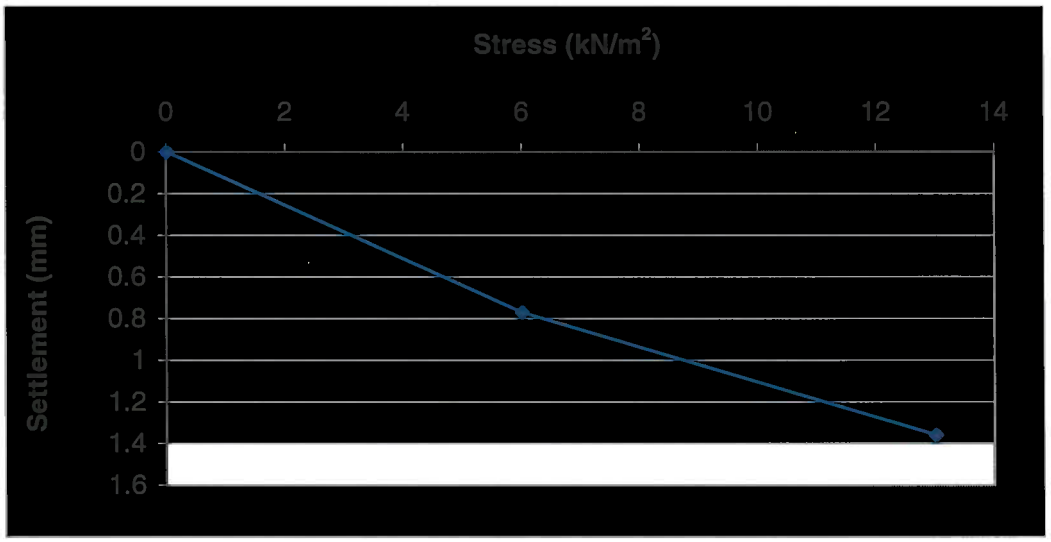
Report No:	**WA6966/14/13**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	3
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**3**
	Manchester		
	M17 8PL		
		Date tested	**09/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Silty Clay**	Plate size (mm):	450
Test location:	**Position CBR 10**	Moisture content % (BS 1377-2:1990 Clause 3.2)	65

Results

Stress kN/m²	Settlement mm
0	0
6	0.77
13	1.36

Max stress kN/m²
13
Max deflection mm
1.36



K_{762} value (kN/m²/mm)	5.8

EQUIVALENT CBR VALUE (%)	0.2

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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PLATE LOADING TEST

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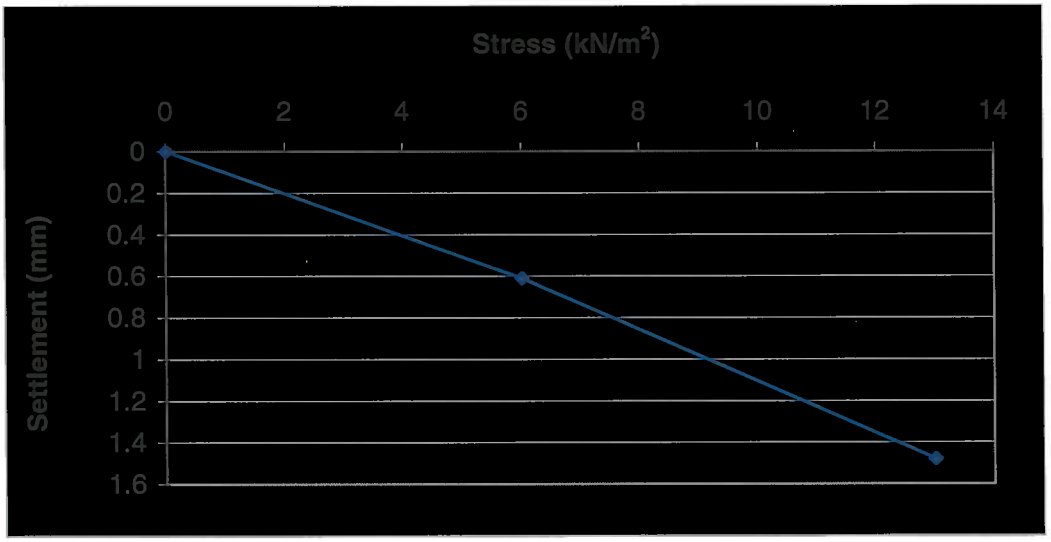
Report No:	**WA6966/14/14**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	4
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**4**
	Manchester		
	M17 8PL		
		Date tested	**09/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Silty Clay**	Plate size (mm):	450
Test location:	**Position CBR 11**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	60

Results

Stress kN/m²	Settlement mm
0	0
6	0.61
13	1.48

Max stress kN/m²
13
Max deflection mm
1.48



K_{762} value (kN/m²/mm)	5.5

EQUIVALENT CBR VALUE (%)	0.2

Remarks:
Tested 300mm Below Surface

Signed:

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PLATE LOADING TEST

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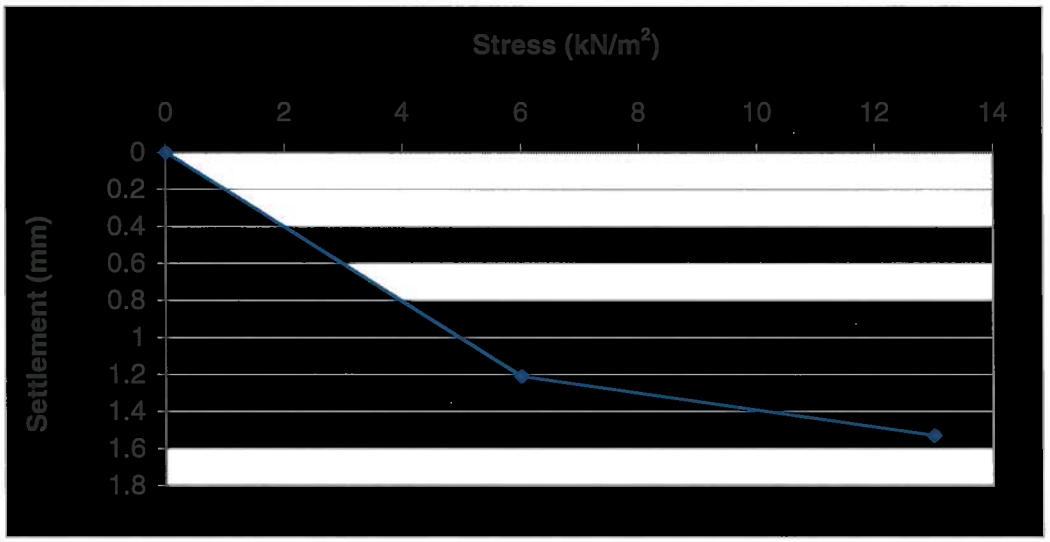
Report No:	**WA6966/14/15**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	5
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**5**
	Manchester		
	M17 8PL		
		Date tested	**09/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Silty Clay**	Plate size (mm):	450
Test location:	**Position CBR 12**	Moisture content % (BS 1377-2:1990 Clause 3.2)	51

Results

Stress kN/m²	Settlement mm
0	0
6	1.21
13	1.53

Max stress kN/m²
13
Max deflection mm
1.53



K_{762} value (kN/m²/mm)	3.4

EQUIVALENT CBR VALUE (%)	0.1

Remarks:
Tested 300mm Below Surface

Signed:

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UKAS TESTING 0001

TEST REPORT

DETERMINATION OF EQUIVALENT CBR VALUE
PLATE LOADING TEST

In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

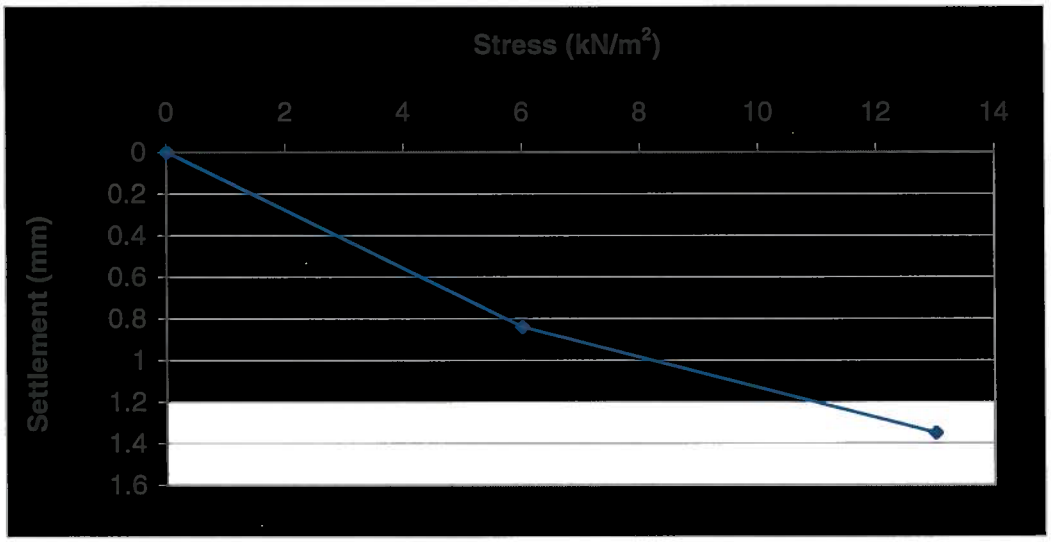
Report No:	**WA6966/14/16**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	6
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**6**
	Manchester		
	M17 8PL		
		Date tested	**09/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Silty Clay**	Plate size (mm):	450
Test location:	**Position CBR 13**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	84

Results

Stress kN/m²	Settlement mm
0	0
6	0.84
13	1.35

Max stress kN/m²
13
Max deflection
1.35



K_{762} value (kN/m²/mm)	5.8

EQUIVALENT CBR VALUE (%)	0.2

Remarks:
Tested 300mm Below Surface

Signe

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PLATE LOADING TEST

In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

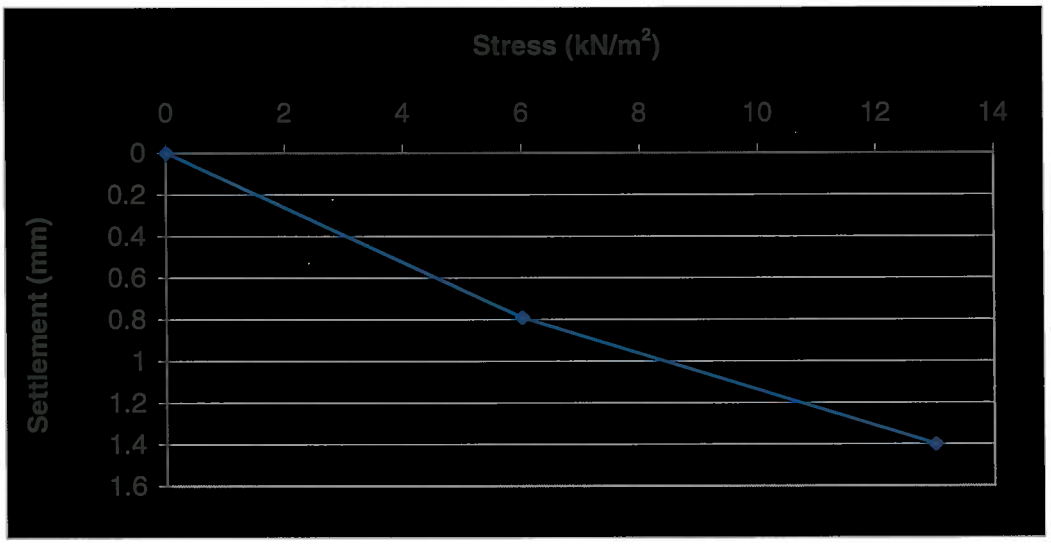
Report No:	**WA6966/14/17**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	7
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**7**
	Manchester		
	M17 8PL		
		Date tested	**09/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Silty Clay**	Plate size (mm):	450
Test location:	**Position CBR 14**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	83

Results

Stress kN/m²	Settlement mm
0	0
6	0.79
13	1.40

Max stress kN/m²
13
Max deflection mm
1.4



K_{762} value (kN/m²/mm)	5.6

EQUIVALENT CBR VALUE (%)	0.2

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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DETERMINATION OF EQUIVALENT CBR VALUE
PLATE LOADING TEST

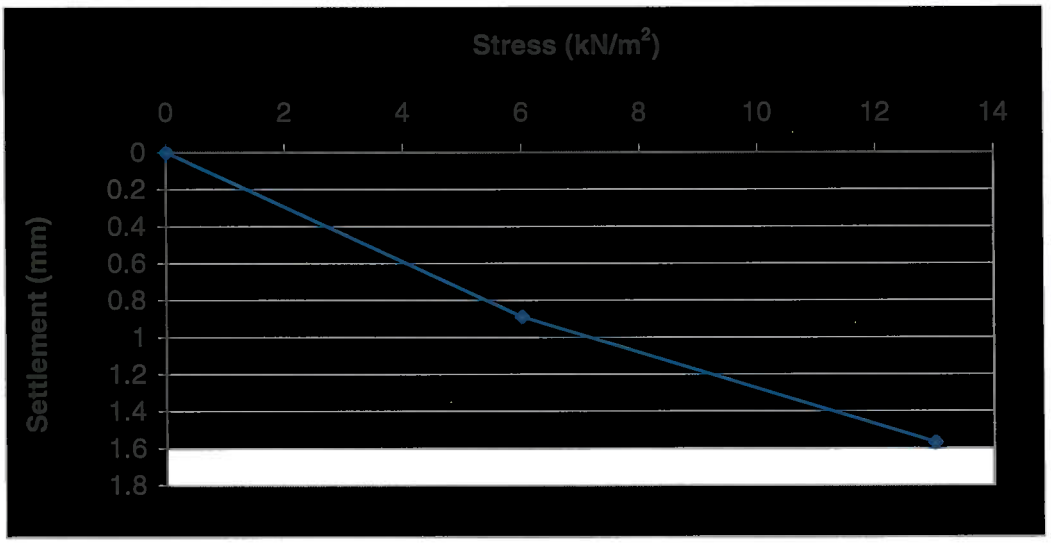
In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

Report No:	**WA6966/14/18**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	8
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**8**
	Manchester		
	M17 8PL		
		Date tested	**09/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Silty Clay**	Plate size (mm):	450
Test location:	**Position CBR 16**	Moisture content % (BS 1377-2:1990 Clause 3.2)	62

Results

Stress kN/m²	Settlement mm
0	0
6	0.89
13	1.57

Max stress kN/m²
13
Max deflection mm
1.57



K_{762} value (kN/m²/mm)	4.8

EQUIVALENT CBR VALUE (%)	0.1

Remarks:
Tested 300mm Below Surface

Signed [redacted]

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DETERMINATION OF EQUIVALENT CBR VALUE
PLATE LOADING TEST

In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

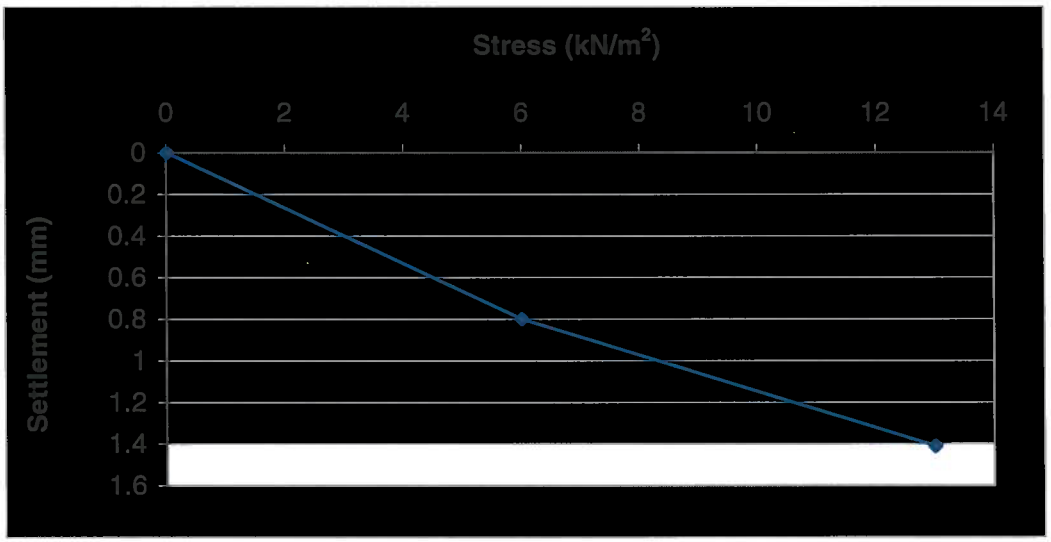
Report No:	**WA6966/14/19**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	9
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**9**
	Manchester		
	M17 8PL		
		Date tested	**09/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Overcast
		Kentledge:	10 Ton Excavator
Material Description:	**Silty Clay**	Plate size (mm):	450
Test location:	**Position CBR 15**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	72

Results

Stress kN/m²	Settlement mm
0	0
6	0.80
13	1.41

Max stress kN/m²
13
Max deflection mm
1.41



K_{762} value (kN/m²/mm)	5.6

EQUIVALENT CBR VALUE (%)	0.2

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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TEST REPORT

DETERMINATION OF EQUIVALENT CBR VALUE
PLATE LOADING TEST

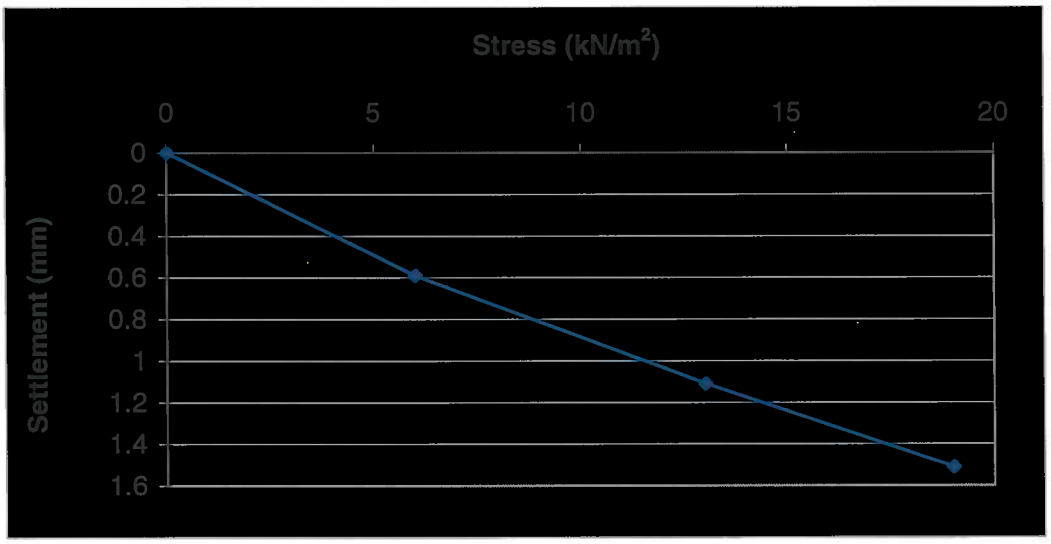
In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

Report No:	**WA6966/14/20**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	10
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**10**
	Manchester		
	M17 8PL		
		Date tested	**09/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Silty Clay**	Plate size (mm):	450
Test location:	**Position CBR 17**	Moisture content % (BS 1377-2:1990 Clause 3.2)	25

Results

Stress kN/m²	Settlement mm
0	0
6	0.59
13	1.11
19	1.51

Max stress kN/m²
19
Max deflection mm
1.51



K_{762} value (kN/m²/mm)	7.5

EQUIVALENT CBR VALUE (%)	0.3

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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PLATE LOADING TEST

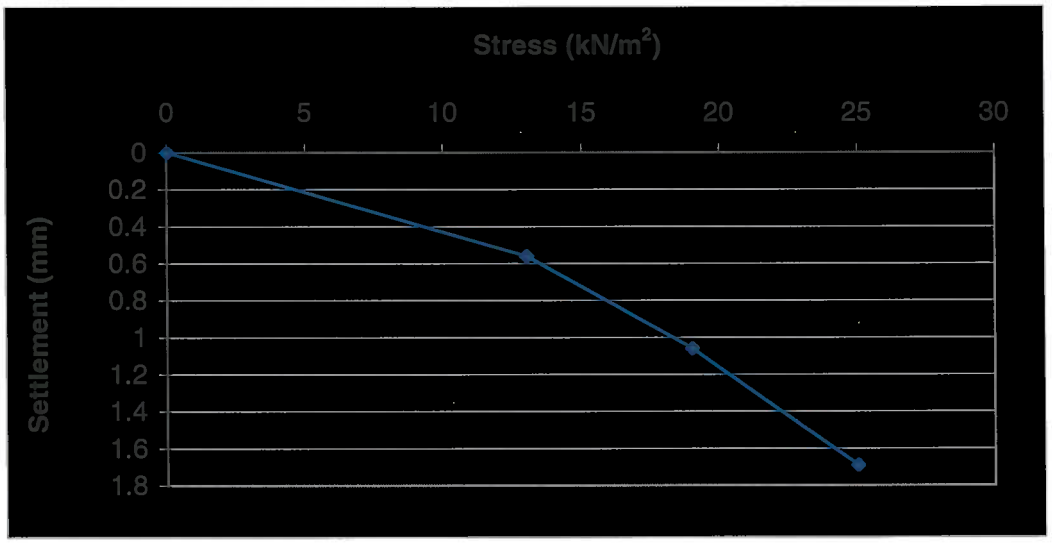
In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

Report No:	**WA6966/14/21**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	1
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**1**
	Manchester		
	M17 8PL		
		Date tested	**10/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Silty Clay**	Plate size (mm):	450
Test location:	**Position CBR 18**	Moisture content % (BS 1377-2:1990 Clause 3.2)	62

Results

Stress kN/m²	Settlement mm
0	0
13	0.56
19	1.06
25	1.69

Max stress kN/m²
25
Max deflection mm
1.69



K_{762} value (kN/m²/mm)	10.4

EQUIVALENT CBR VALUE (%)	0.6

Remarks:
Tested 300mm Below Surface

Signed:

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TEST REPORT

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PLATE LOADING TEST

In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

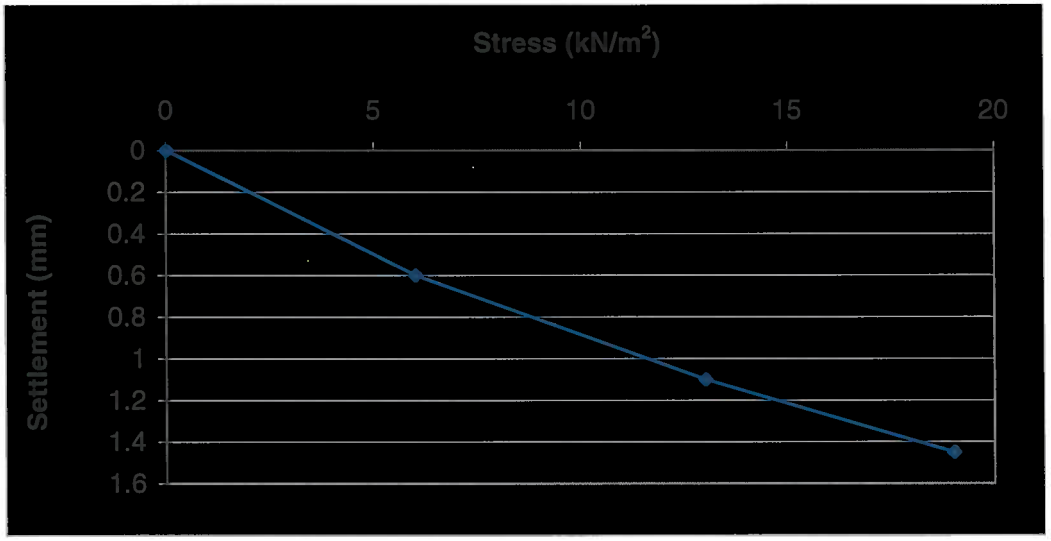
Report No:	**WA6966/14/22**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	2
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**2**
	Manchester		
	M17 8PL		
		Date tested	**10/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Silty Clay**	Plate size (mm):	450
Test location:	**Position CBR 19**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	52

Results

Stress kN/m²	Settlement mm
0	0
6	0.60
13	1.10
19	1.45

Max stress kN/m²
19
Max deflection mm
1.45



K_{762} value (kN/m²/mm)	7.8

EQUIVALENT CBR VALUE (%)	0.3

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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PLATE LOADING TEST

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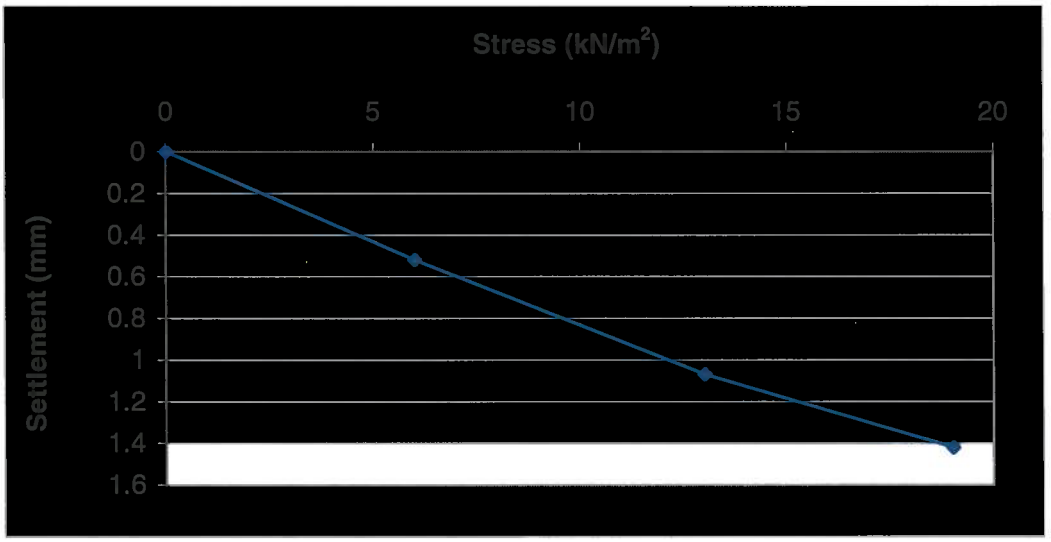
Report No:	**WA6966/14/23**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	3
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**3**
	Manchester		
	M17 8PL		
		Date tested	**10/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Silty Clay & Sand**	Plate size (mm):	450
Test location:	**Position CBR 20**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	39

Results

Stress kN/m²	Settlement mm
0	0
6	0.52
13	1.07
19	1.42

Max stress kN/m²
19
Max deflection mm
1.42



K_{762} value (kN/m²/mm)	8

EQUIVALENT CBR VALUE (%)	0.4

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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TEST REPORT

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PLATE LOADING TEST

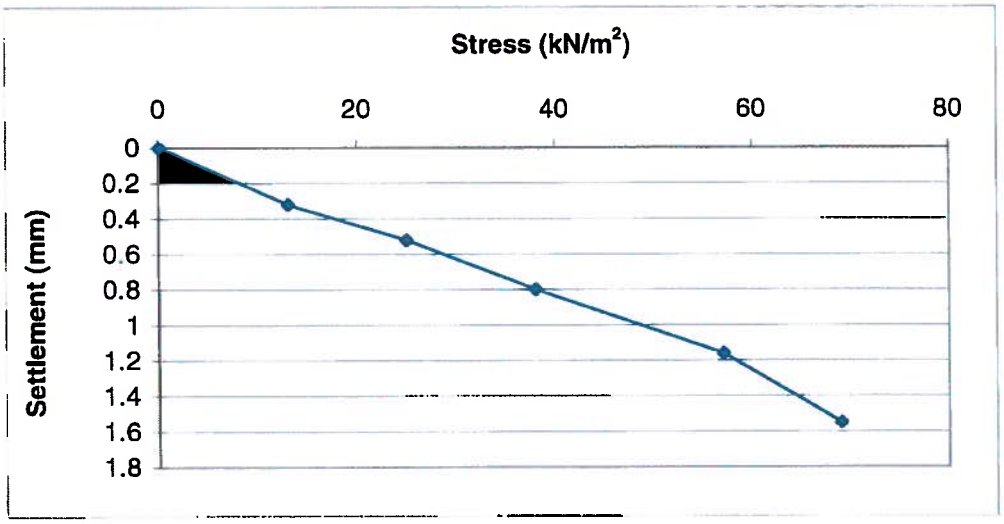
In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

Report No:	**WA6966/14/24**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	4
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**4**
	Manchester		
	M17 8PL		
		Date tested	**10/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Sand, Silt & Clay**	Plate size (mm):	450
Test location:	**Position CBR 21**	Moisture content % (BS 1377-2 1990 Clause 3 2)	25

Results

Stress kN/m²	Settlement mm
0	0
13	0.32
25	0.52
38	0.80
57	1.16
69	1.55

Max stress kN/m²
69
Max deflection mm
1.55



K_{762} value (kN/m²/mm)	29.8

EQUIVALENT CBR VALUE (%)	3.5

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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PLATE LOADING TEST

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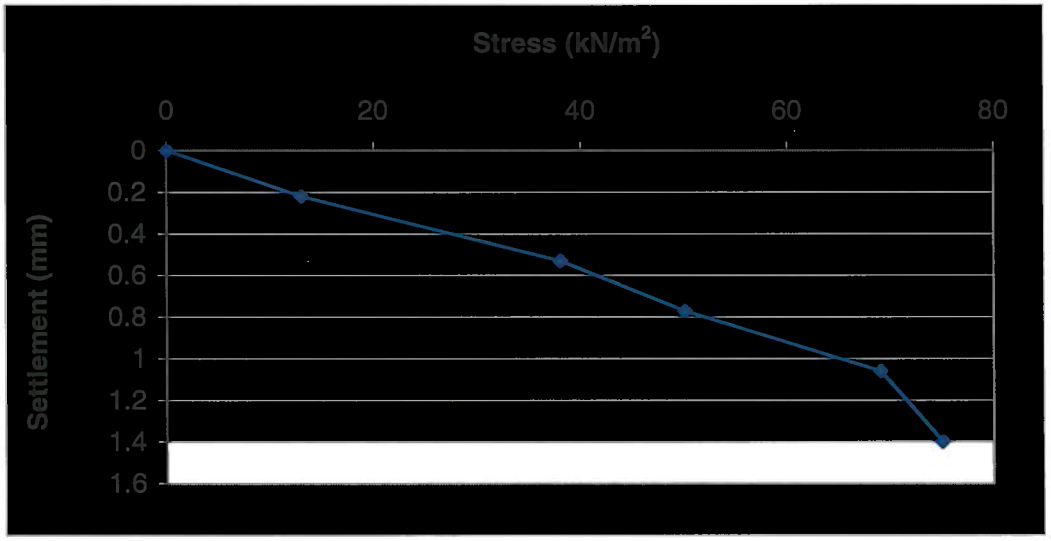
Report No:	**WA6966/14/25**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	5
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**5**
	Manchester		
	M17 8PL		
		Date tested	**10/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Sand**	Plate size (mm):	450
Test location:	**Position CBR 22**	Moisture content % (BS 1377-2:1990 Clause 3.2)	14

Results

Stress kN/m²	Settlement mm
0	0
13	0.22
38	0.53
50	0.77
69	1.06
75	1.40

Max stress kN/m²
75
Max deflection mm
1.4



K_{762} value (kN/m²/mm)	36.1

EQUIVALENT CBR VALUE (%)	4.8

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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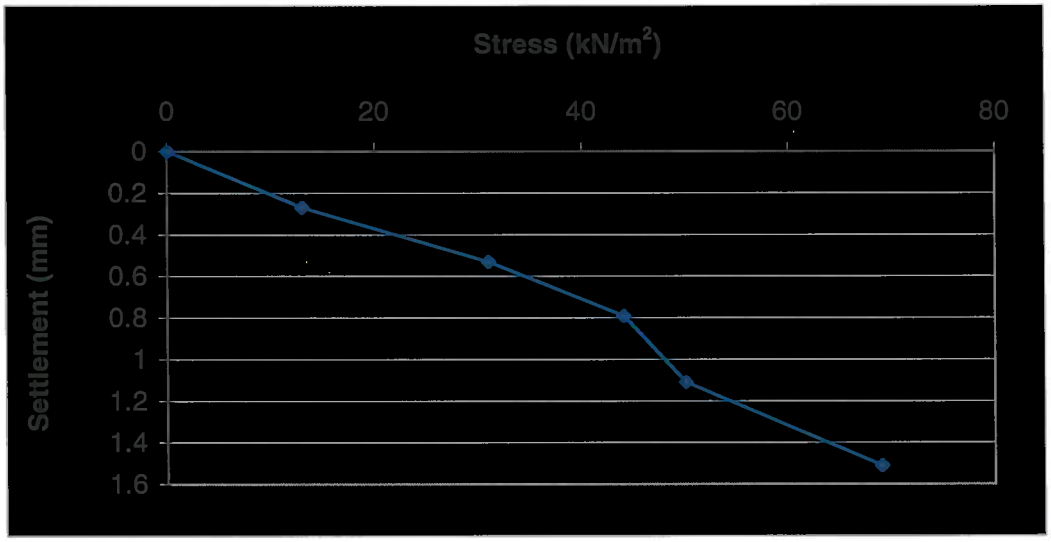
Report No:	**WA6966/14/26**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	6
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**6**
	Manchester		
	M17 8PL		
		Date tested	**10/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Sand**	Plate size (mm):	450
Test location:	**Position CBR 23**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	12

Results

Stress kN/m²	Settlement mm
0	0
13	0.27
31	0.53
44	0.79
50	1.11
69	1.51

Max stress kN/m²
69
Max deflection mm
1.51



K_{762} value (kN/m²/mm)	28.3

EQUIVALENT CBR VALUE (%)	3.2

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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PLATE LOADING TEST

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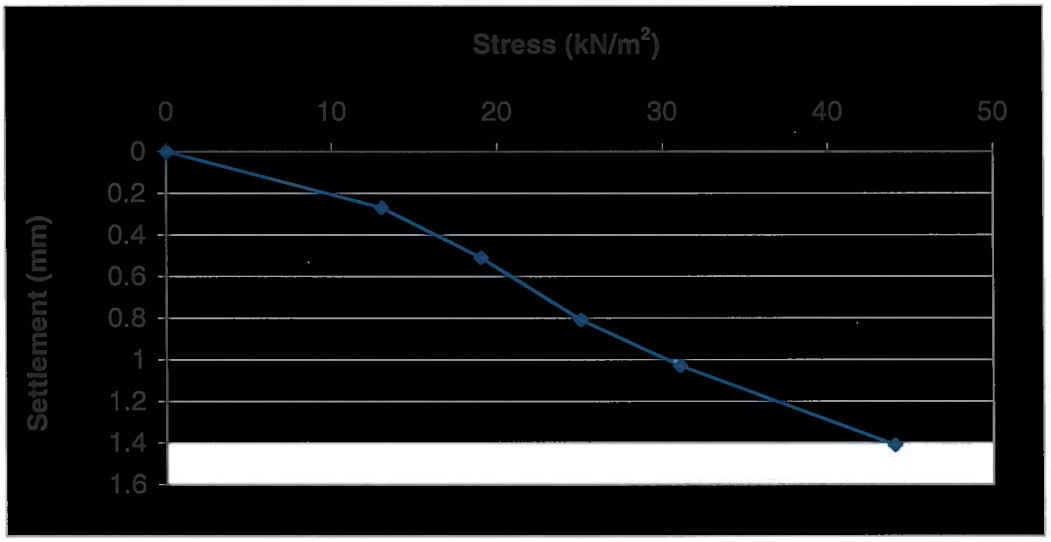
Report No:	**WA6966/14/27**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	7
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**7**
	Manchester		
	M17 8PL		
		Date tested	**10/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Sand**	Plate size (mm):	450
Test location:	**Position CBR 25**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	26

Results

Stress kN/m²	Settlement mm
0	0
13	0.27
19	0.51
25	0.81
31	1.03
44	1.41

Max stress kN/m²
44
Max deflection mm
1.41



K_{762} value (kN/m²/mm)	19.2

EQUIVALENT CBR VALUE (%)	1.6

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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TEST REPORT

DETERMINATION OF EQUIVALENT CBR VALUE
PLATE LOADING TEST

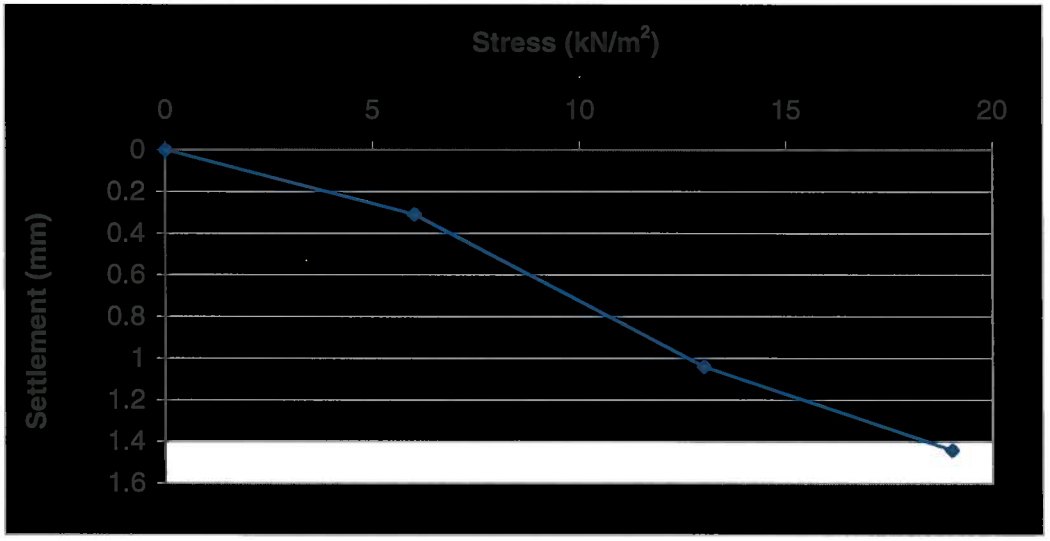
In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

Report No:	**WA6966/14/28**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	8
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**8**
	Manchester		
	M17 8PL		
		Date tested	**10/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Sand & Silt**	Plate size (mm):	450
Test location:	**Position CBR 24**	Moisture content % (BS 1377-2:1990 Clause 3.2)	49

Results

Stress kN/m²	Settlement mm
0	0
6	0.31
13	1.04
19	1.44

Max stress kN/m²
19
Max deflection mm
1.44



K_{762} value (kN/m²/mm)	8.1

EQUIVALENT CBR VALUE (%)	0.4

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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PLATE LOADING TEST

In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

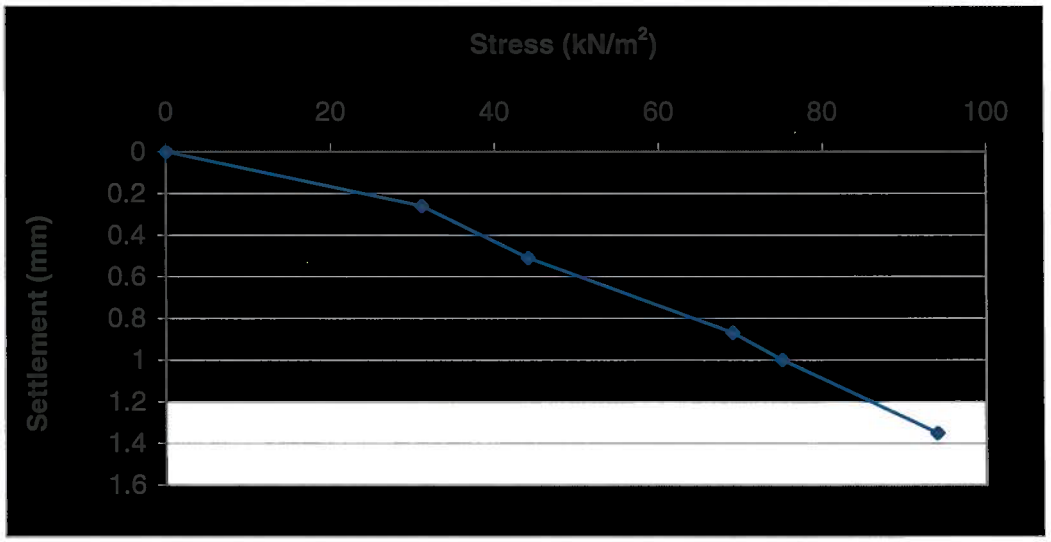
Report No:	**WA6966/14/29**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	9
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**9**
	Manchester		
	M17 8PL		
		Date tested	**10/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Sand**	Plate size (mm):	450
Test location:	**Position CBR 26**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	9.8

Results

Stress kN/m²	Settlement mm
0	0
31	0.26
44	0.51
69	0.87
75	1.00
94	1.35

Max stress kN/m²
94
Max deflection mm
1.35



K_{762} value (kN/m²/mm)	44.2

EQUIVALENT CBR VALUE (%)	6.9

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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PLATE LOADING TEST

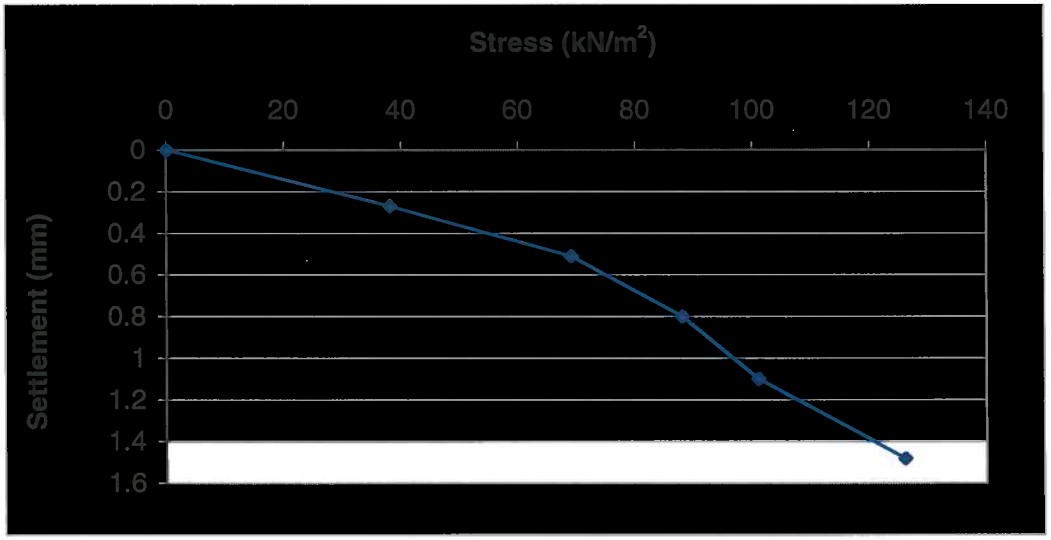
In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

Report No:	**WA6966/14/30**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	10
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**10**
	Manchester		
	M17 8PL		
		Date tested	**10/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Sand**	Plate size (mm):	450
Test location:	**Position CBR 27**	Moisture content % (BS 1377-2:1990 Clause 3.2)	6.2

Results

Stress kN/m²	Settlement mm
0	0
38	0.27
69	0.51
88	0.80
101	1.10
126	1.48

Max stress kN/m²
126
Max deflection mm
1.48



K_{762} value (kN/m²/mm)	55.3

EQUIVALENT CBR VALUE (%)	10

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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DETERMINATION OF EQUIVALENT CBR VALUE
PLATE LOADING TEST

In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

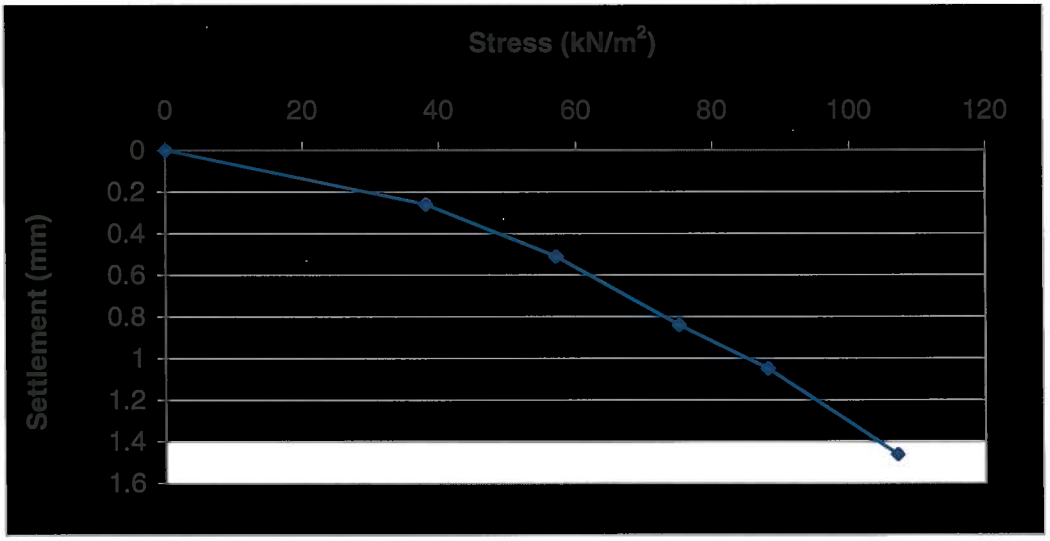
Report No:	**WA6966/14/31**	Report Date:	17/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	11
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**11**
	Manchester		
	M17 8PL		
		Date tested	**10/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Sand**	Plate size (mm):	450
Test location:	**Position CBR 28**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	5.4

Results

Stress kN/m²	Settlement mm
0	0
38	0.26
57	0.51
75	0.84
88	1.05
107	1.46

Max stress kN/m²
107
Max deflection mm
1.46



K_{762} value (kN/m²/mm)	48.5

EQUIVALENT CBR VALUE (%)	8

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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PLATE LOADING TEST

In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

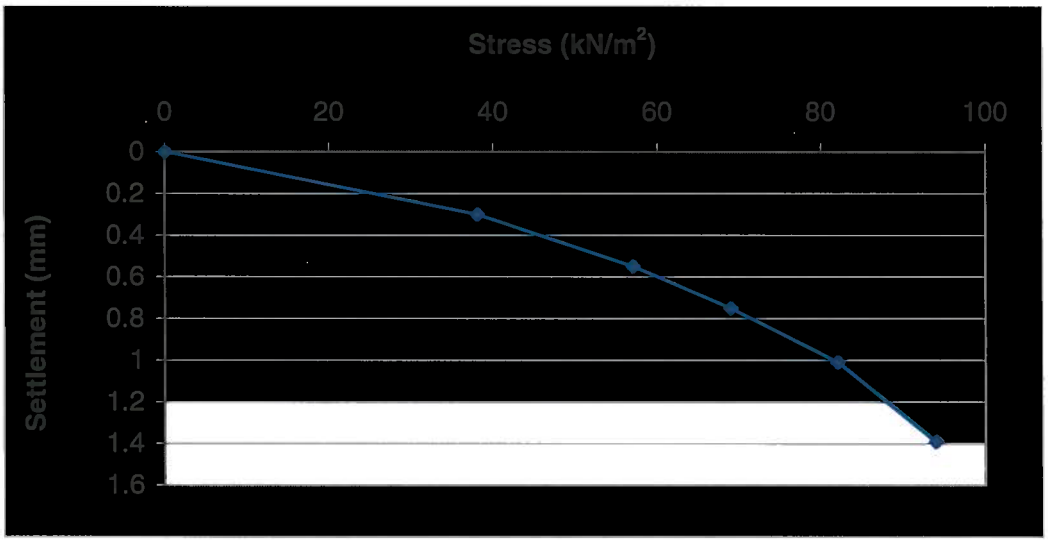
Report No:	**WA6966/14/32**	Report Date:	18/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	1
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**1**
	Manchester		
	M17 8PL		
		Date tested	**11/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Sand**	Plate size (mm):	450
Test location:	**Position CBR 29**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	1.7

Results

Stress kN/m²	Settlement mm
0	0
38	0.30
57	0.55
69	0.75
82	1.01
94	1.39

Max stress kN/m²
94
Max deflection mm
1.39



K_{762} value (kN/m²/mm)	44.7

EQUIVALENT CBR VALUE (%)	7

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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PLATE LOADING TEST

In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

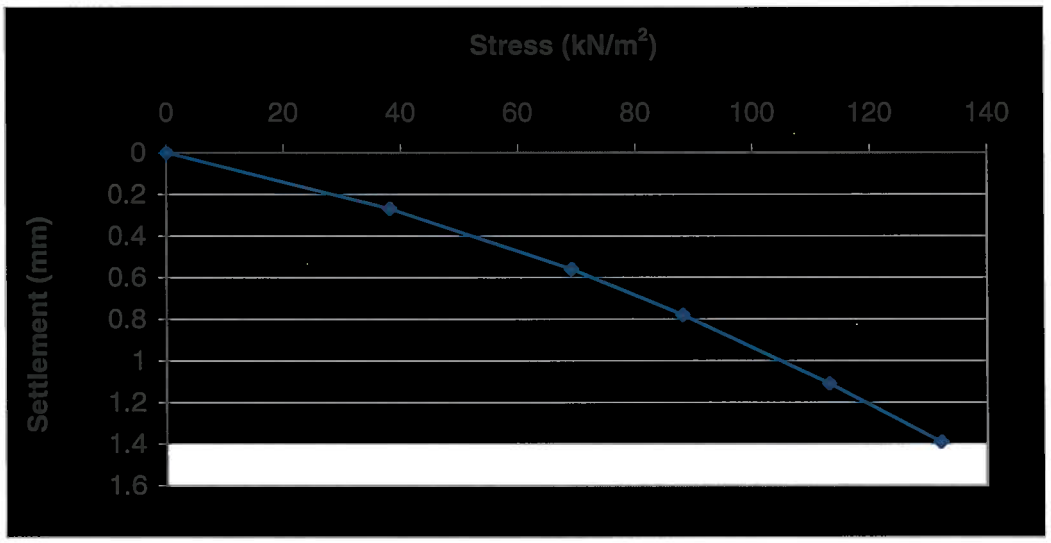
Report No:	**WA6966/14/33**	Report Date:	18/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	2
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**2**
	Manchester		
	M17 8PL		
		Date tested	**11/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Sand**	Plate size (mm):	450
Test location:	**Position CBR 30**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	3.7

Results

Stress kN/m²	Settlement mm
0	0
38	0.27
69	0.56
88	0.78
113	1.11
132	1.39

Max stress kN/m²
132
Max deflection mm
1.39



K_{762} value (kN/m²/mm)	61.1

EQUIVALENT CBR VALUE (%)	12

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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TEST REPORT

DETERMINATION OF EQUIVALENT CBR VALUE
PLATE LOADING TEST
In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

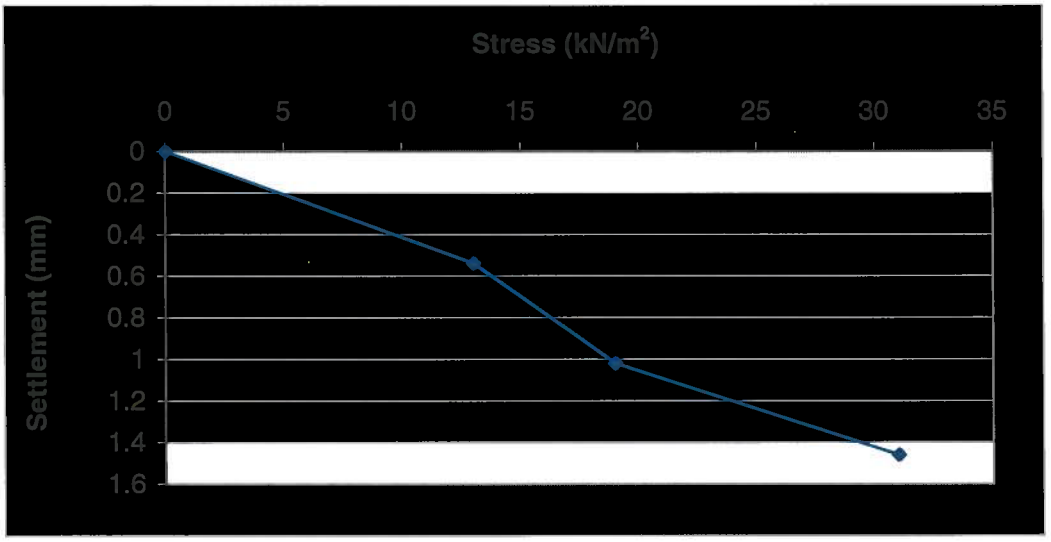
Report No:	**WA6966/14/34**	Report Date:	18/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	3
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**3**
	Manchester		
	M17 8PL		
		Date tested	**11/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Sand**	Plate size (mm):	450
Test location:	**Position CBR 31**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	18

Results

Stress kN/m²	Settlement mm
0	0
13	0.54
19	1.02
31	1.46

Max stress kN/m²
31
Max deflection mm
1.46



K_{762} value (kN/m²/mm)	12.6

EQUIVALENT CBR VALUE (%)	0.8

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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PLATE LOADING TEST

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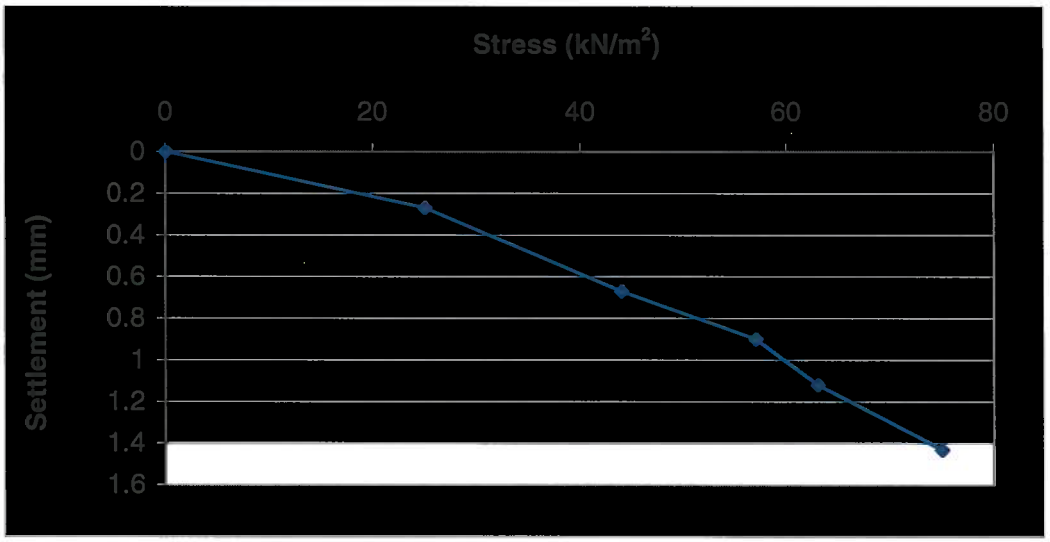
Report No:	**WA6966/14/35**	Report Date:	18/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	4
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**4**
	Manchester		
	M17 8PL		
		Date tested	**11/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Sand**	Plate size (mm):	450
Test location:	**Position CBR 32**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	2.7

Results

Stress kN/m²	Settlement mm
0	0
25	0.27
44	0.67
57	0.90
63	1.12
75	1.43

Max stress kN/m²
75
Max deflection mm
1.43



K_{762} value (kN/m²/mm)	33.9

EQUIVALENT CBR VALUE (%)	4.3

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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PLATE LOADING TEST

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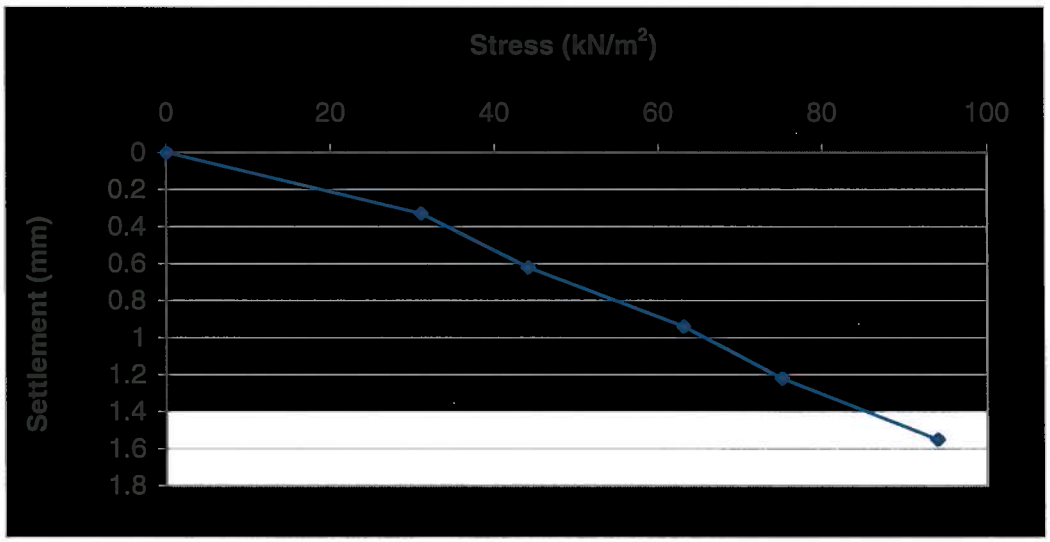
Report No:	**WA6966/14/36**	Report Date:	18/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	5
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**5**
	Manchester		
	M17 8PL		
		Date tested	**11/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Sand**	Plate size (mm):	450
Test location:	**Position CBR 33**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	3.3

Results

Stress kN/m²	Settlement mm
0	0
31	0.33
44	0.62
63	0.94
75	1.22
94	1.55

Max stress kN/m²
94
Max deflection mm
1.55



K_{762} value (kN/m²/mm)	38.2

EQUIVALENT CBR VALUE (%)	5.3

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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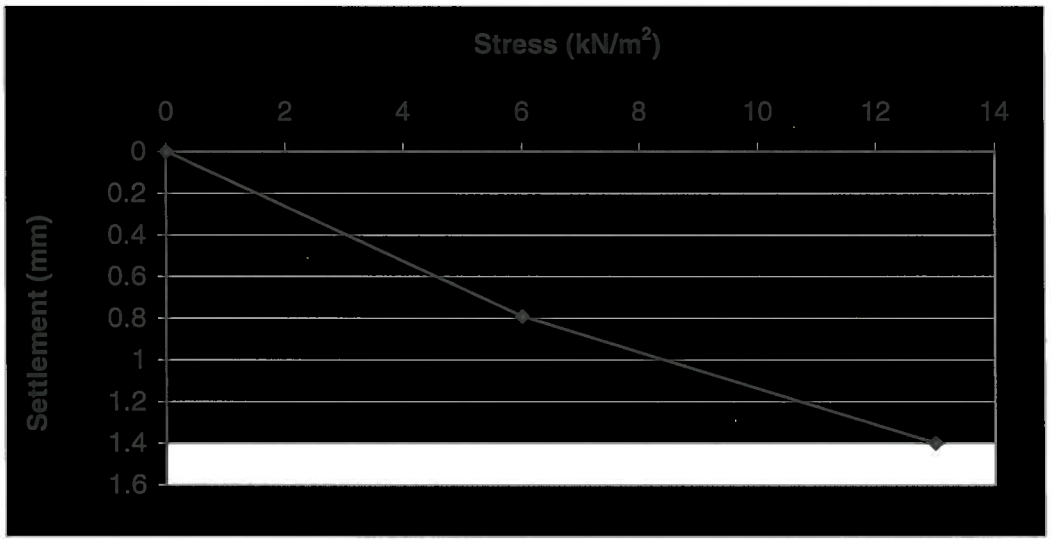
Report No:	**WA6966/14/37**	Report Date:	18/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	6
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**6**
	Manchester		
	M17 8PL		
		Date tested	**11/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Silt some Sand**	Plate size (mm):	450
Test location:	**Position CBR 41**	Moisture content % (BS 1377-2:1990 Clause 3.2)	50

Results

Stress kN/m²	Settlement mm
0	0
6	0.79
13	1.40

Max stress kN/m²
13
Max deflection mm
1.4



K_{762} value (kN/m²/mm)	5.6

EQUIVALENT CBR VALUE (%)	0.2

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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PLATE LOADING TEST

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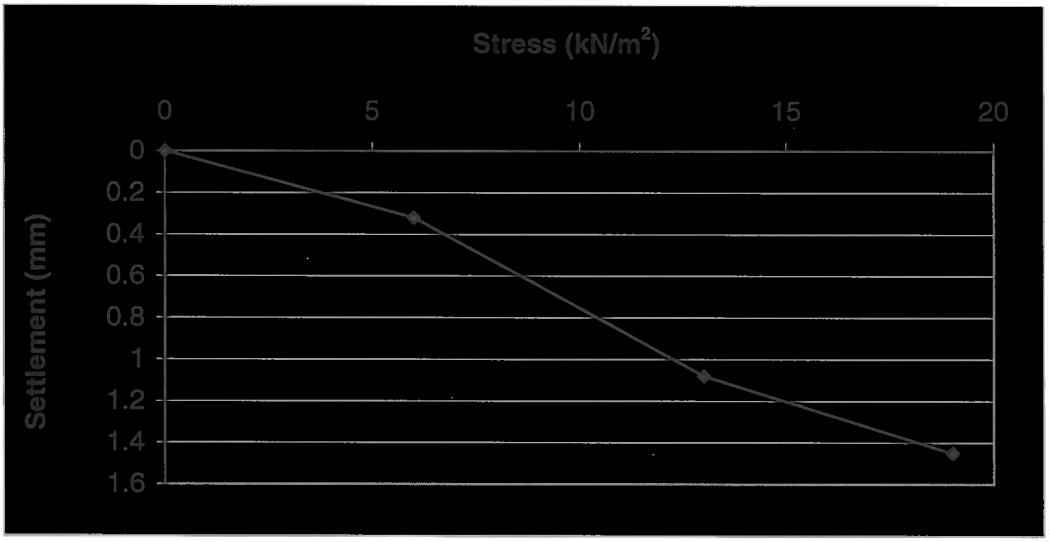
Report No:	**WA6966/14/38**	Report Date:	18/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	7
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**7**
	Manchester		
	M17 8PL		
		Date tested	**11/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Silt**	Plate size (mm):	450
Test location:	**Position CBR 40**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	54

Results

Stress kN/m²	Settlement mm
0	0
6	0.32
13	1.08
19	1.45

Max stress kN/m²
19
Max deflection mm
1.45



K_{762} value (kN/m²/mm)	7.9

EQUIVALENT CBR VALUE (%)	0.3

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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PLATE LOADING TEST

In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

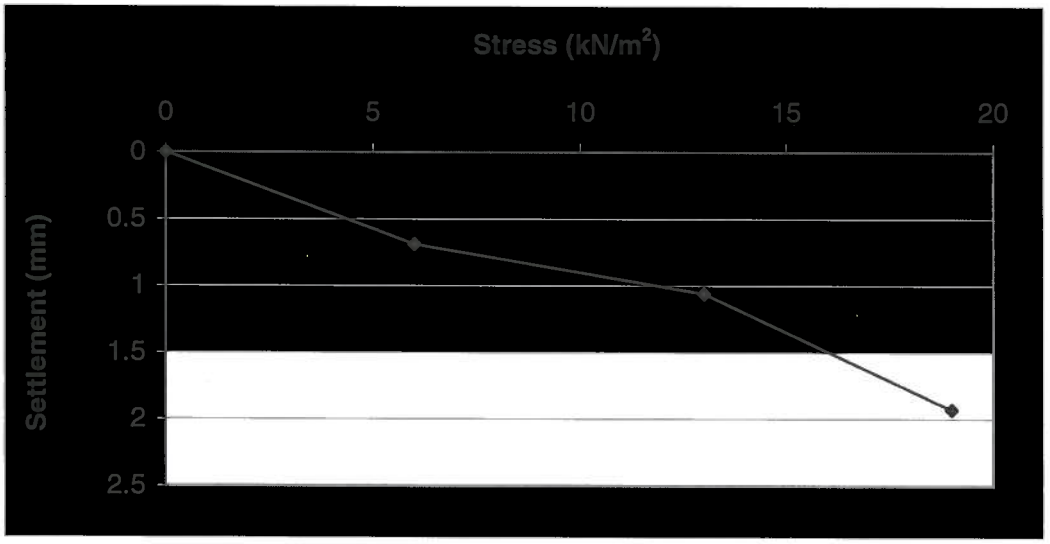
Report No:	**WA6966/14/39**	Report Date:	18/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	8
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**8**
	Manchester		
	M17 8PL		
		Date tested	**11/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Silt**	Plate size (mm):	450
Test location:	**Position CBR 39**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	62

Results

Stress kN/m²	Settlement mm
0	0
6	0.69
13	1.06
19	1.93

Max stress kN/m²
19
Max deflection mm
1.93



K_{762} value (kN/m²/mm)	7.1

EQUIVALENT CBR VALUE (%)	0.3

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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TEST REPORT

DETERMINATION OF EQUIVALENT CBR VALUE
PLATE LOADING TEST

In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

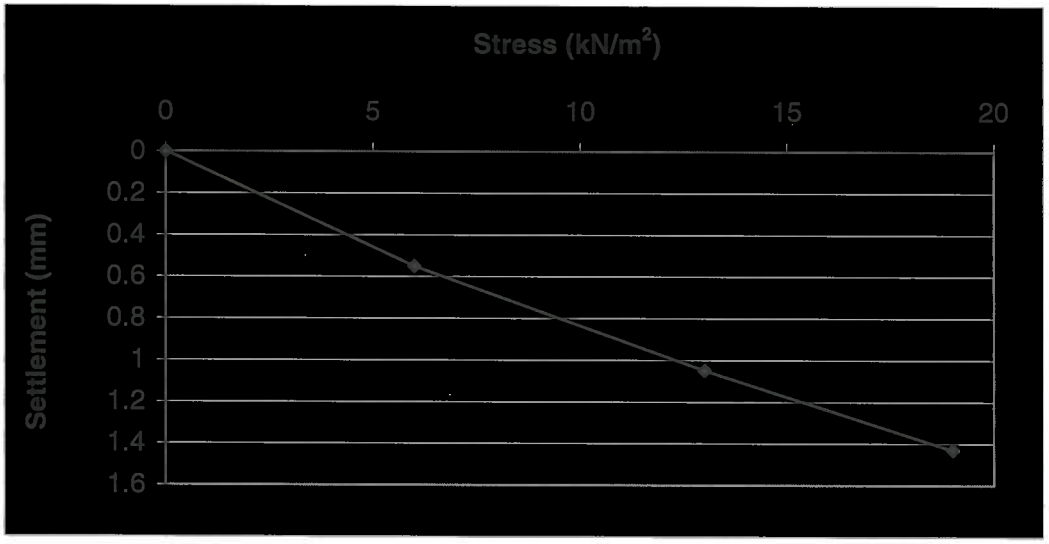
Report No:	**WA6966/14/40**	Report Date:	18/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	9
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**9**
	Manchester		
	M17 8PL		
		Date tested	**11/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Silt**	Plate size (mm):	450
Test location:	**Position CBR 38**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	60

Results

Stress kN/m²	Settlement mm
0	0
6	0.55
13	1.05
19	1.43

Max stress kN/m²
19
Max deflection mm
1.43



K_{762} value (kN/m²/mm)	8.1

EQUIVALENT CBR VALUE (%)	0.4

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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DETERMINATION OF EQUIVALENT CBR VALUE
PLATE LOADING TEST

In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

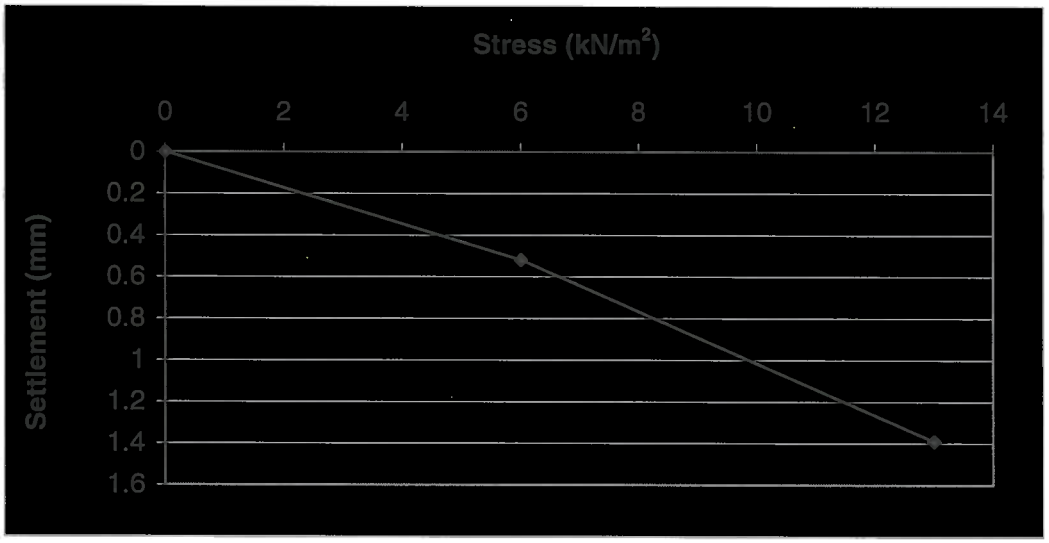
Report No:	**WA6966/14/41**	Report Date:	18/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	10
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**10**
	Manchester		
	M17 8PL		
		Date tested	**11/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Silt**	Plate size (mm):	450
Test location:	**Position CBR 37**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	57

Results

Stress kN/m²	Settlement mm
0	0
6	0.52
13	1.39

Max stress kN/m²
13
Max deflection mm
1.39



K_{762} value (kN/m²/mm)	5.9

EQUIVALENT CBR VALUE (%)	0.2

Remarks:
Tested 300mm Below Surface

Signed [redacted]

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TEST REPORT

DETERMINATION OF EQUIVALENT CBR VALUE
PLATE LOADING TEST

In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

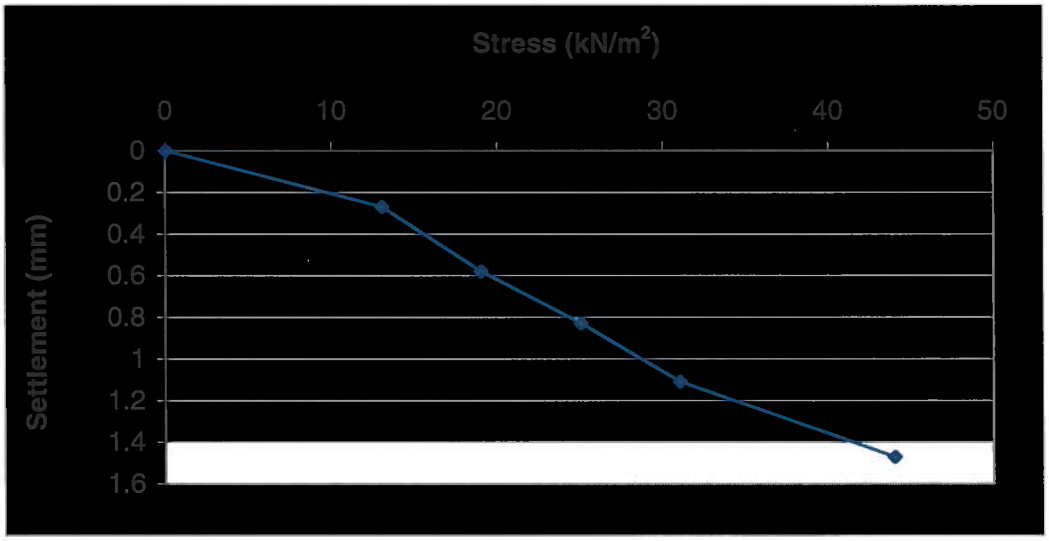
Report No:	**WA6966/14/42**	Report Date:	18/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	1
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**1**
	Manchester		
	M17 8PL		
		Date tested	**12/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Sunny
		Kentledge:	10 Ton Excavator
Material Description:	**Sand**	Plate size (mm):	450
Test location:	**Position CBR 34**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	16

Results

Stress kN/m²	Settlement mm
0	0
13	0.27
19	0.58
25	0.83
31	1.11
44	1.47

Max stress kN/m²
44
Max deflection mm
1.47



K_{762} value (kN/m²/mm)	18

EQUIVALENT CBR VALUE (%)	1.4

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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TEST REPORT

DETERMINATION OF EQUIVALENT CBR VALUE
PLATE LOADING TEST

In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

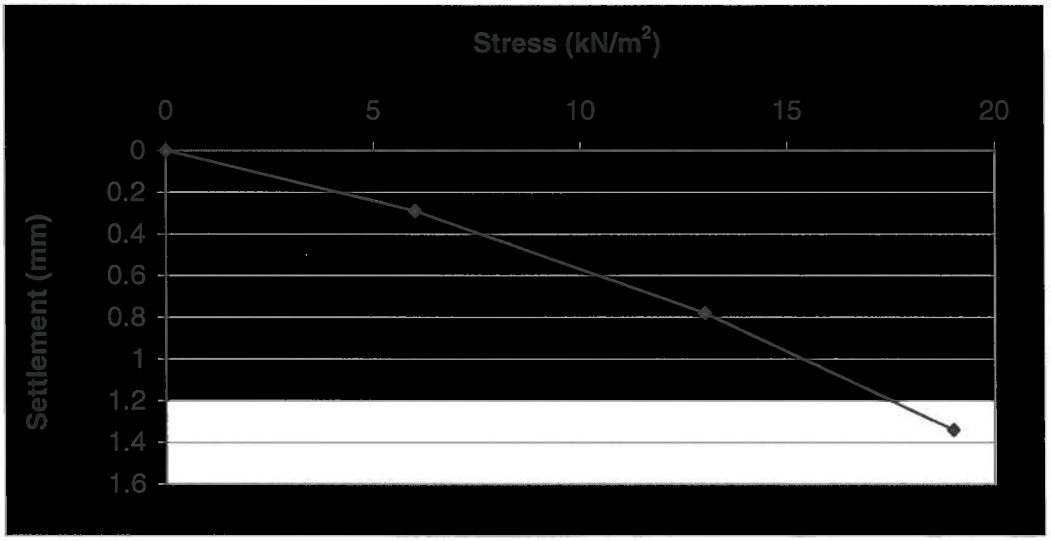
Report No:	**WA6966/14/43**	Report Date:	18/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	2
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**2**
	Manchester		
	M17 8PL		
		Date tested	**12/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Overcast
		Kentledge:	10 Ton Excavator
Material Description:	**Silt**	Plate size (mm):	450
Test location:	**Position CBR 35**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	56

Results

Stress kN/m²	Settlement mm
0	0
6	0.29
13	0.78
19	1.34

Max stress kN/m²
19
Max deflection mm
1.34



K_{762} value (kN/m²/mm)	9

EQUIVALENT CBR VALUE (%)	0.4

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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TEST REPORT

DETERMINATION OF EQUIVALENT CBR VALUE
PLATE LOADING TEST

In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

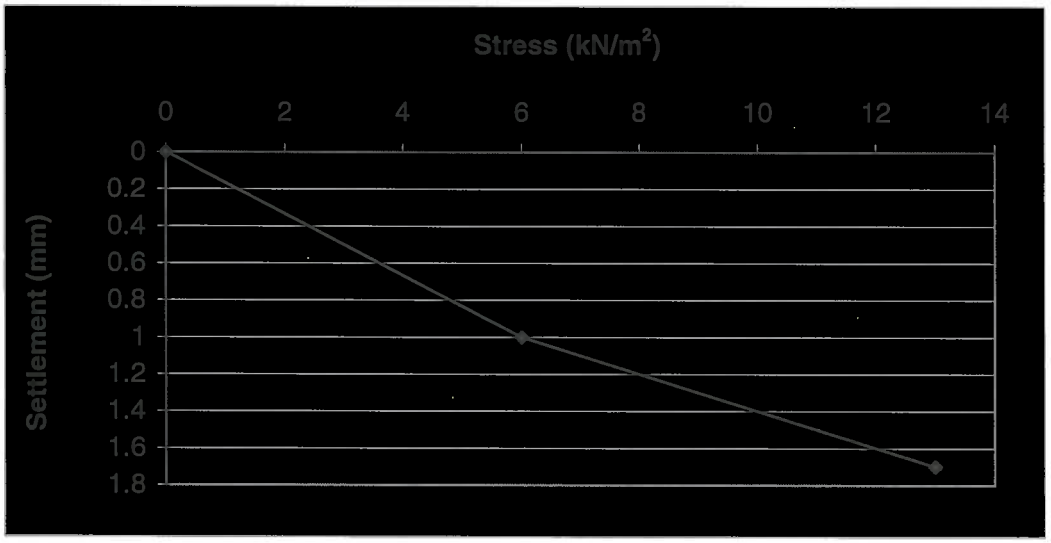
Report No:	**WA6966/14/44**	Report Date:	18/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	3
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**3**
	Manchester		
	M17 8PL		
		Date tested	**12/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Overcast
		Kentledge:	10 Ton Excavator
Material Description:	**Silt**	Plate size (mm):	450
Test location:	**Position CBR 36**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	51

Results

Stress kN/m²	Settlement mm
0	0
6	1.00
13	1.70

Max stress kN/m²
13
Max deflection mm
1.7



K_{762} value (kN/m²/mm)	4.2

EQUIVALENT CBR VALUE (%)	0.1

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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TEST REPORT

DETERMINATION OF EQUIVALENT CBR VALUE
PLATE LOADING TEST

In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

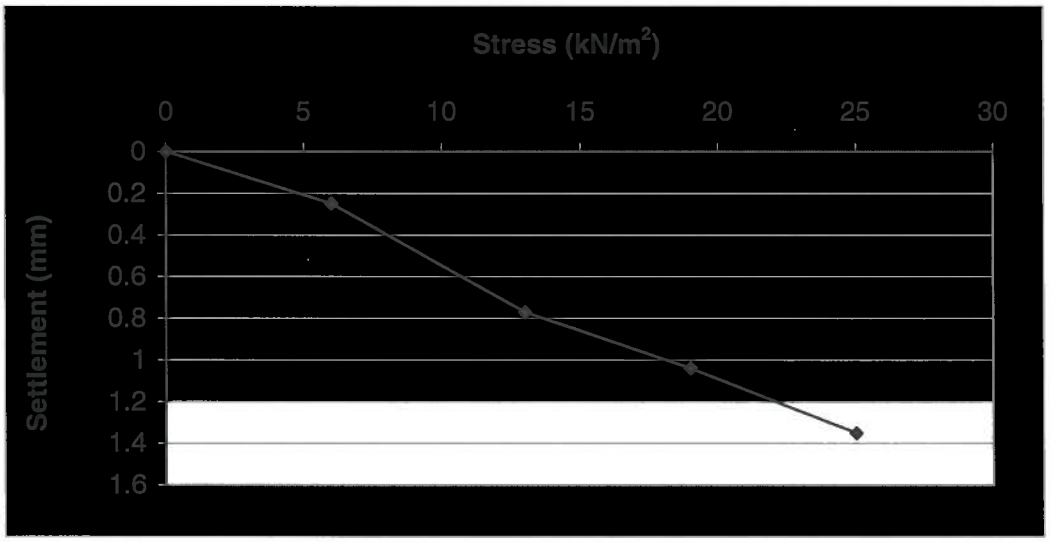
Report No:	**WA6966/14/45**	Report Date:	18/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	4
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**4**
	Manchester		
	M17 8PL		
		Date tested	**12/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Overcast
		Kentledge:	10 Ton Excavator
Material Description:	**Silt some Sand**	Plate size (mm):	450
Test location:	**Position CBR 42**		

Moisture content % (BS 1377-2:1990 Clause 3.2)	50

Results

Stress kN/m²	Settlement mm
0	0
6	0.25
13	0.77
19	1.04
25	1.35

Max stress kN/m²
25
Max deflection mm
1.35



K_{762} value (kN/m²/mm)	11.5

EQUIVALENT CBR VALUE (%)	0.7

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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TEST REPORT

DETERMINATION OF EQUIVALENT CBR VALUE
PLATE LOADING TEST

In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

Report No:	**WA6966/14/46**	Report Date:	18/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	5
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**5**
	Manchester		
	M17 8PL		
		Date tested	**12/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Overcast
		Kentledge:	10 Ton Excavator
Material Description:	**Silt some Sand**	Plate size (mm):	450
Test location:	**Position CBR 43**	Moisture content % (BS 1377-2:1990 Clause 3.2)	44

Results

Stress kN/m²	Settlement mm
0	0
6	0.49
13	0.99
19	1.34

Max stress kN/m²
19
Max deflection mm
1.34

K_{762} value (kN/m²/mm)	8.7

EQUIVALENT CBR VALUE (%)	0.4

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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TEST REPORT

DETERMINATION OF EQUIVALENT CBR VALUE
PLATE LOADING TEST

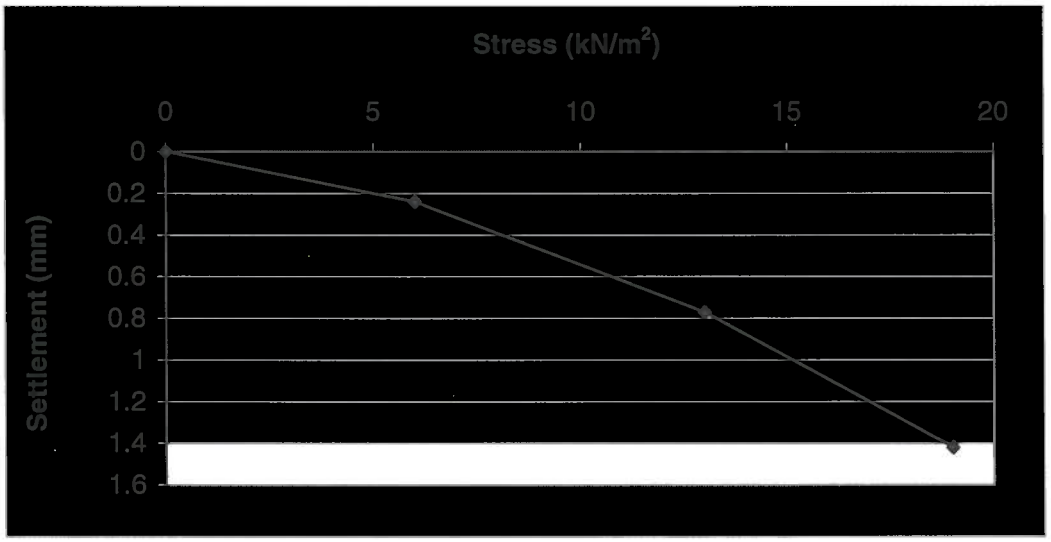
In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

Report No:	**WA6966/14/47**	Report Date:	18/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	6
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**6**
	Manchester		
	M17 8PL		
		Date tested	**12/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Overcast
		Kentledge:	10 Ton Excavator
Material Description:	**Silt**	Plate size (mm):	450
Test location:	**Position CBR 44**	Moisture content % (BS 1377-2:1990 Clause 3.2)	40

Results

Stress kN/m²	Settlement mm
0	0
6	0.24
13	0.77
19	1.42

Max stress kN/m²
19
Max deflection mm
1.42



K_{762} value (kN/m²/mm)	8.7

EQUIVALENT CBR VALUE (%)	0.4

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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PLATE LOADING TEST

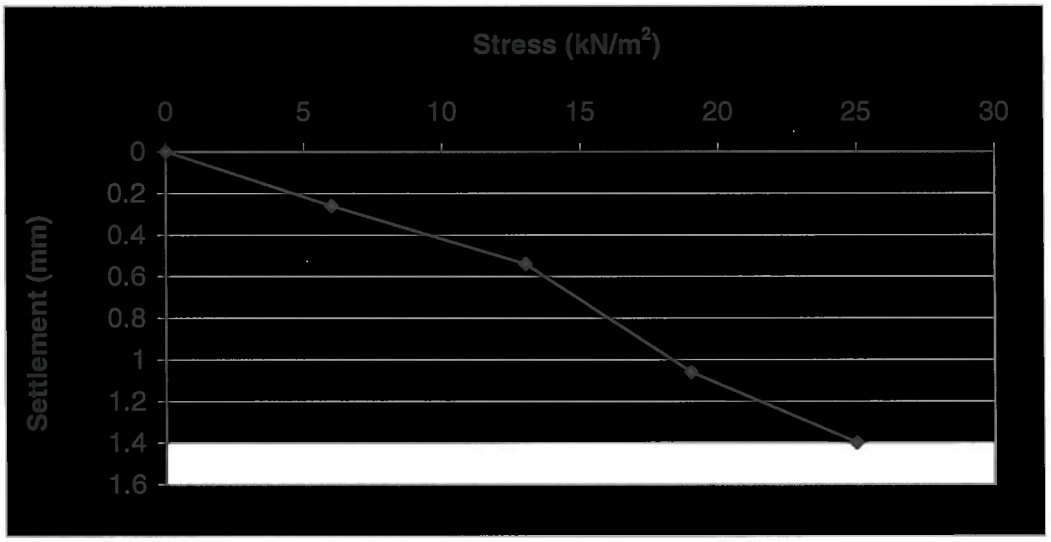
In accordance with ESG's In-house procedure & DMRB Volume 7, IAN 73/06 rev 1 (2009).

Report No:	**WA6966/14/48**	Report Date:	18/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	7
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**7**
	Manchester		
	M17 8PL		
		Date tested	**12/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Overcast
		Kentledge:	10 Ton Excavator
Material Description:	**Silt & Sand**	Plate size (mm):	450
Test location:	**Position CBR 45**	Moisture content % (BS 1377-2:1990 Clause 3.2)	31

Results

Stress kN/m²	Settlement mm
0	0
6	0.26
13	0.54
19	1.06
25	1.40

Max stress kN/m²
25
Max deflection mm
1.4



K_{762} value (kN/m²/mm)	11.2

EQUIVALENT CBR VALUE (%)	0.6

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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PLATE LOADING TEST

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Report No:	**WA6966/14/49**	Report Date:	18/09/2014
Client:	**Frodsham Wind Farm Ltd**	Laboratory ref:	8
Address	**Peel Dome**		
	The Trafford Centre	**Client ref.**	**8**
	Manchester		
	M17 8PL		
		Date tested	**12/09/2014**
		Tested By:	ESG (PR)
Client contact:	**James Northeast**		
Site:	**Frodsham Wind Farm, Cheshire**	Weather conditions:	Overcast
		Kentledge:	10 Ton Excavator
Material Description:	**Silt & Sand**	Plate size (mm):	450
Test location:	**Position CBR 46**	Moisture content % (BS 1377-2:1990 Clause 3.2)	36

Results

Stress kN/m²	Settlement mm
0	0
6	0.29
13	0.82
19	1.17
31	1.75

Max stress kN/m²
31
Max deflection mm
1.75

K_{762} value (kN/m²/mm)	10.3

EQUIVALENT CBR VALUE (%)	0.5

Remarks:
Tested 300mm Below Surface

Signed: [redacted]

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Hole No	Test Number	Date	Reference depth (mBGL)	Thermal Resistivity (ρ) (°C *cm/W)	Temperature (°C)	Thermal Conductivity (K) (W/m*K)		Equipment used	Remarks
TP R22	1	30 Sep 2014	0.90	52.69	15.31	1.898		Decagon KD2 Pro	
TP R23	1	30 Sep 2014	0.90	301.90	15.27	0.331		Decagon KD2 Pro	
TP R24	1	30 Sep 2014	0.90	90.39	14.27	1.106		Decagon KD2 Pro	
TP R25	1	30 Sep 2014	0.90	102.10	14.06	0.579		Decagon KD2 Pro	
TP R26	1	30 Sep 2014	0.90	57.01	14.70	1.754		Decagon KD2 Pro	
TP R27	1	30 Sep 2014	0.90	126.90	14.10	0.789		Decagon KD2 Pro	
TP R28	1	30 Sep 2014	0.90	92.33	14.24	1.083		Decagon KD2 Pro	

Notes:

Date	Position	Electrode Spacing	Orientation (Degrees)	Resistance Measured Ω	Resistivity Ωm	Resistivity for location (Ωm)
23/09/2014	R2	1	200	0.78	4.90	5.06
			290	0.83	5.22	
		3	200	0.08	1.51	1.51
			290	0.08	1.51	
		10	200	0		Test Fail
			290	0		
23/09/2014	R9	1	010	1.21	7.60	7.16
			100	1.07	6.72	
		3	010	0.08	1.51	1.41
			100	0.07	1.32	
		10	010	0		Test Fail
			100	0		
22/09/2014	R13	1	120	2.34	14.70	14.33
			210	2.22	13.95	
		3	120	0.12	2.26	2.45
			210	0.14	2.64	
		10	120	0.02	1.26	1.26
			210	0.02	1.26	
23/09/2014	R15	1	220	2.5	15.71	15.43
			310	2.41	15.14	
		3	220	0.13	2.45	2.54
			310	0.14	2.64	
		10	220	0		Test Fail
			310	0		
23/09/2014	R16	1	340	0.46	2.89	2.61
			070	0.37	2.32	
		3	340	0.03	0.57	0.75
			070	0.05	0.94	
		10	340	0		Test Fail
			070	0		
22/09/2014	R20	1	060	0.55	3.46	3.05
			150	0.42	2.64	
		3	060	0.03	0.57	0.57
			150	0.03	0.57	
		10	060	0		Test Fail
			150	0		
22/09/2014	R21	1	260	1.28	8.04	7.63
			350	1.15	7.23	
		3	260	0.08	1.51	1.60
			350	0.09	1.70	
		10	260	0.03	1.88	1.88
			350	0.03	1.88	

Notes:	Table
Surface ground conditions on days on tests were dry. Equipment used = DET5/3R (SN: 960281 1010 0296). 4 Electrode testing at all positions. Equipment checked before each test using 100Ω resistor	D2

Project:	Frodsham Wind Farm
Project No.	F4036-14
Carried out for:	Peel Wind Farms (Frodsham) Limited

INDEX PROPERTIES - SUMMARY OF RESULTS

Project No	Project Name
F4036-14	Frodsham Wind Farm

Hole No.	Sample No.	Depth (m) from	Depth (m) to	type	Soil Description	p Mg/m^3	p_d Mg/m^3	w %	< 425 µm sieve %	W_L %	W_P %	I_P	p_s Mg/m^3	Remarks
BH01	8	4.00	4.45	B	Black and brown slightly sandy CLAY.			104	100 n	128 a	38	90		
BH01	26	15.00	15.45	B	Dark greyish brown slightly gravelly slightly silty SAND.			18	86 s	21 b	NP			
BH02	7	2.00	2.45	B	Greyish brown slightly sandy CLAY with occasional rootlets.			90	100 s	95 a	45	50		
BH03	20	9.00	9.45	B	Greyish brown slightly sandy CLAY.			30	99 s	55 a	23	32		
BH04	28	10.50	10.95	B	Dark greyish brown silty CLAY.			80	100 n	128 a	59	69		
BH05	32	13.50	13.95	B	Brownish grey slightly sandy silty CLAY.			36	100 n	45 a	25	20		
BH06	4	2.00	2.45	B	Black and brown slightly sandy slightly gravelly CLAY with occasional rootlets.			102	100 n	113 a	61	52		
BH07	4	2.00	2.45	B	Black slightly sandy slightly gravelly CLAY.			119	100 n	134 a	41	93		
BH08	37	23.50	23.95	B	Brown slightly sandy slightly gravelly CLAY.			21	93 s	37 a	19	18		
BH09	6	3.00	3.45	B	Black slightly sandy slightly gravelly CLAY.			92	99 n	99 a	45	54		
BH10	5	2.50	3.00	B	Black and brown slightly sandy CLAY with rootlets.			67	100 s	69 a	27	42		
BH10	26	12.00	12.50	B	Greyish brown clayey SILT.			34	100 n	34 a	23	11		
BH11	55	25.50	25.95	B	Brown slightly sandy slightly gravelly CLAY.			27	76 s	36 a	19	17		
BH12	12	5.00	5.50	B	Brownish grey slightly sandy CLAY.			41	100 n	50 a	28	22		
BH13	13	6.00	6.50	B	Greyish brown slightly sandy CLAY.			52	100 n	44 a	25	19		
BH14	6	2.00	2.45	B	Dark brownish grey silty CLAY.			84	100 n	96 a	46	50		
BH15	17	7.50	7.95	B	Brown slightly sandy CLAY.			29	100 n	44 a	23	21		
BH16	12	4.00	4.45	B	Dark grey and brown organic silty CLAY.			102	100 n	107 a	57	50		
BH17	6	2.00	2.45	B	Dark grey and black organic slightly sandy silty CLAY.			112	100 n	108 a	67	41		
BH17	27	9.00	9.45	B	Dark brown slightly sandy clayey SILT.			36	100 n	40 a	23	17		
BH18	10	4.00	4.45	B	Dark grey and brown silty CLAY.			100	100 s	84 a	36	48		
BH19	11	4.00	4.45	B	Dark grey and brown silty CLAY.			114	100 n	125 a	53	72		
BH20	19	7.50	8.00	B	Greyish brown organic silty CLAY.			60	100 n	49 a	26	23		
BH21	8	2.50	3.00	B	Brownish grey slightly sandy CLAY.			28	100 n	52 a	25	27		
BH21	22	7.50	8.00	B	Greyish brown clayey SILT.			57	100 n	48 a	27	21		
BH22	20	7.00	7.50	B	Greyish brown clayey SILT.			61	100 n	54 a	29	25		
BH23	10	5.00	5.50	B	Greyish brown silty CLAY.			65	100 n	57 a	27	30		
BH24	5	2.00	2.50	B	Brown slightly sandy slightly gravelly CLAY.			33	97 n	38 a	21	17		
BH25	6	3.00	3.50	B	Dark grey clayey SILT.			48	100 n	46 a	22	24		
BH26	8	4.00	4.50	B	Brownish grey slightly sandy silty CLAY.			48	100 n	34 a	21	13		
BH27	13	4.00	5.00	B	Brownish grey SAND with frequent clay pockets.			23	99 n	31 a	19	12		
BH27	36	12.50	13.00	B	Dark grey silty CLAY.			36	100 n	43 a	23	20		

General notes: All above tests carried out to BS1377 : 1990 unless annotated otherwise. See individual test reports for further details.

Key :

p	bulk density, linear	W_L Liquid limit	W_P	Plastic limit	<425um preparation	p_s	particle density
p_d	dry density	a 4 point cone test	NP	non - plastic	n from natural soil	-g = gas jar	
w	moisture content	b 1 point cone test	I_P	Plasticity Index	s sieved specimen	-p = small pyknometer	

INDEX PROPERTIES - SUMMARY OF RESULTS

Project No	Project Name
F4036-14	Frodsham Wind Farm

Hole No.	Sample No.	Depth (m) from	Depth (m) to	type	Soil Description	p Mg/m^3	p_d Mg/m^3	w %	< 425 µm sieve %	W_L %	W_P %	I_P	p_s Mg/m^3	Remarks
BH28	3	2.00	2.50	B	Dark greyish brown silty CLAY.			83	89 s	90 a	53	37		
BH28	7	6.00	6.50	B	Dark greyish brown silty CLAY.			76	99 n	86 a	32	54		
BH29	8	3.00	3.50	B	Brownish gery slightly sandy slightly gravelly CLAY.			28	93 n	51 a	24	27		
BH30	5	2.00	2.45	B	Brownish grey slightly sandy CLAY.			96	100 n	105 a	38	67		
BH32	8	3.00	3.45	B	Dark brown slightly sandy silty CLAY.			55	100 n	76 a	36	40		
BHMM	9	3.00	3.45	B	Dark grey and brown slightly sandy slightly gravelly silty CLAY.			85	100 n	93 a	43	50		
BHMM	55	25.50	25.95	B	Brown slightly sandy slightly gravelly CLAY.			26	98 s	55 a	23	32		

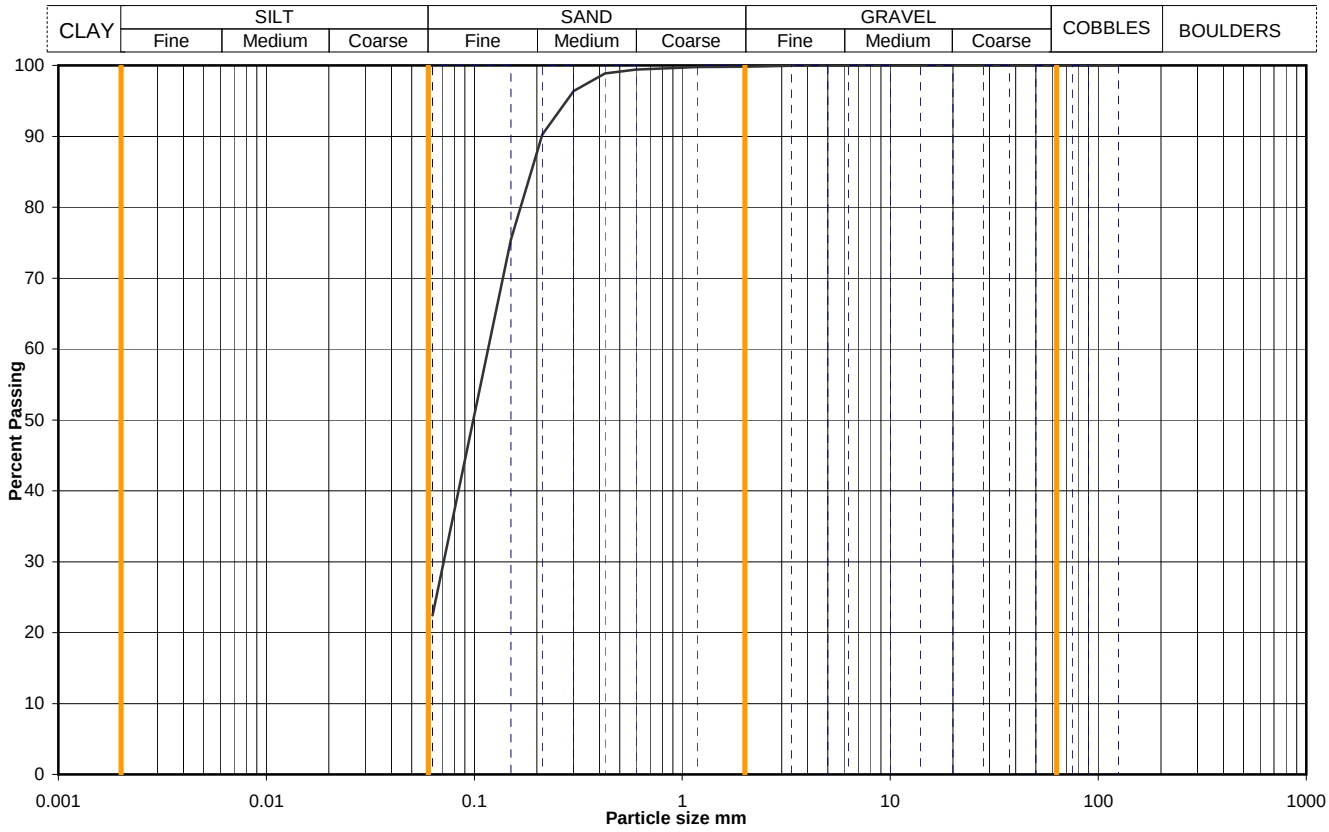
General notes: All above tests carried out to BS1377 : 1990 unless annotated otherwise. See individual test reports for further details.

Key :

p	bulk density, linear	W_L Liquid limit	W_P	Plastic limit	<425um preparation	p_s	particle density
p_d	dry density	a 4 point cone test	NP	non - plastic	n from natural soil	-g = gas jar	
w	moisture content	b 1 point cone test	I_P	Plasticity Index	s sieved specimen	-p = small pyknometer	

Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH01A		
Project Name	Frodsham Wind Farm		Depth (m BGL)	27.50		
			Samp No	16	Type	B
			ID	ESGF4036-14201409110000000614		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5.0	100		
3.35	100		
2.00	100		
1.18	100		
0.600	99		
0.425	99		
0.300	96	Dry mass of sample, kg	
0.212	90		
0.150	75	9.3	
0.063	22		

Soil description	Brown SAND with rare clay pockets.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	0	0
	Sand	77	77
	Silt	silt+clay =	
	Clay	23	23

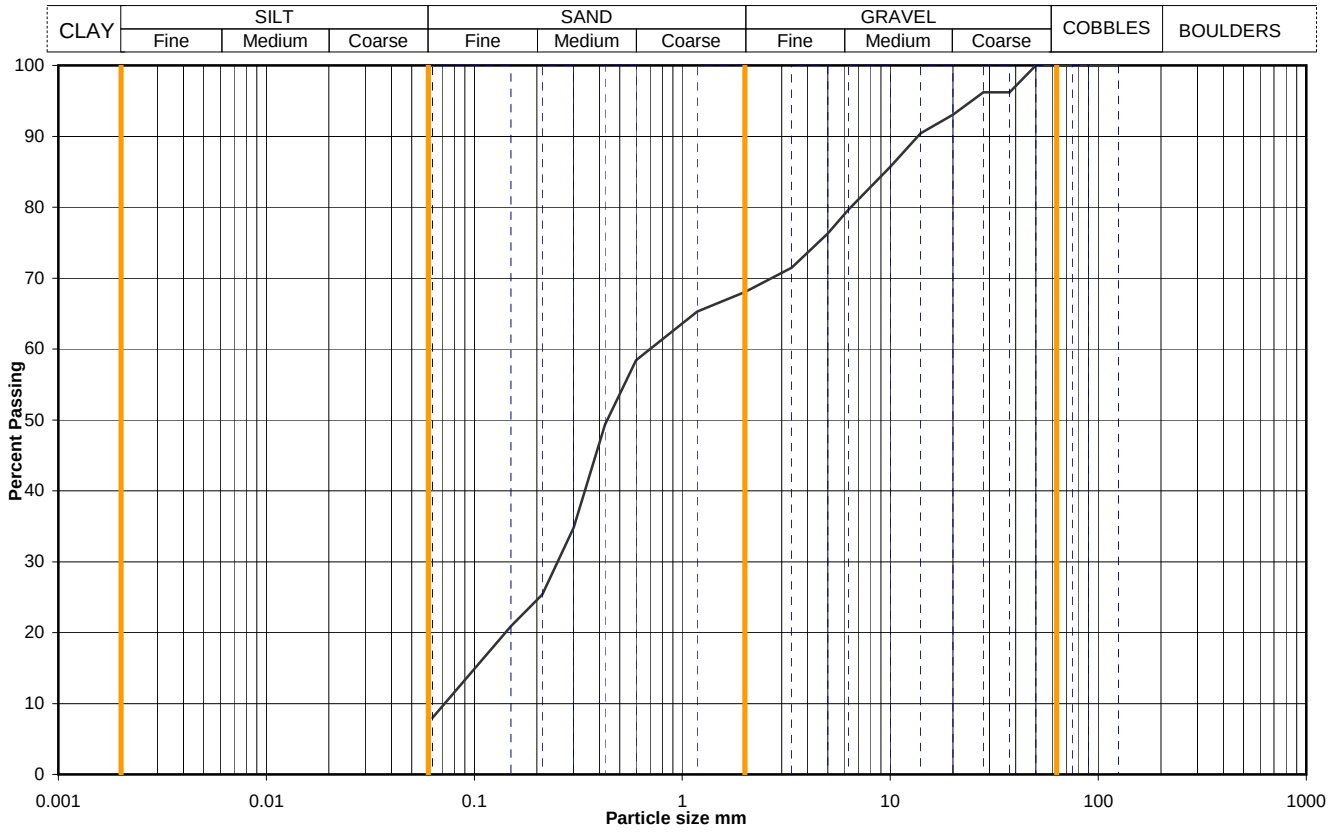
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/12/2014 10:37	**Figure** **PSD 1**

Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH02		
Project Name	Frodsham Wind Farm		Depth (m BGL)	16.00		
			Samp No	37	Type	B
			ID	ESGF4036-14201409110000000656		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	96		
28	96		
20	93		
14	90		
10	86		
6.3	80		
5.0	76		
3.35	71		
2.00	68		
1.18	65		
0.600	58		
0.425	49		
0.300	35	Dry mass of sample, kg	
0.212	25		
0.150	21	4.4	
0.063	8		

Soil description	Greyish brown very gravelly clayey SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	32	32
	Sand	60	60
	Silt	silt+clay =	
	Clay	8	8

Uniformity Coefficient	D_{60} / D_{10}	10

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

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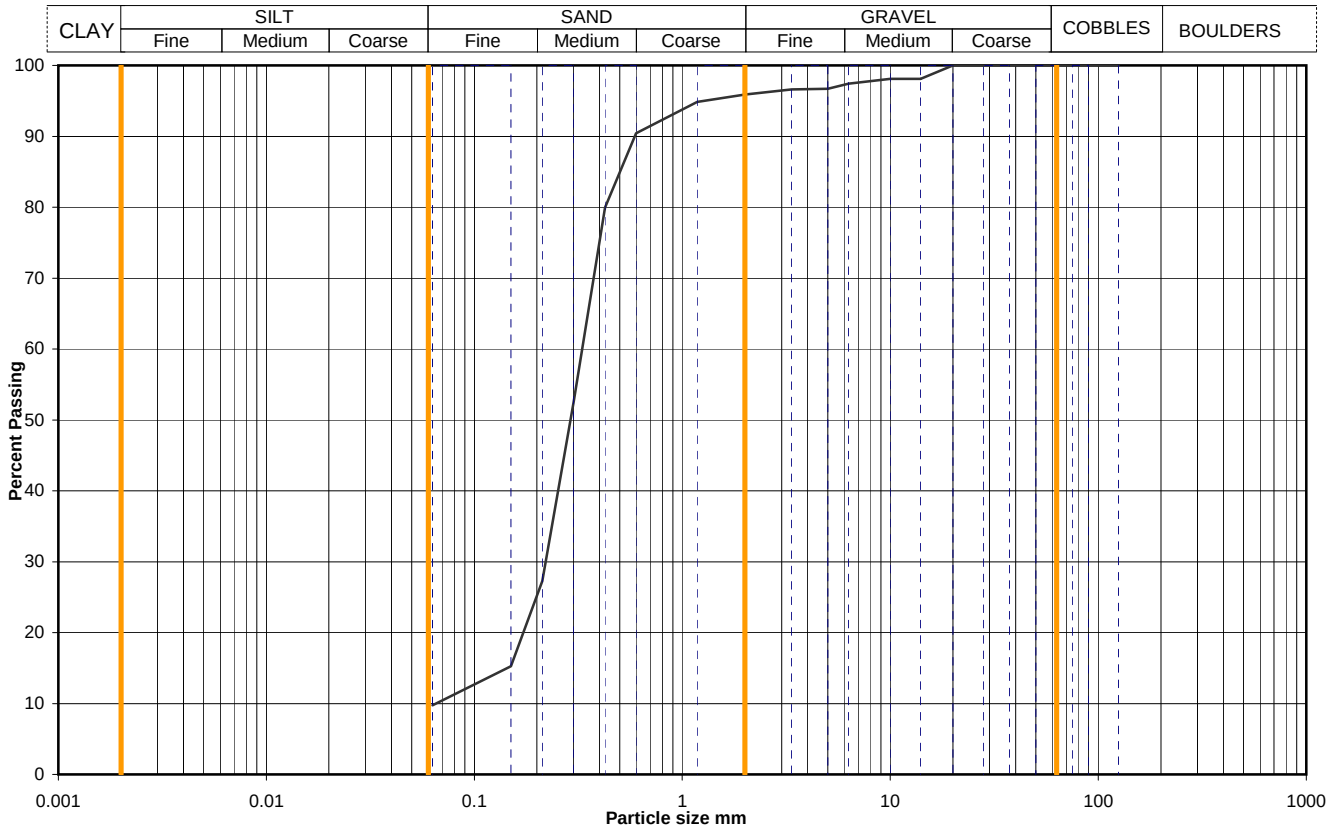
Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH03		
Project Name	Frodsham Wind Farm		Depth (m BGL)	16.00		
			Samp No	34	Type	B
			ID	ESGF4036-14201409050000000285		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	98		
10	98		
6.3	97		
5.0	97		
3.35	97		
2.00	96		
1.18	95		
0.600	90		
0.425	80		
0.300	53	Dry mass of sample, kg	
0.212	27		
0.150	15	7.3	
0.063	10		

Soil description	Grey slightly gravelly silty SAND with occasional plant remains.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	4	4
	Sand	86	86
	Silt	silt+clay =	
	Clay	10	10

Uniformity Coefficient	D_{60} / D_{10}	5

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

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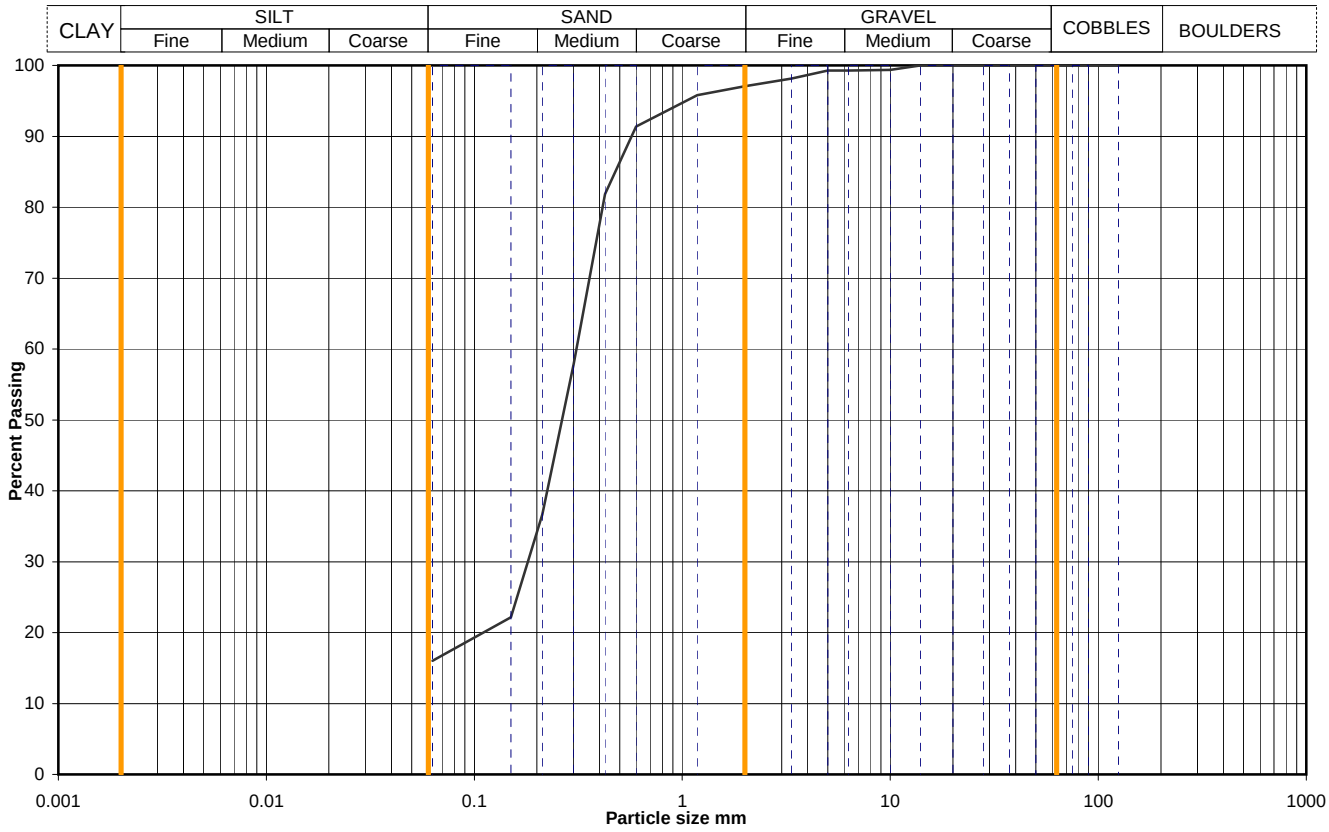
Figure **PSD 3**

Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH04		
Project Name	Frodsham Wind Farm		Depth (m BGL)	13.50		
			Samp No	33	Type	B
			ID	ESGF4036-14201409120000000713		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	99		
6.3	99		
5.0	99		
3.35	98		
2.00	97		
1.18	96		
0.600	91		
0.425	82		
0.300	58	Dry mass of sample, kg	
0.212	37		
0.150	22	6.5	
0.063	16		

Soil description	Dark greyish brown slightly gravelly silty SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	3	3
	Sand	81	81
	Silt	silt+clay =	
	Clay	16	16

Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

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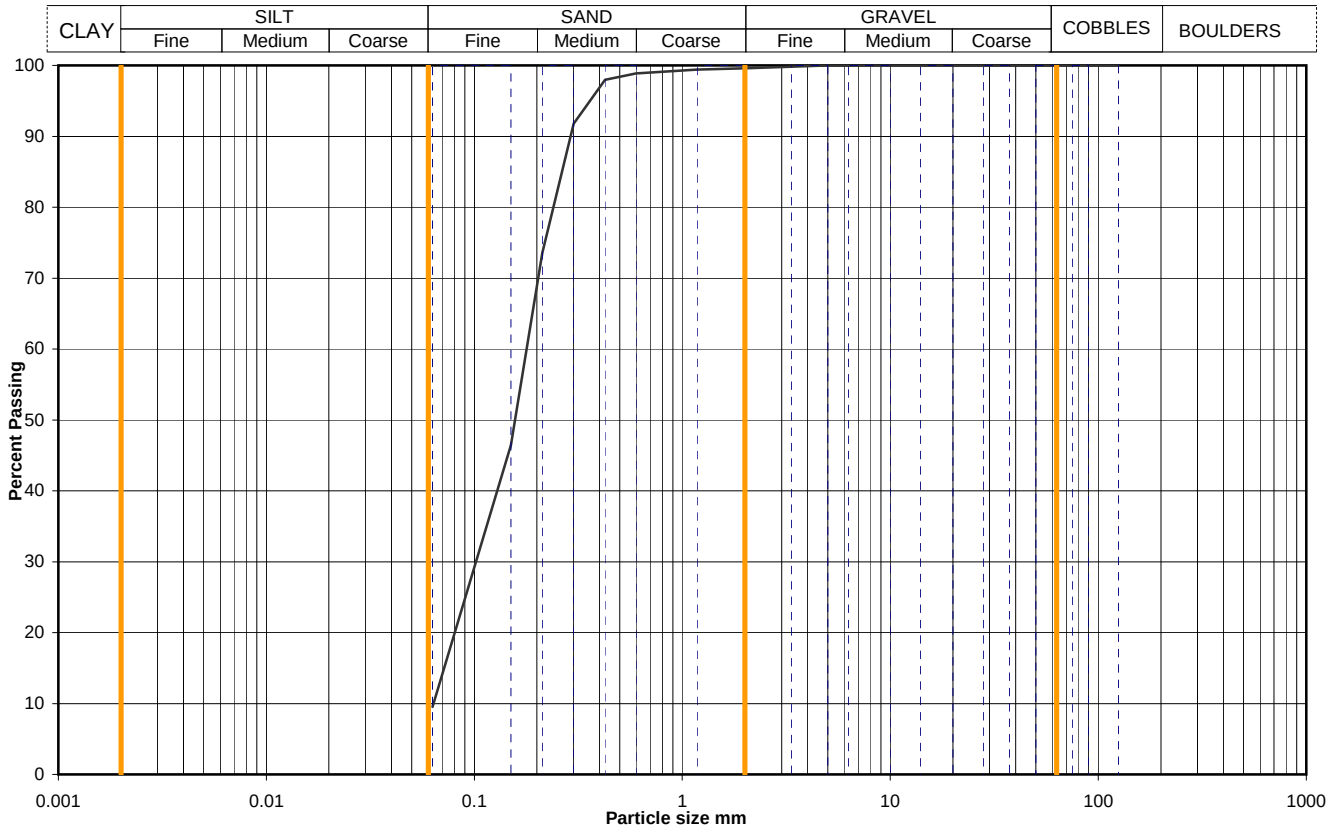
Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH05		
Project Name	Frodsham Wind Farm		Depth (m BGL)	2.00		
			Samp No	5	Type	B
			ID	ESGF4036-14201409120000000755		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5.0	100		
3.35	100		
2.00	100		
1.18	99		
0.600	99		
0.425	98		
0.300	92	Dry mass of sample, kg	
0.212	74		
0.150	46	0.3	
0.063	10		

Soil description	Greyish brown clayey SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	0	0
	Sand	90	90
	Silt	silt+clay =	
	Clay	10	10

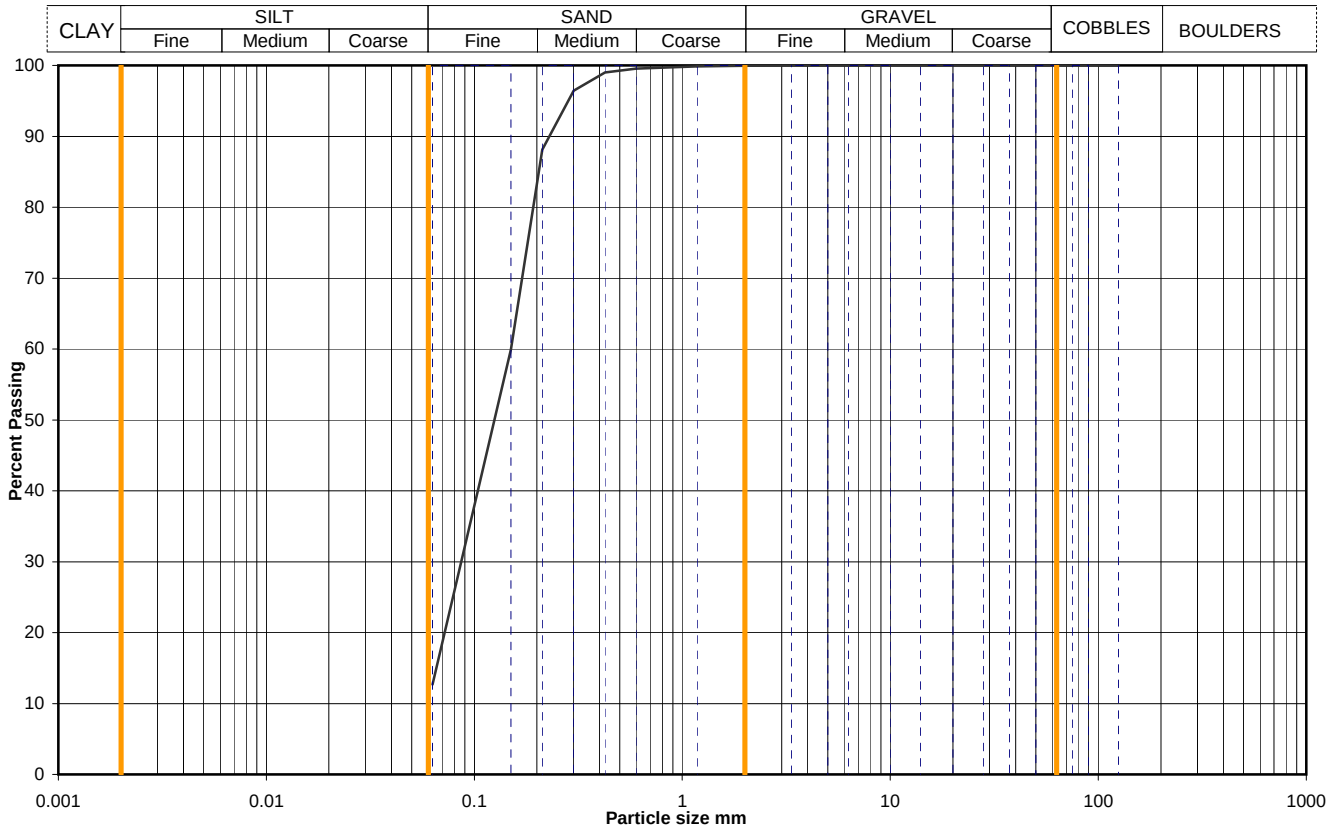
Uniformity Coefficient	D_{60} / D_{10}	3

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/12/2014 10:37	**Figure** **PSD 5**

Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH06		
Project Name	Frodsham Wind Farm		Depth (m BGL)	24.00		
			Samp No	36	Type	B
			ID	ESGF4036-14201408280000000048		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5.0	100		
3.35	100		
2.00	100		
1.18	100		
0.600	100		
0.425	99		
0.300	96	Dry mass of sample, kg	
0.212	88		
0.150	60	10.1	
0.063	13		

Soil description	Orangish brown SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	0	0
	Sand	87	87
	Silt	silt+clay =	
	Clay	13	13

Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

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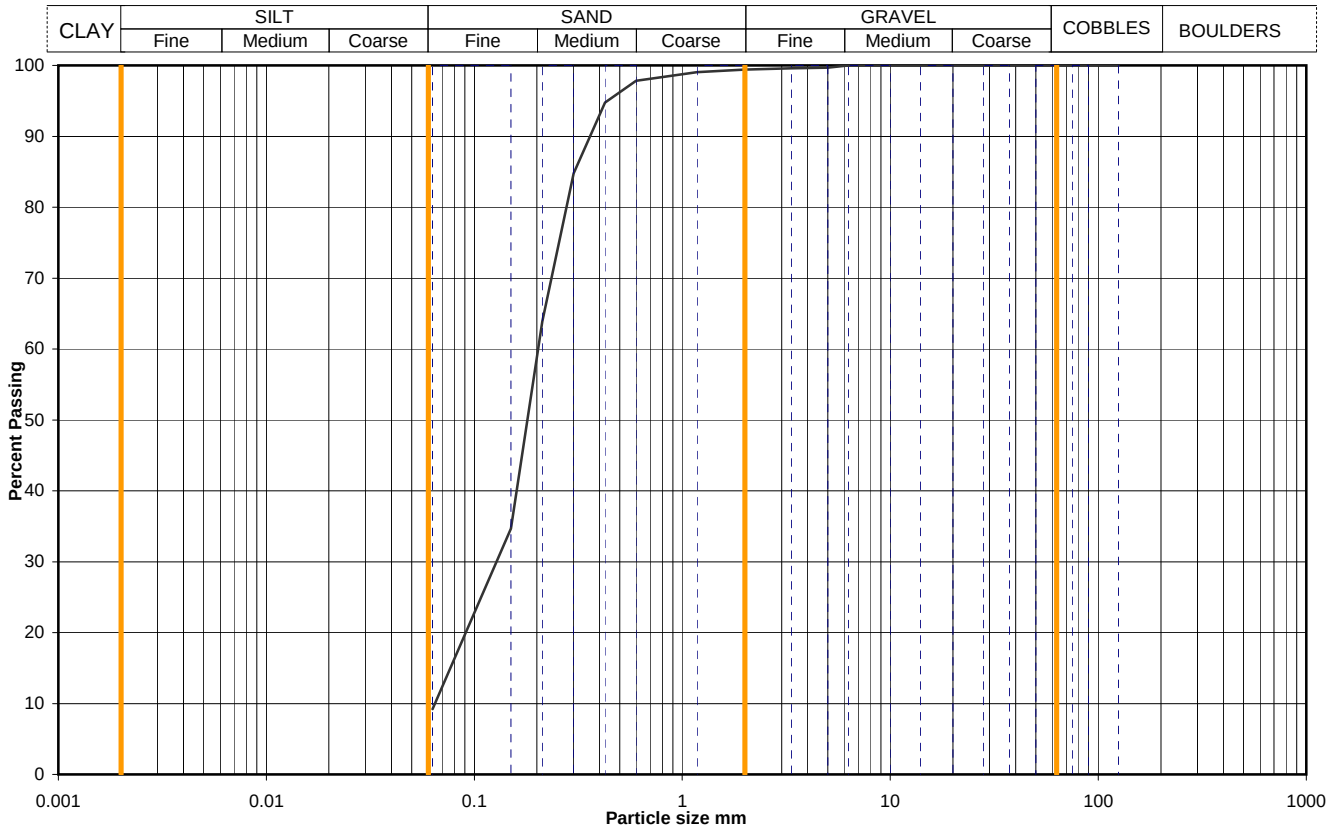
Figure **PSD 6**

Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH07		
Project Name	Frodsham Wind Farm		Depth (m BGL)	24.00		
			Samp No	36	Type	B
			ID	ESGF4036-14201408290000000232		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5.0	100		
3.35	100		
2.00	99		
1.18	99		
0.600	98		
0.425	95		
0.300	85	Dry mass of sample, kg	
0.212	64		
0.150	35	8.7	
0.063	9		

Soil description	Brown slightly gravelly SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	1	1
	Sand	90	90
	Silt	silt+clay =	
	Clay	9	9

Uniformity Coefficient	D_{60} / D_{10}	3

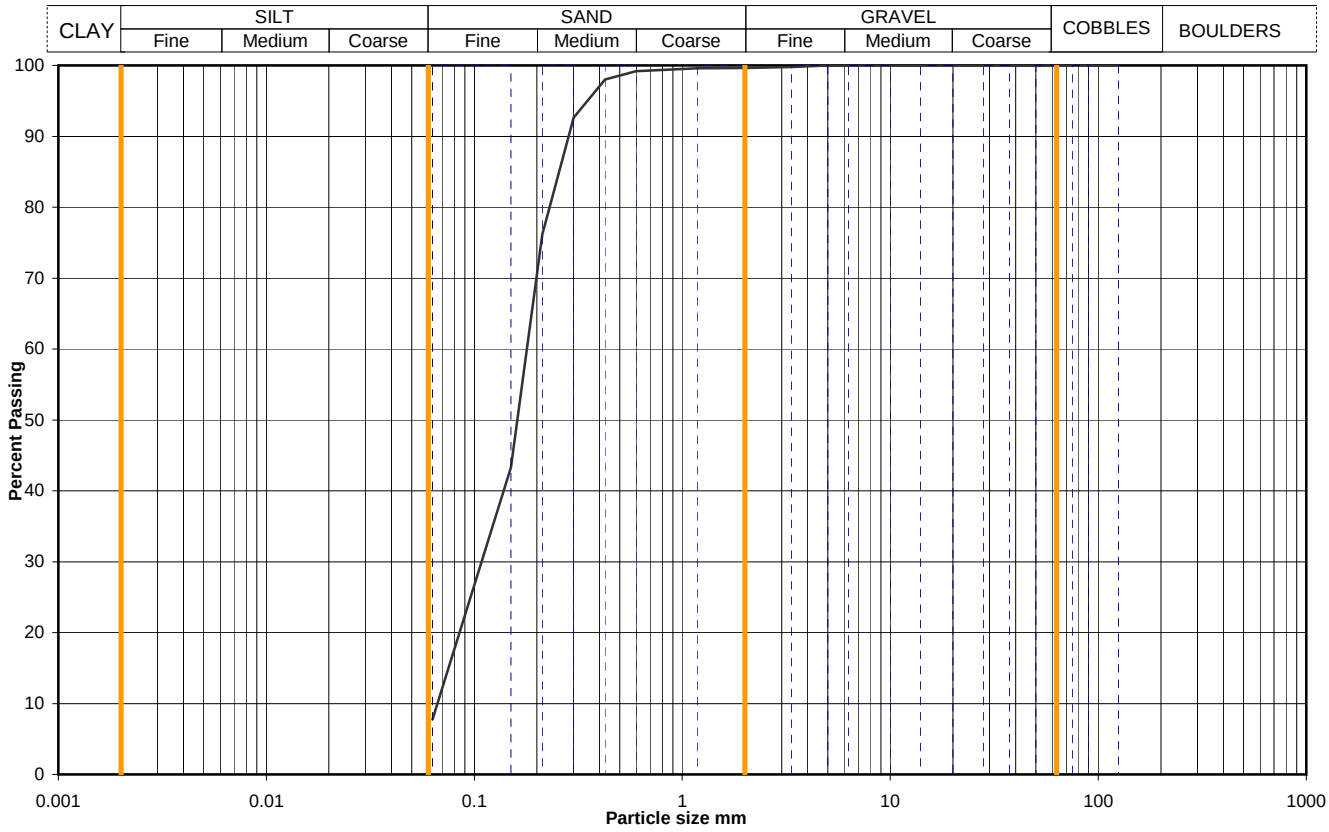
Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/12/2014 10:37

Figure **PSD 7**

Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH08		
Project Name	Frodsham Wind Farm		Depth (m BGL)	26.50		
			Samp No	41	Type	B
			ID	ESGF4036-14201409020000000246		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5.0	100		
3.35	100		
2.00	100		
1.18	100		
0.600	99		
0.425	98		
0.300	93	Dry mass of sample, kg	
0.212	76		
0.150	43	6.8	
0.063	8		

Soil description	Brown silty SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	0	0
	Sand	92	92
	Silt	silt+clay =	
	Clay	8	8

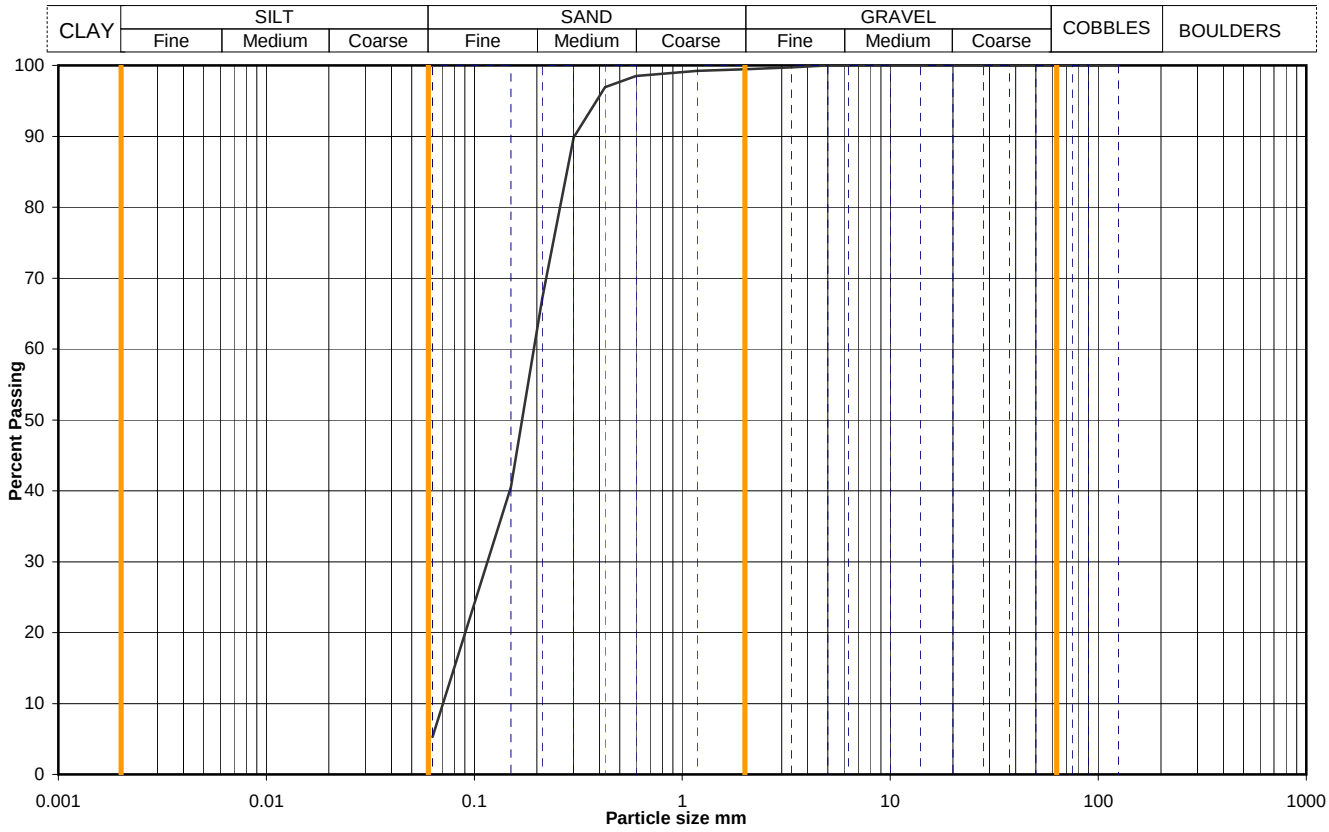
Uniformity Coefficient	D_{60} / D_{10}	3

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/12/2014 10:37	**Figure** **PSD 8**

Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH09		
Project Name	Frodsham Wind Farm		Depth (m BGL)	24.00		
			Samp No	38	Type	B
			ID	ESGF4036-14201408280000000173		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5.0	100		
3.35	100		
2.00	99		
1.18	99		
0.600	98		
0.425	97		
0.300	90	Dry mass of sample, kg	
0.212	67		
0.150	41	9.2	
0.063	5		

Soil description	Brown slightly gravelly SAND. Gravel is weak sandstone.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	1	1
	Sand	94	94
	Silt	silt+clay =	
	Clay	5	5

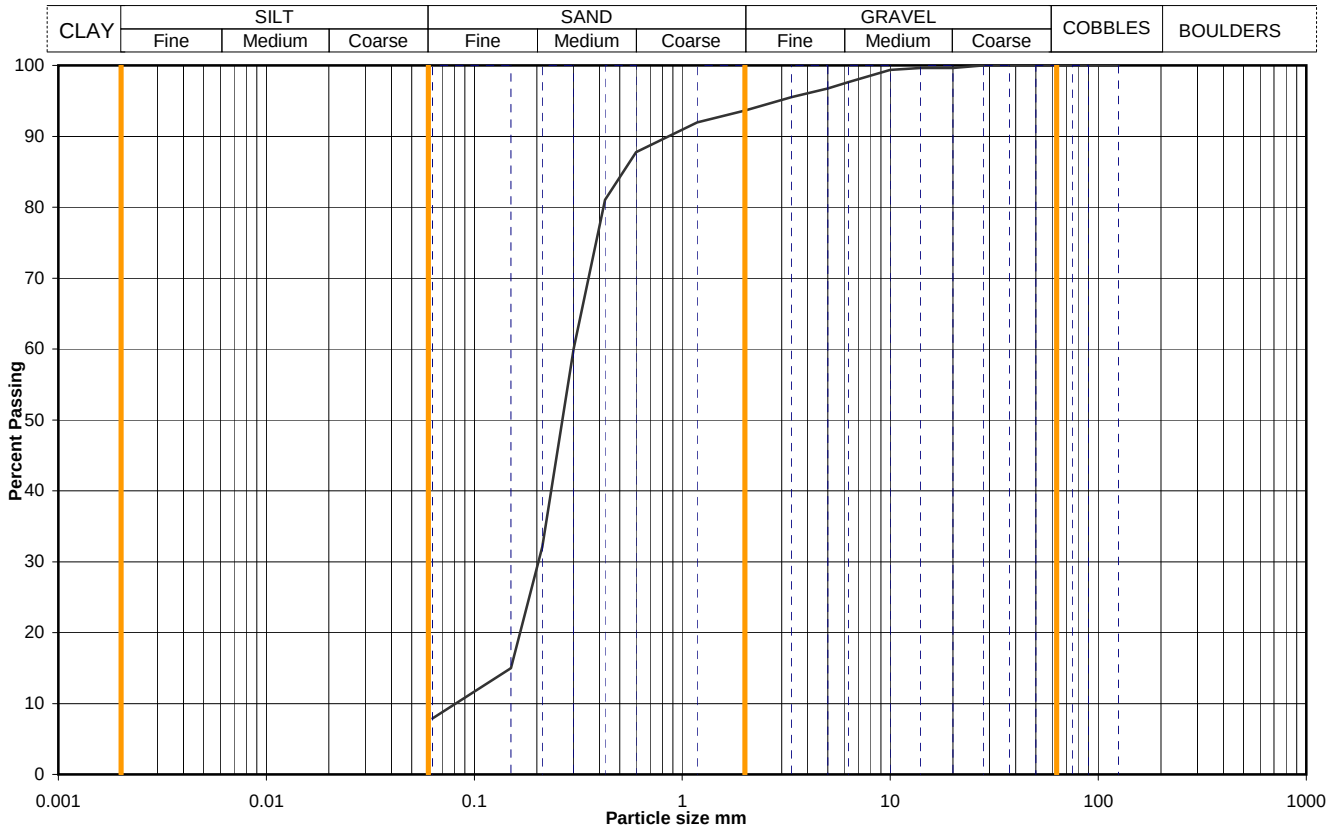
Uniformity Coefficient	D_{60} / D_{10}	3

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/12/2014 10:37	**Figure** **PSD 9**

Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH10		
Project Name	Frodsham Wind Farm		Depth (m BGL)	16.50		
			Samp No	34	Type	B
			ID	ESGF4036-14201409080000000341		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	99		
6.3	98		
5.0	97		
3.35	96		
2.00	94		
1.18	92		
0.600	88		
0.425	81		
0.300	60	Dry mass of sample, kg	
0.212	32		
0.150	15	11.5	
0.063	8		

Soil description	Grey slightly gravelly very sandy SILT.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	6	6
	Sand	86	86
	Silt	silt+clay =	
	Clay	8	8

Uniformity Coefficient	D_{60} / D_{10}	4

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

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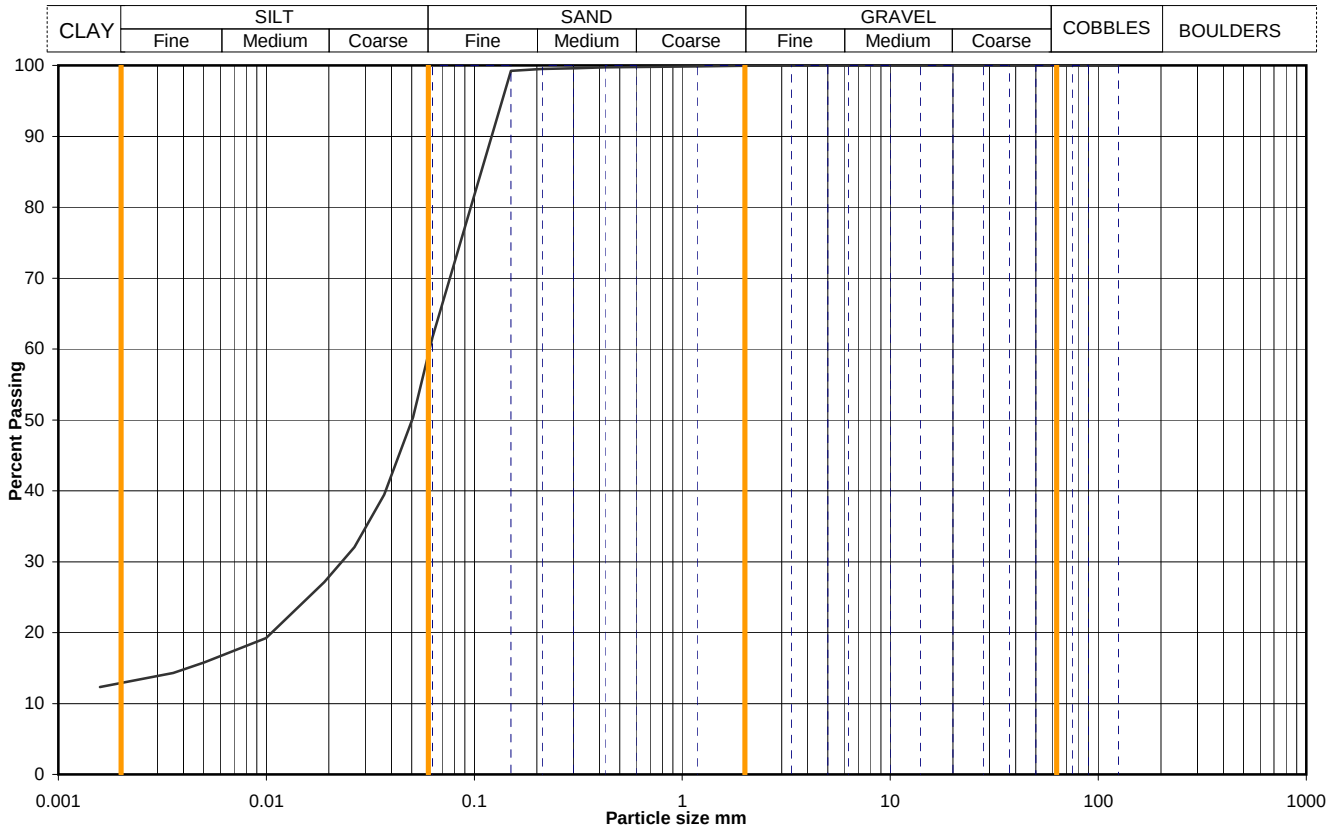
Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH11		
Project Name	Frodsham Wind Farm		Depth (m BGL)	6.00		
			Samp No	15	Type	B
			ID	ESGF4036-14201409120000000811		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	62
90	100	0.0508	50
75	100	0.0369	39
63	100	0.0265	32
50	100	0.0190	27
37.5	100	0.0100	19
28	100	0.0050	16
20	100	0.0036	14
14	100	0.0016	12
10	100		
6.3	100		
5.0	100		
3.35	100		
2.00	100		
1.18	100	Particle density, Mg/m3	
0.600	100		
0.425	100	2.65 assumed	
0.300	100	Dry mass of sample, kg	
0.212	100		
0.150	99	4.8	
0.063	62		

Soil description	Brownish grey sandy clayey SILT.		
Preparation / Pretreatment	Sieve: natural material Hydro: as BS1377		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	0	0
	Sand	41	41
	Silt	46	46
	Clay	13	13

Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	9.5 hydrometer

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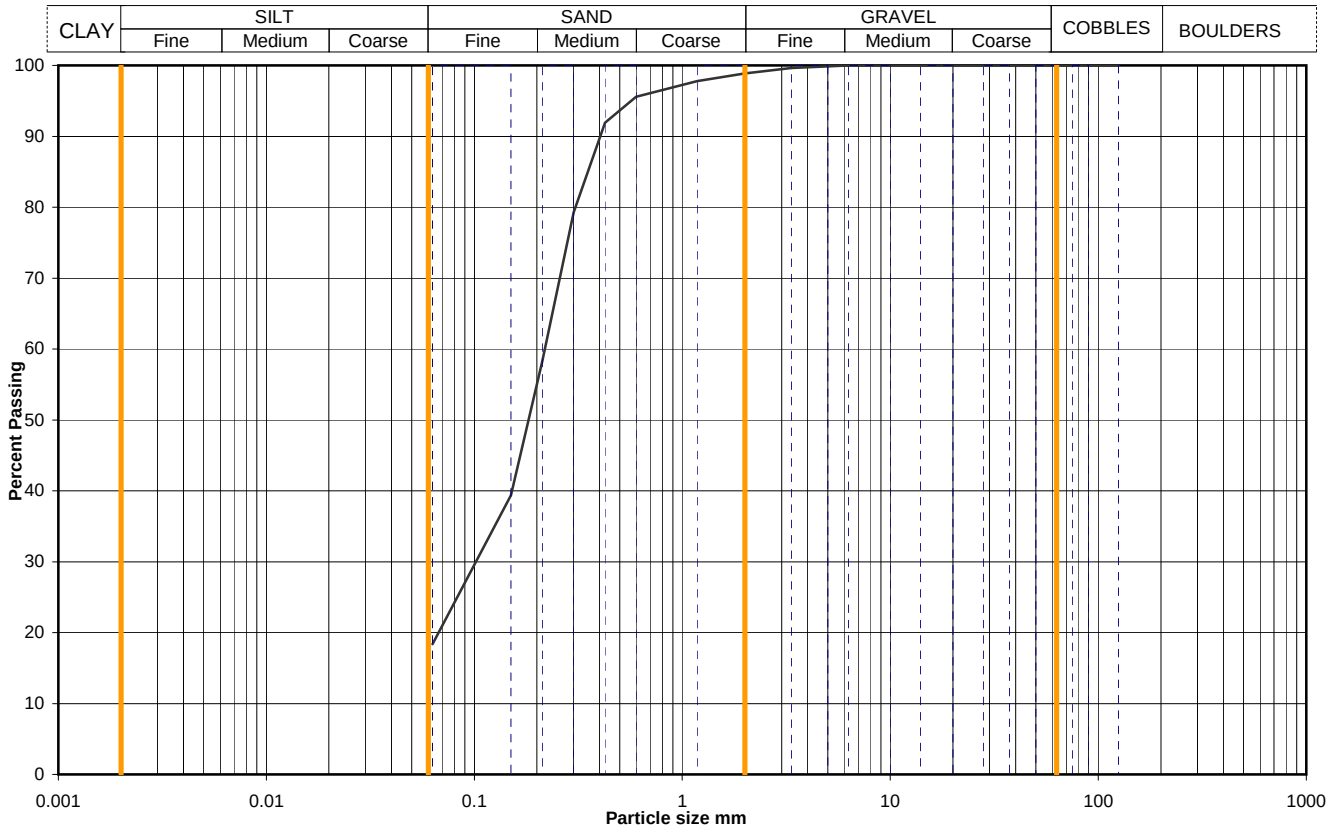
Figure **PSD 11**

Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH12		
Project Name	Frodsham Wind Farm		Depth (m BGL)	9.00		
			Samp No	20	Type	B
			ID	ESGF4036-14201409240000001538		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5.0	100		
3.35	100		
2.00	99		
1.18	98		
0.600	96		
0.425	92		
0.300	79	Dry mass of sample, kg	
0.212	58		
0.150	39	6.3	
0.063	18		

Soil description	Grey silty SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	1	1
	Sand	80	80
	Silt	silt+clay =	
	Clay	19	19

Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

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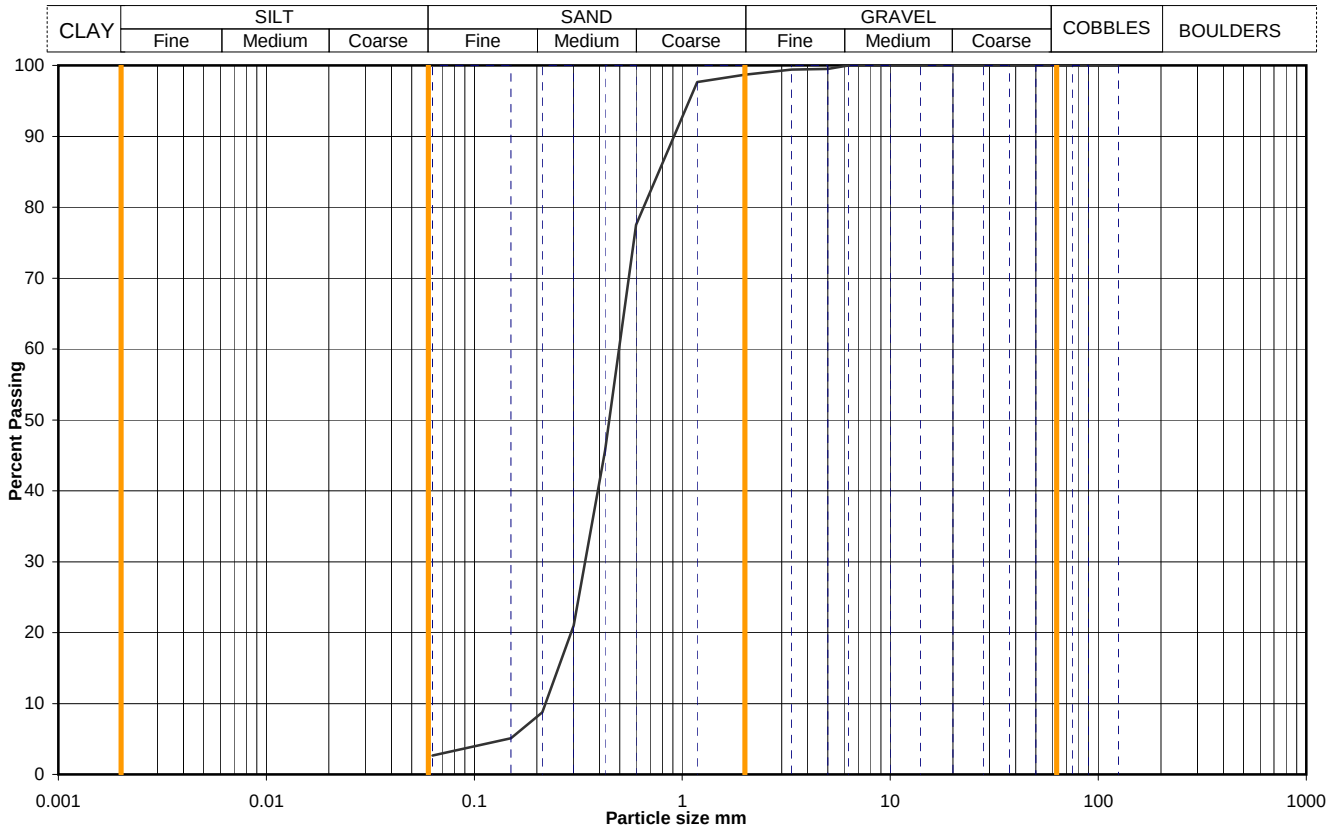
Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH13		
Project Name	Frodsham Wind Farm		Depth (m BGL)	13.50		
			Samp No	25	Type	B
			ID	ESGF4036-14201409160000000942		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5.0	99		
3.35	99		
2.00	99		
1.18	98		
0.600	78		
0.425	46		
0.300	21	Dry mass of sample, kg	
0.212	9		
0.150	5	12.2	
0.063	3		

Soil description	Brown slightly silty SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	1	1
	Sand	96	96
	Silt	silt+clay =	
	Clay	3	3

Uniformity Coefficient	D_{60} / D_{10}	2

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

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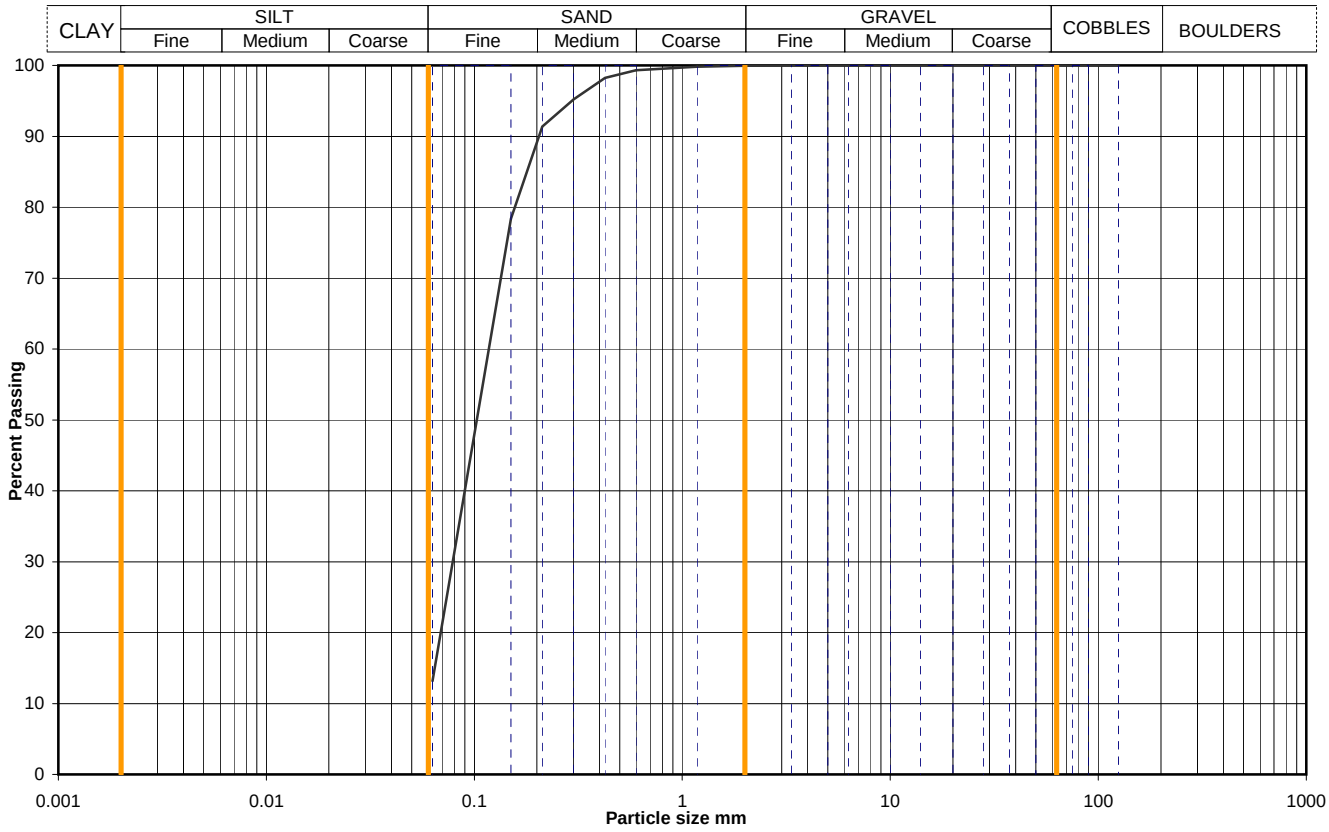
Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH14		
Project Name	Frodsham Wind Farm		Depth (m BGL)	10.50		
			Samp No	26	Type	B
			ID	ESGF4036-14201409170000001087		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5.0	100		
3.35	100		
2.00	100		
1.18	100		
0.600	99		
0.425	98		
0.300	95	Dry mass of sample, kg	
0.212	91		
0.150	78	4.3	
0.063	13		

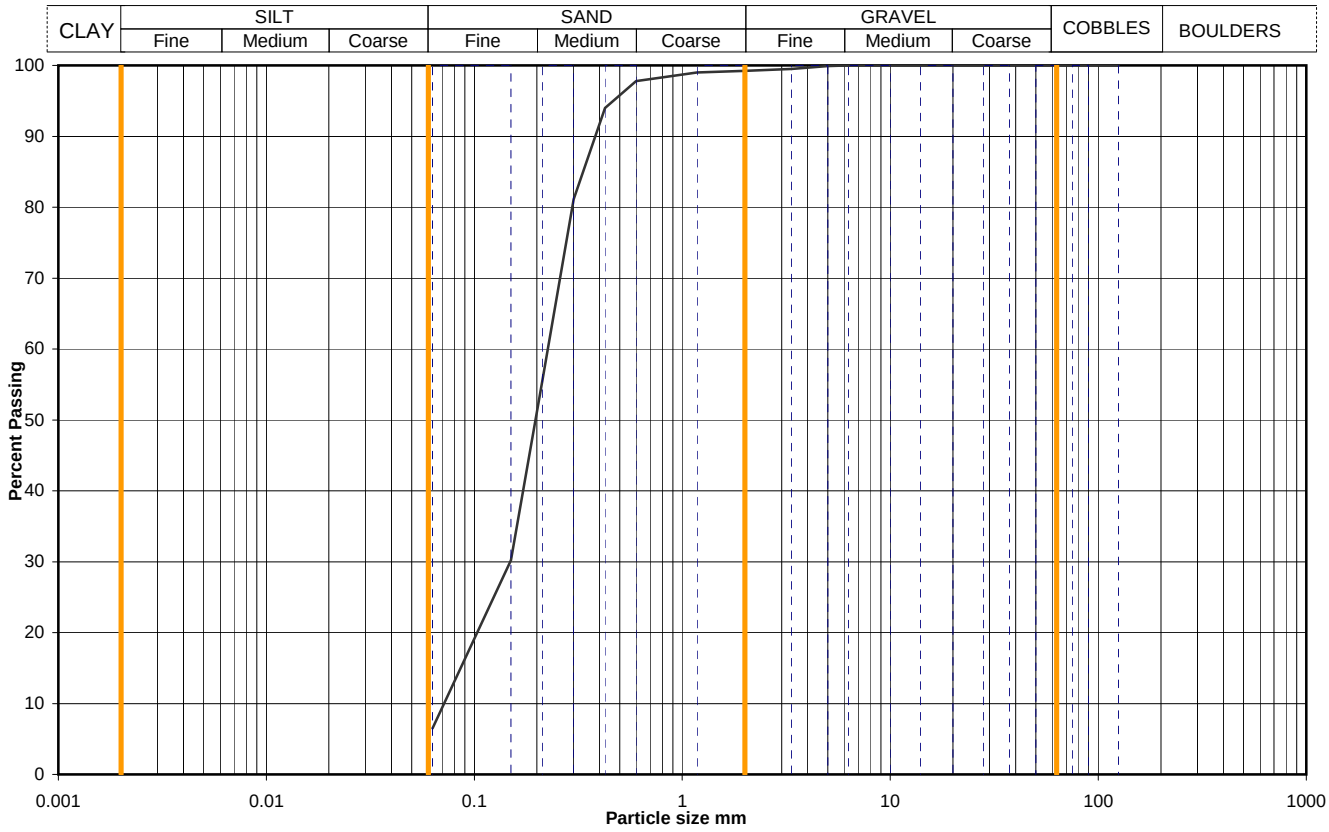
Soil description	Brownish grey SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	0	0
	Sand	87	87
	Silt	silt+clay =	
	Clay	13	13

Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH14		
Project Name	Frodsham Wind Farm		Depth (m BGL)	27.00		
			Samp No	58	Type	B
			ID	ESGF4036-14201409220000001383		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5.0	100		
3.35	99		
2.00	99		
1.18	99		
0.600	98		
0.425	94		
0.300	81	Dry mass of sample, kg	
0.212	55		
0.150	30	11.1	
0.063	6		

Soil description	Brown slightly gravelly SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	1	1
	Sand	93	93
	Silt	silt+clay =	
	Clay	6	6

Uniformity Coefficient	D_{60} / D_{10}	3

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

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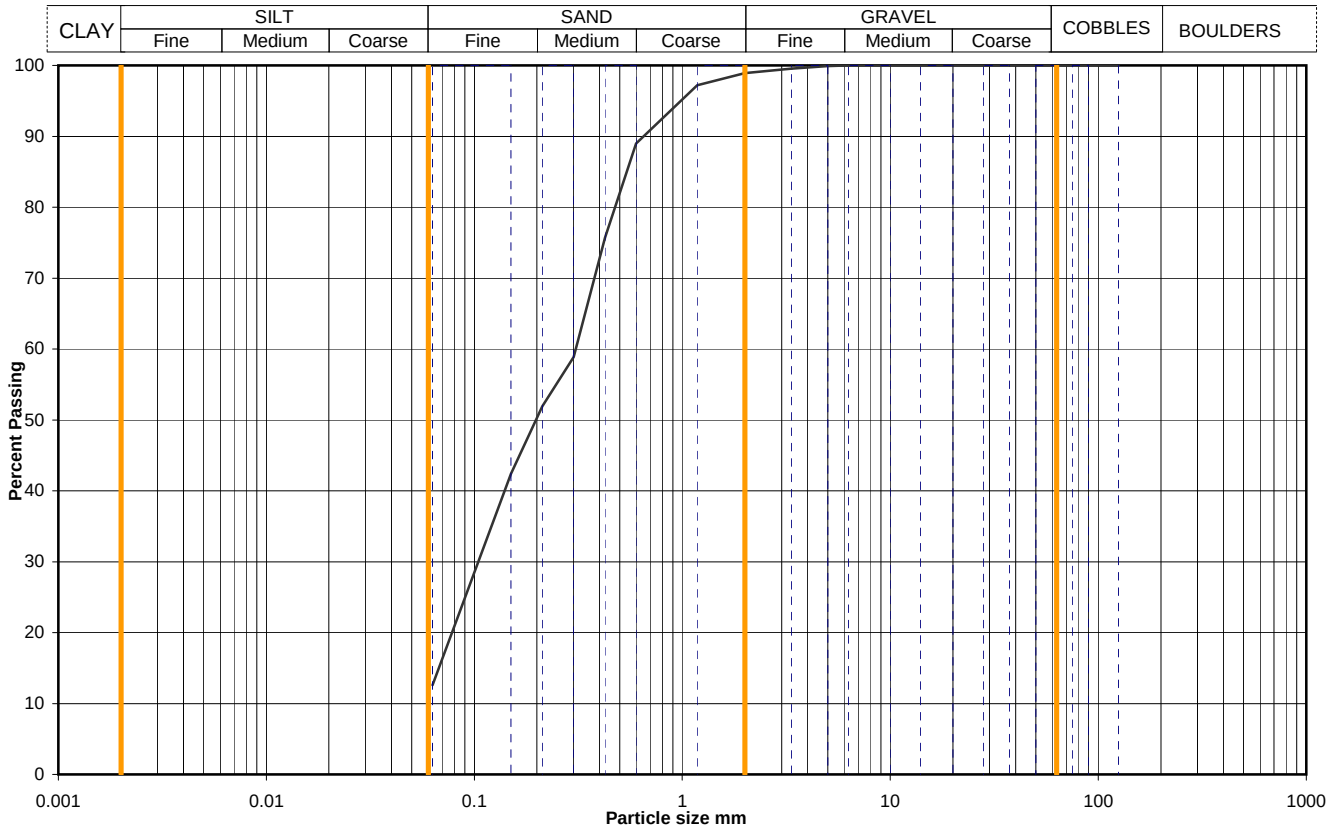
Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH15		
Project Name	Frodsham Wind Farm		Depth (m BGL)	12.00		
			Samp No	25	Type	B
			ID	ESGF4036-14201409170000001122		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5.0	100		
3.35	100		
2.00	99		
1.18	97		
0.600	89		
0.425	76		
0.300	59	Dry mass of sample, kg	
0.212	52		
0.150	42	9.1	
0.063	13		

Soil description	Greyish brown silty SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	1	1
	Sand	86	86
	Silt	silt+clay =	
	Clay	13	13

Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

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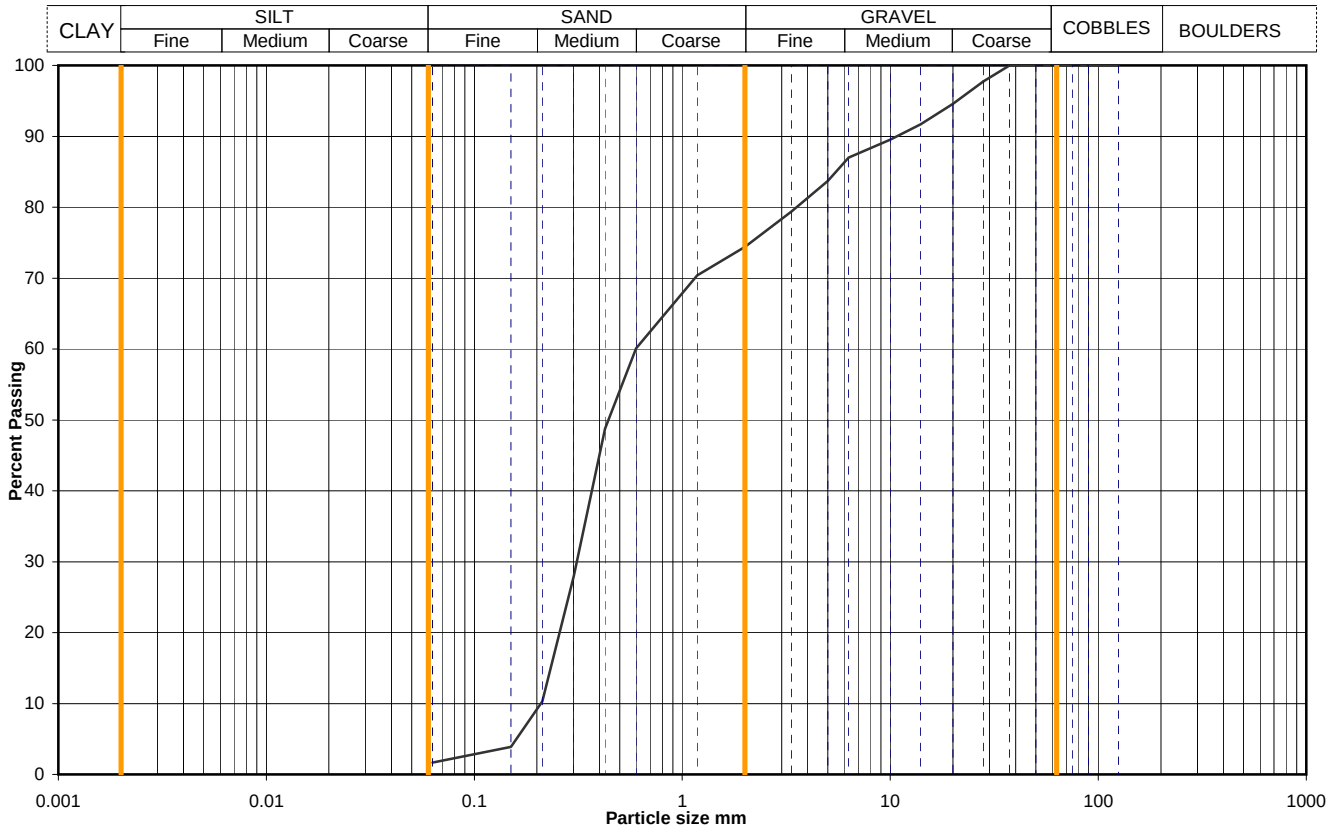
Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH15		
Project Name	Frodsham Wind Farm		Depth (m BGL)	21.00		
			Samp No	42	Type	B
			ID	ESGF4036-14201409170000001139		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	98		
20	95		
14	92		
10	90		
6.3	87		
5.0	84		
3.35	79		
2.00	74		
1.18	70		
0.600	60		
0.425	49		
0.300	28	Dry mass of sample, kg	
0.212	10		
0.150	4	17.3	
0.063	2		

Soil description	Brown very gravelly SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	26	26
	Sand	73	73
	Silt	silt+clay =	
	Clay	1	1

Uniformity Coefficient	D_{60} / D_{10}	3

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

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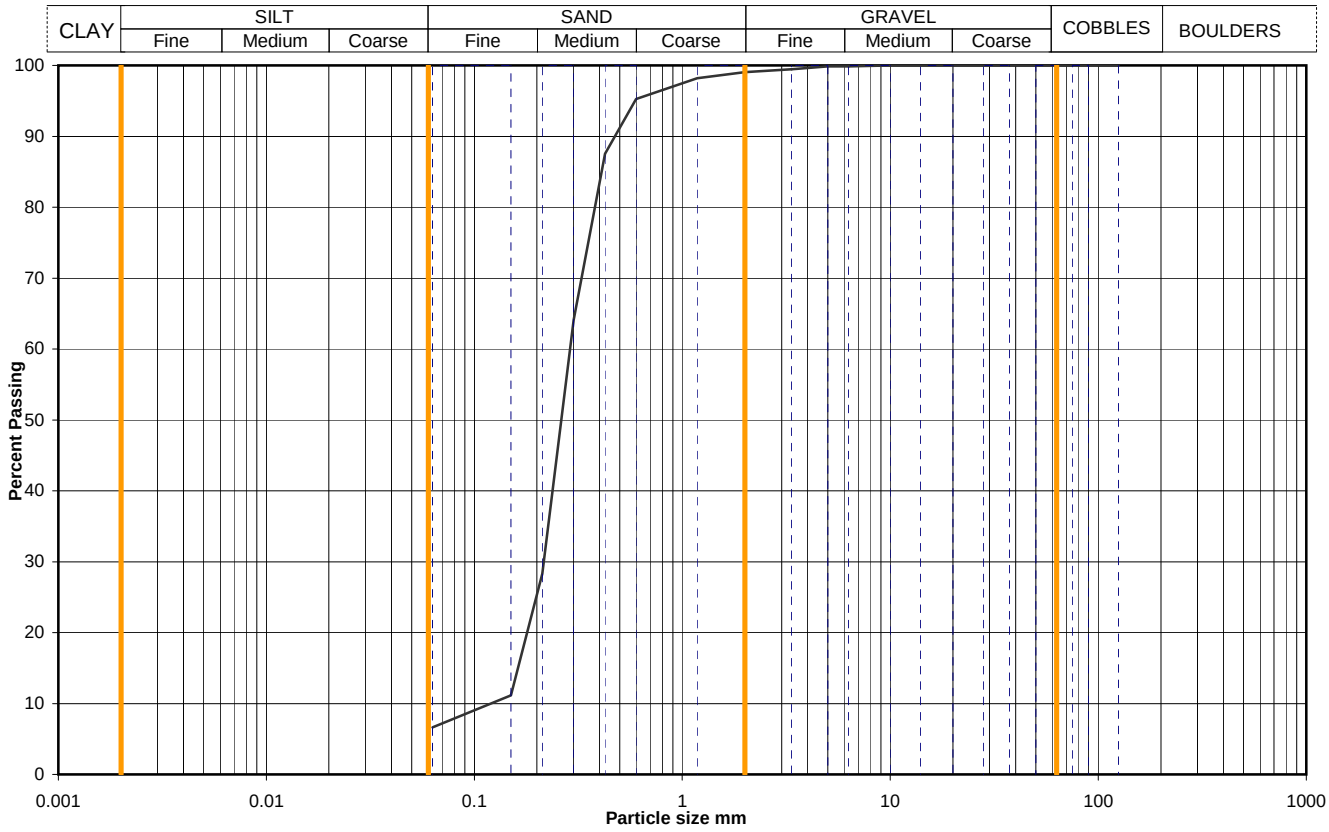
Figure **PSD 17**

Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH16		
Project Name	Frodsham Wind Farm		Depth (m BGL)	15.00		
			Samp No	39	Type	B
			ID	ESGF4036-14201409240000001560		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5.0	100		
3.35	99		
2.00	99		
1.18	98		
0.600	95		
0.425	88		
0.300	64	Dry mass of sample, kg	
0.212	28		
0.150	11	9.1	
0.063	7		

Soil description	Grey slightly gravelly silty SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	1	1
	Sand	92	92
	Silt	silt+clay =	
	Clay	7	7

Uniformity Coefficient	D_{60} / D_{10}	2

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

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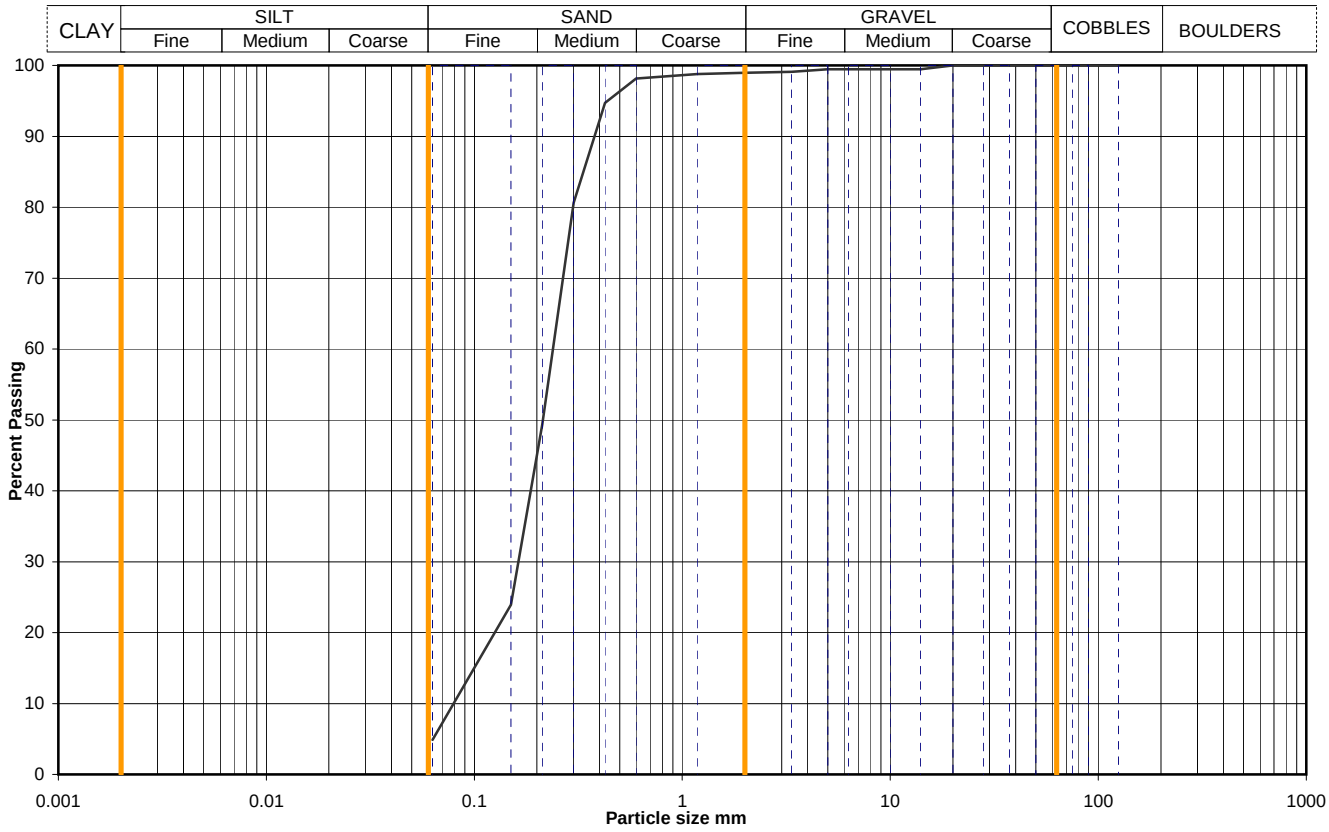
Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH16		
Project Name	Frodsham Wind Farm		Depth (m BGL)	27.00		
			Samp No	64	Type	B
			ID	ESGF4036-14201409240000001585		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	99		
10	99		
6.3	99		
5.0	99		
3.35	99		
2.00	99		
1.18	99		
0.600	98		
0.425	95		
0.300	81	Dry mass of sample, kg	
0.212	49		
0.150	24	8.9	
0.063	5		

Soil description	Orangish brown slightly gravelly SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	1	1
	Sand	94	94
	Silt	silt+clay =	
	Clay	5	5

Uniformity Coefficient	D_{60} / D_{10}	3

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

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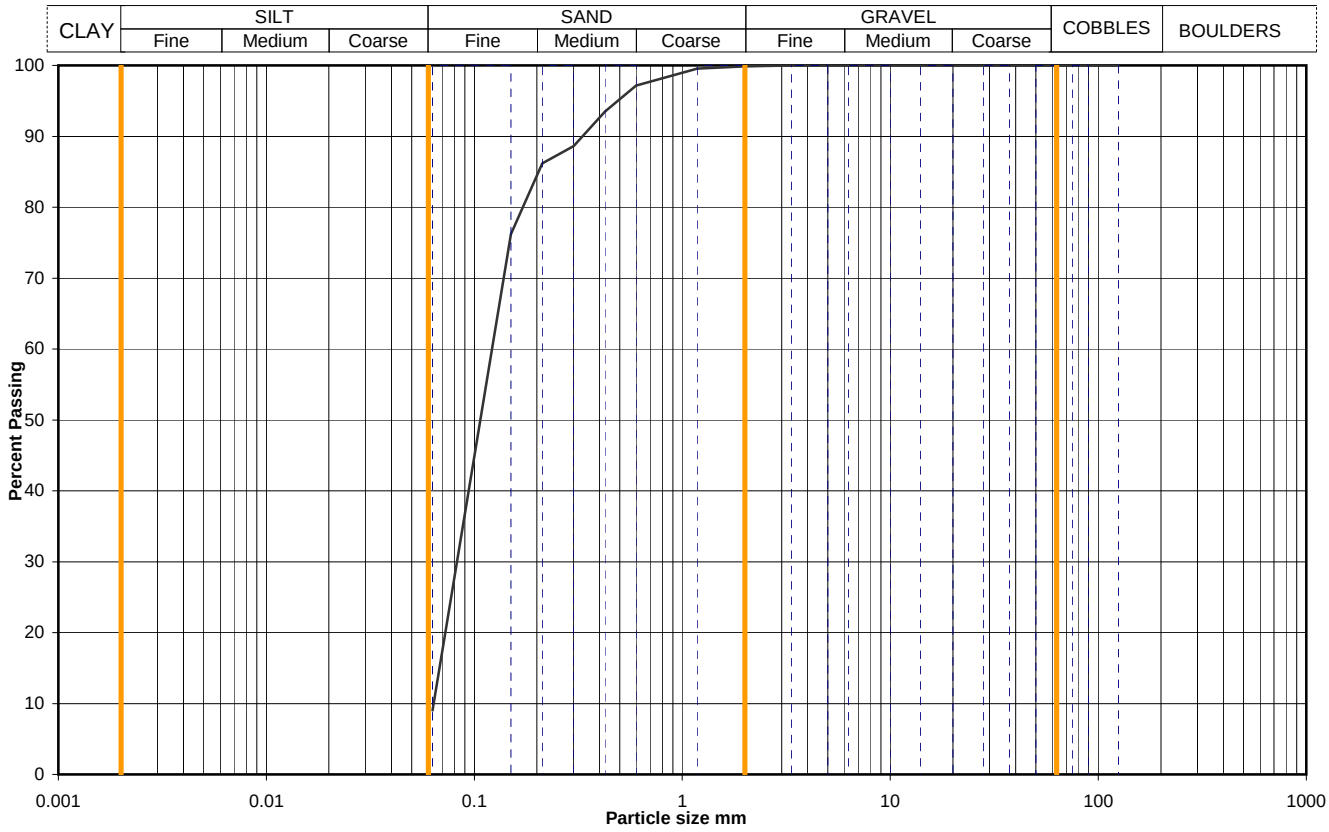
Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH17		
Project Name	Frodsham Wind Farm		Depth (m BGL)	10.50		
			Samp No	30	Type	B
			ID	ESGF4036-14201409260000001921		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5.0	100		
3.35	100		
2.00	100		
1.18	100		
0.600	97		
0.425	93		
0.300	89	Dry mass of sample, kg	
0.212	86		
0.150	76	9.7	
0.063	9		

Soil description	Dark greyish brown silty SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	0	0
	Sand	91	91
	Silt	silt+clay =	
	Clay	9	9

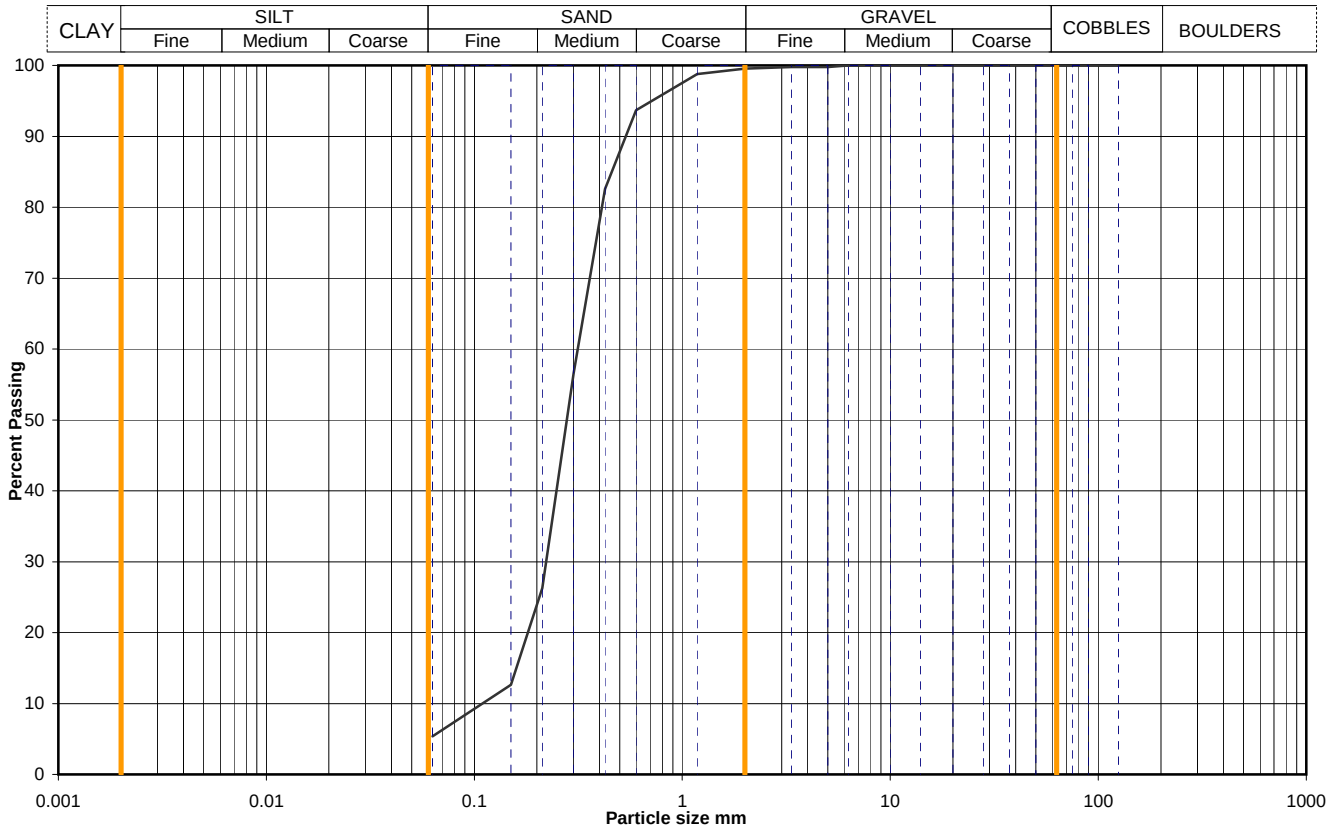
Uniformity Coefficient	D_{60} / D_{10}	2

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/12/2014 10:37	**Figure** **PSD 20**

Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH17		
Project Name	Frodsham Wind Farm		Depth (m BGL)	25.50		
			Samp No	58	Type	B
			ID	ESGF4036-14201409300000002093		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5.0	100		
3.35	100		
2.00	100		
1.18	99		
0.600	94		
0.425	83		
0.300	57	Dry mass of sample, kg	
0.212	26		
0.150	13	9.0	
0.063	5		

Soil description	Brown SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	0	0
	Sand	94	94
	Silt	silt+clay =	
	Clay	6	6

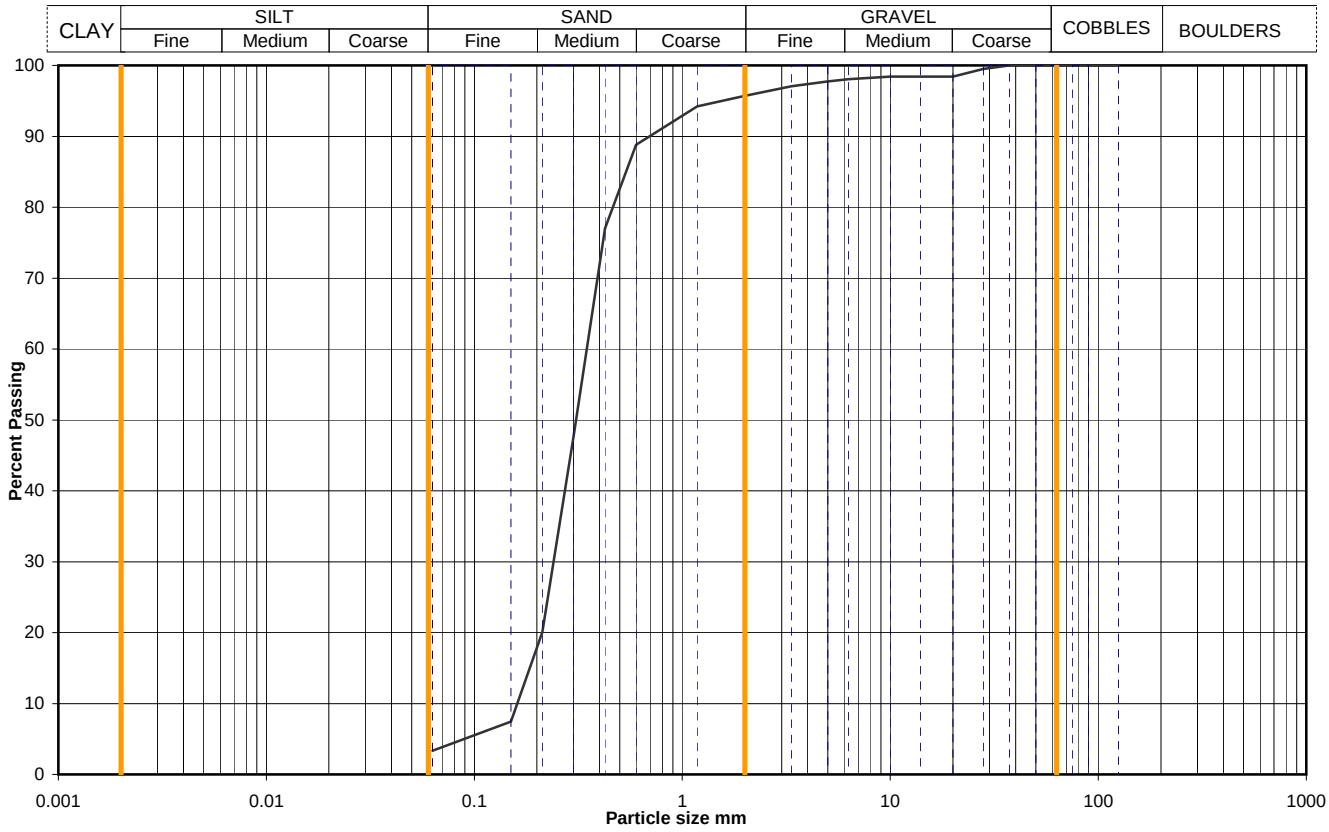
Uniformity Coefficient	D_{60} / D_{10}	3

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/12/2014 10:38	**Figure** **PSD 21**

Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH18		
Project Name	Frodsham Wind Farm		Depth (m BGL)	15.00		
			Samp No	34	Type	B
			ID	ESGF4036-14201409250000001723		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	99		
20	98		
14	98		
10	98		
6.3	98		
5.0	98		
3.35	97		
2.00	96		
1.18	94		
0.600	89		
0.425	77		
0.300	48	Dry mass of sample, kg	
0.212	20		
0.150	7	10.4	
0.063	3		

Soil description	Brownish grey slightly gravelly SAND with rare clay pockets.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	4	4
	Sand	92	92
	Silt	silt+clay =	
	Clay	4	4

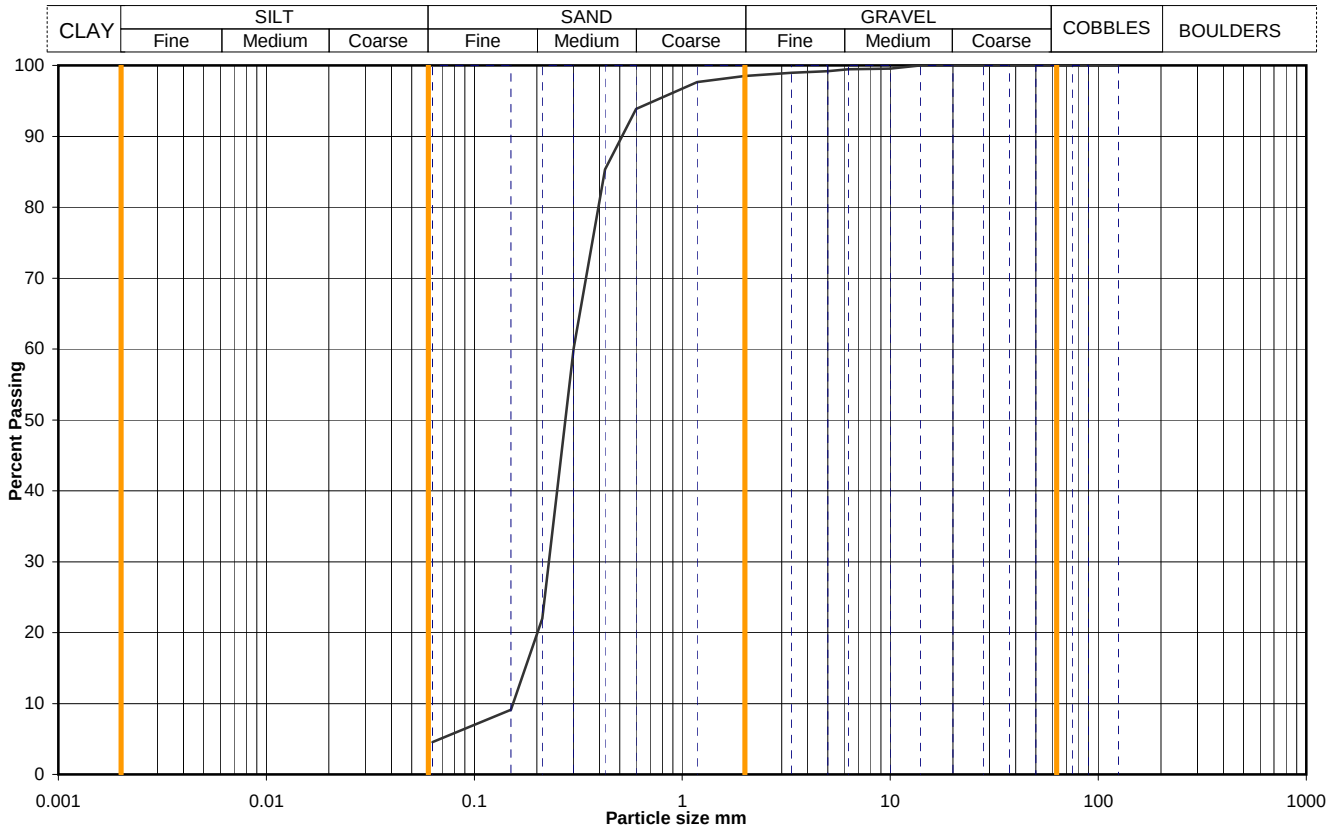
Uniformity Coefficient	D_{60} / D_{10}	2

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/12/2014 10:38	**Figure** **PSD 22**

Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH19		
Project Name	Frodsham Wind Farm		Depth (m BGL)	13.00		
			Samp No	30	Type	B
			ID	ESGF4036-14201409240000001606		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	99		
5.0	99		
3.35	99		
2.00	99		
1.18	98		
0.600	94		
0.425	85		
0.300	60	Dry mass of sample, kg	
0.212	22		
0.150	9	9.5	
0.063	5		

Soil description	Greyish brown slightly gravelly SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	1	1
	Sand	94	94
	Silt	silt+clay =	
	Clay	5	5

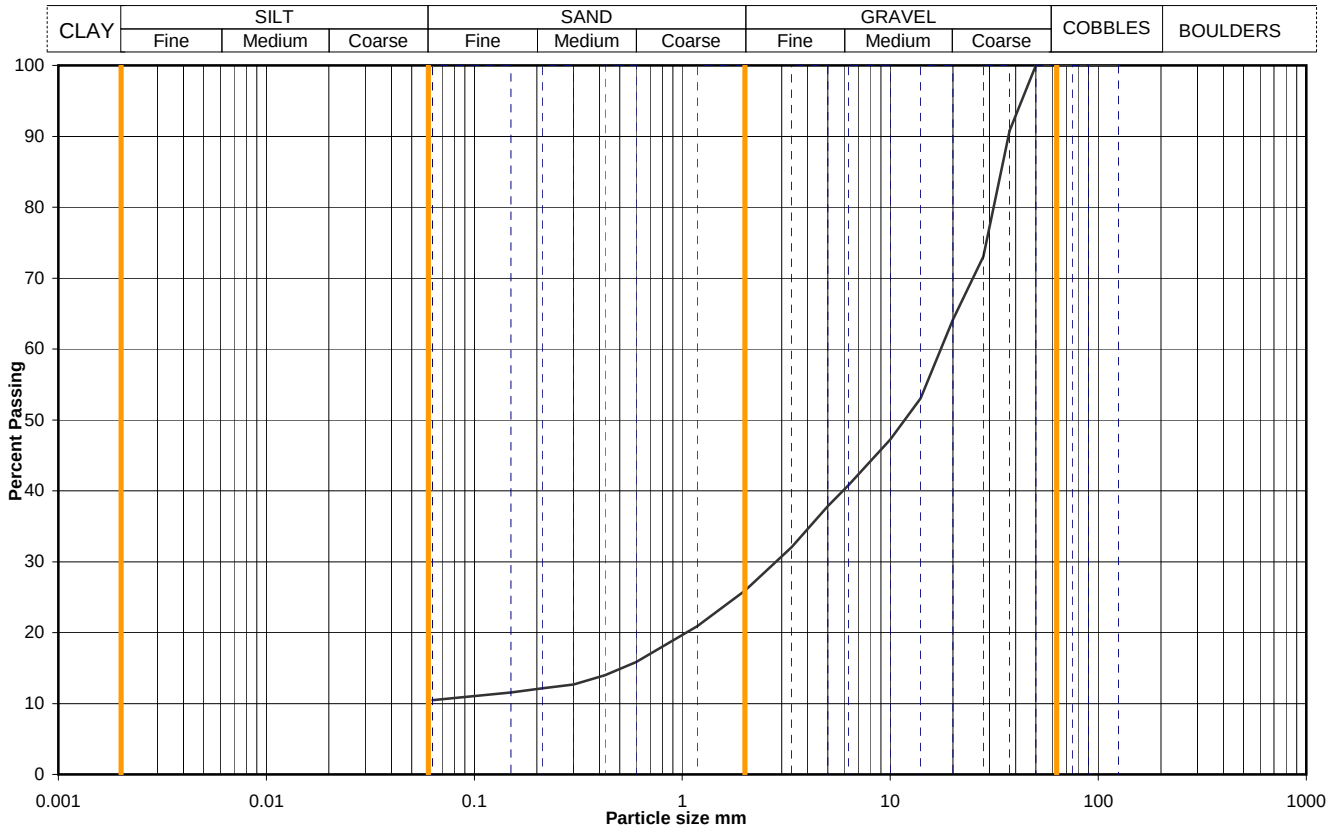
Uniformity Coefficient	D_{60} / D_{10}	2

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/12/2014 10:38	**Figure** **PSD 23**

Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH20		
Project Name	Frodsham Wind Farm		Depth (m BGL)	1.50		
			Samp No	4	Type	B
			ID	ESGF4036-14201409170000001147		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	91		
28	73		
20	64		
14	53		
10	47		
6.3	41		
5.0	38		
3.35	32		
2.00	26		
1.18	21		
0.600	16		
0.425	14		
0.300	13	Dry mass of sample, kg	
0.212	12		
0.150	12	5.5	
0.063	10		

Soil description	Cream sandy clayey GRAVEL.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	74	74
	Sand	15	15
	Silt	silt+clay =	
	Clay	11	11

Uniformity Coefficient	D_{60} / D_{10}	Not applicable

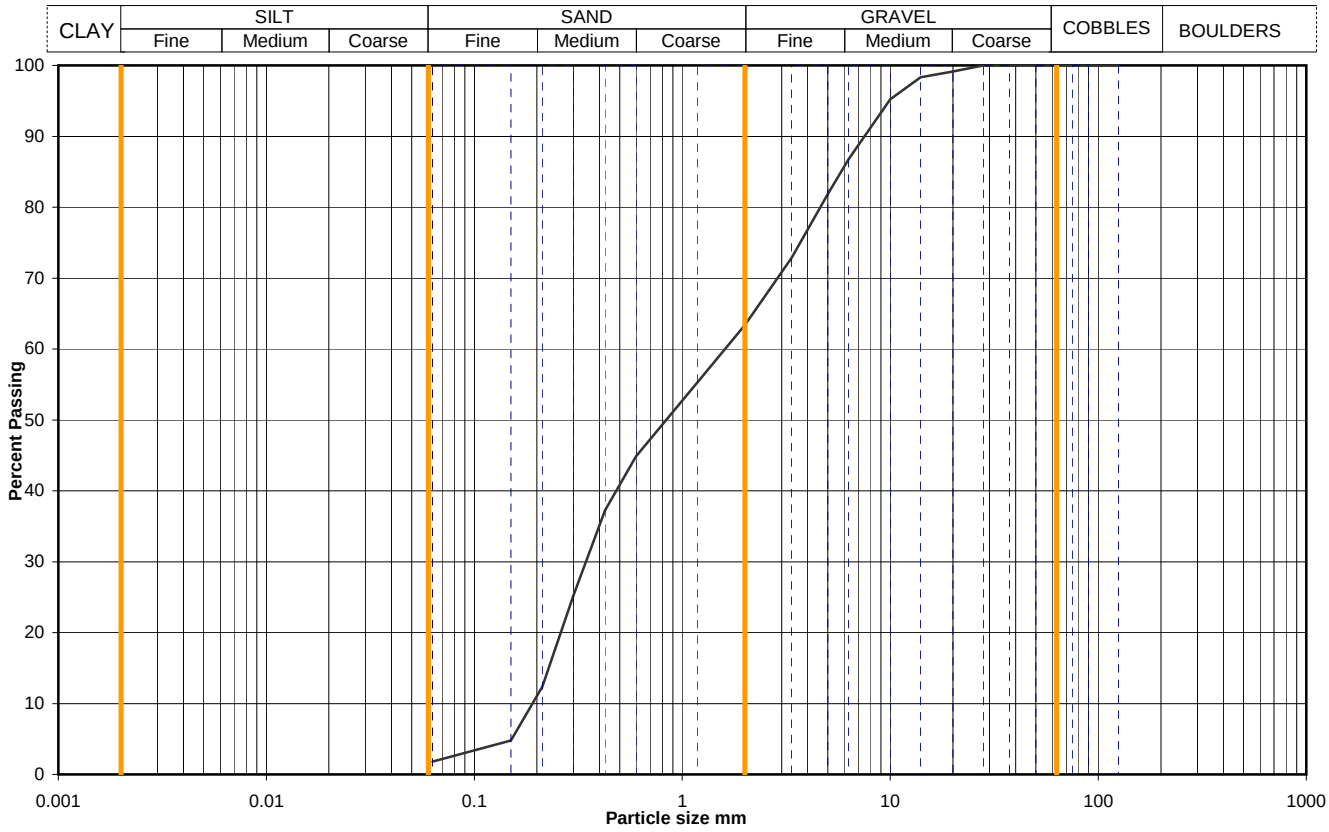
Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/12/2014 10:38

Figure **PSD 24**

Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH20A		
Project Name	Frodsham Wind Farm		Depth (m BGL)	18.00		
			Samp No	4	Type	B
			ID	ESGF4036-14201409300000002117		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	99		
14	98		
10	95		
6.3	87		
5.0	82		
3.35	73		
2.00	63		
1.18	55		
0.600	45		
0.425	37		
0.300	25	Dry mass of sample, kg	
0.212	12		
0.150	5	12.3	
0.063	2		

Soil description	Brownish grey very gravelly SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	37	37
	Sand	62	62
	Silt	silt+clay =	
	Clay	1	1

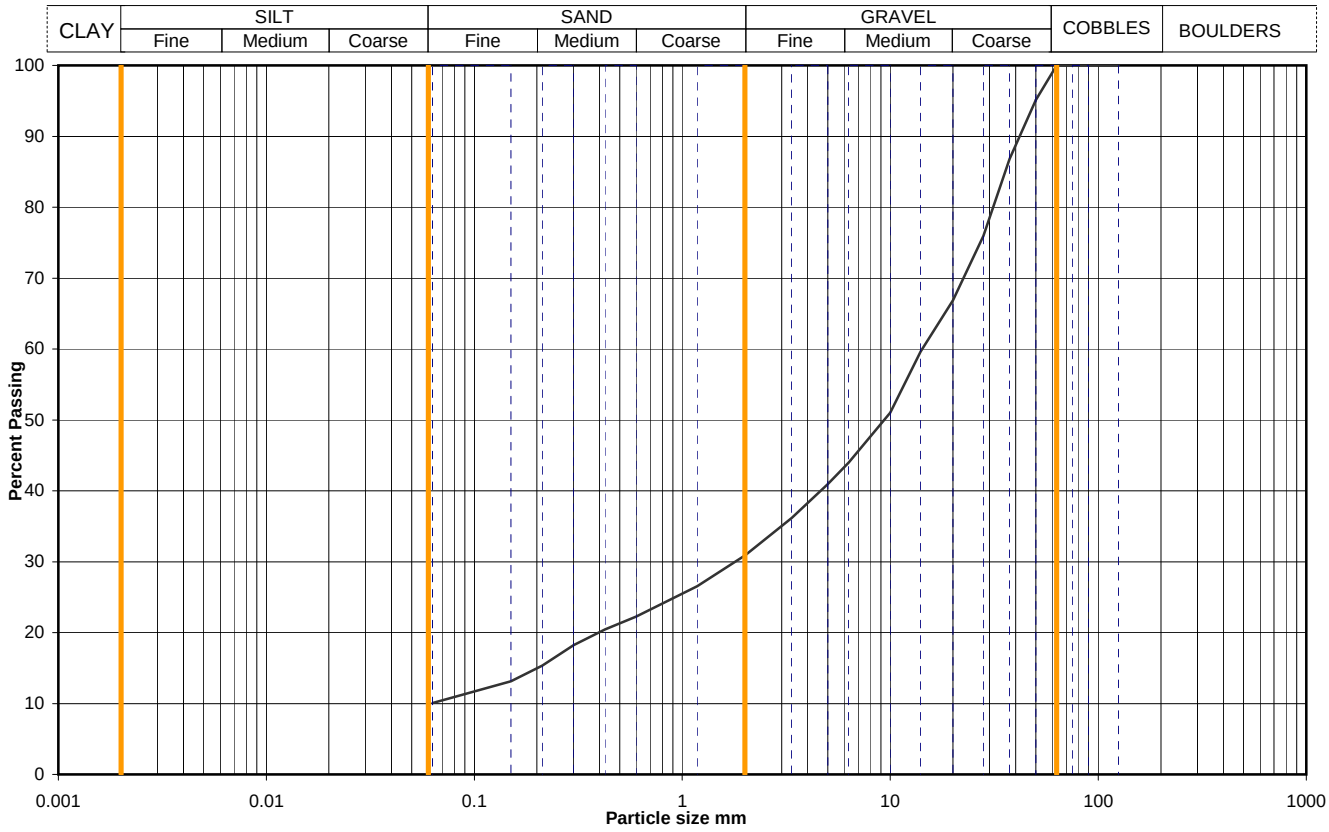
Uniformity Coefficient	D_{60} / D_{10}	8

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/12/2014 10:38	**Figure** **PSD 25**

Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH21		
Project Name	Frodsham Wind Farm		Depth (m BGL)	0.50		
			Samp No	2	Type	B
			ID	ESGF4036-14201409170000001178		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	95		
37.5	87		
28	76		
20	67		
14	60		
10	51		
6.3	44		
5.0	41		
3.35	36		
2.00	31		
1.18	27		
0.600	22		
0.425	20		
0.300	18	Dry mass of sample, kg	
0.212	15		
0.150	13	9.7	
0.063	10		

Soil description	Greyish brown clayey very sandy GRAVEL.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	69	69
	Sand	21	21
	Silt	silt+clay =	
	Clay	10	10

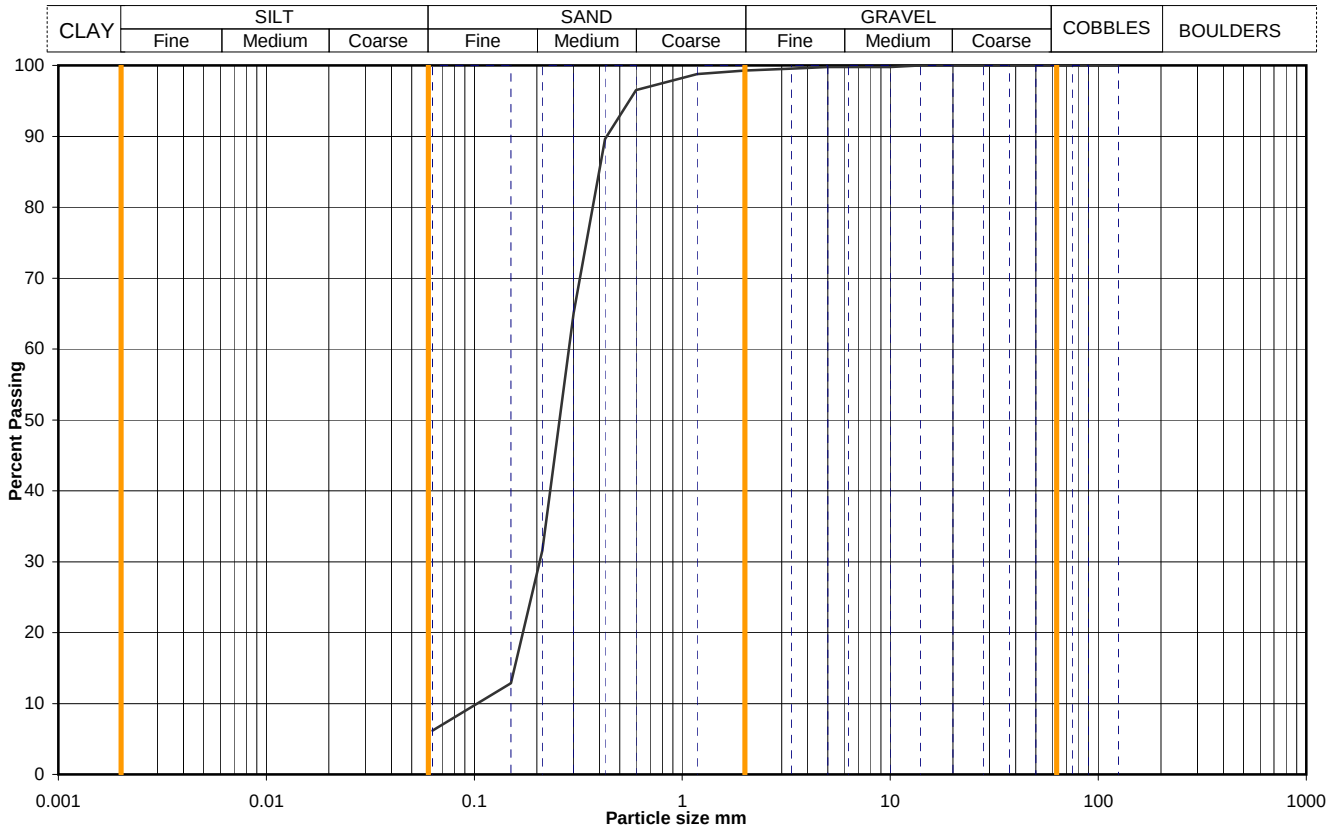
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/12/2014 10:38	**Figure** **PSD 26**

Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH21A		
Project Name	Frodsham Wind Farm		Depth (m BGL)	18.50		
			Samp No	13	Type	B
			ID	ESGF4036-14201409190000001356		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5.0	100		
3.35	100		
2.00	99		
1.18	99		
0.600	97		
0.425	90		
0.300	65	Dry mass of sample, kg	
0.212	32		
0.150	13	9.7	
0.063	6		

Soil description	Grey slightly gravelly SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	1	1
	Sand	93	93
	Silt	silt+clay =	
	Clay	6	6

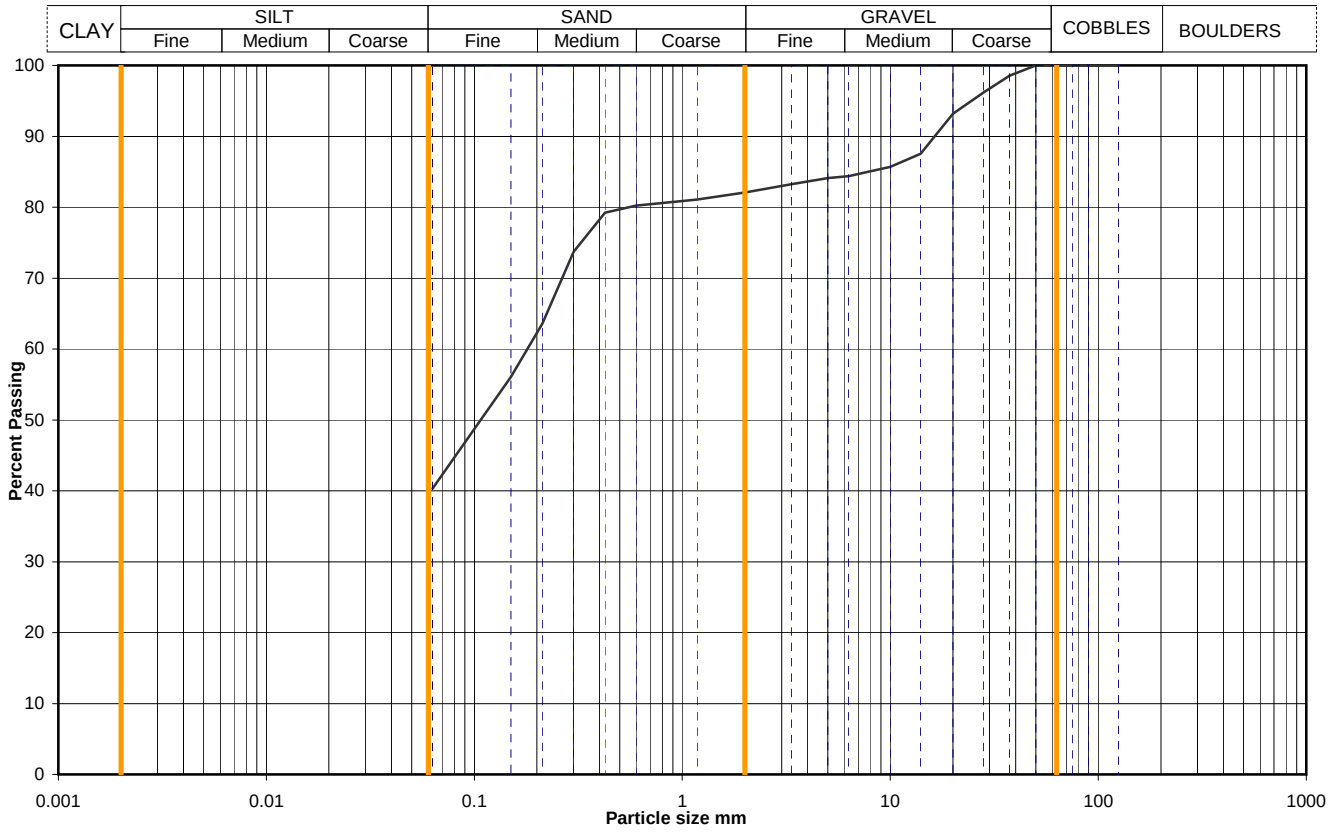
Uniformity Coefficient	D_{60} / D_{10}	3

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/12/2014 10:38	**Figure** **PSD 27**

Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH22		
Project Name	Frodsham Wind Farm		Depth (m BGL)	1.50		
			Samp No	5	Type	B
			ID	ESGF4036-14201409220000001456		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	99		
28	96		
20	93		
14	88		
10	86		
6.3	84		
5.0	84		
3.35	83		
2.00	82		
1.18	81		
0.600	80		
0.425	79		
0.300	74	Dry mass of sample, kg	
0.212	64		
0.150	56	14.3	
0.063	40		

Soil description	Reddish brown slightly gravelly sandy CLAY with rare wood fragments.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	18	18
	Sand	42	42
	Silt	silt+clay =	
	Clay	40	40

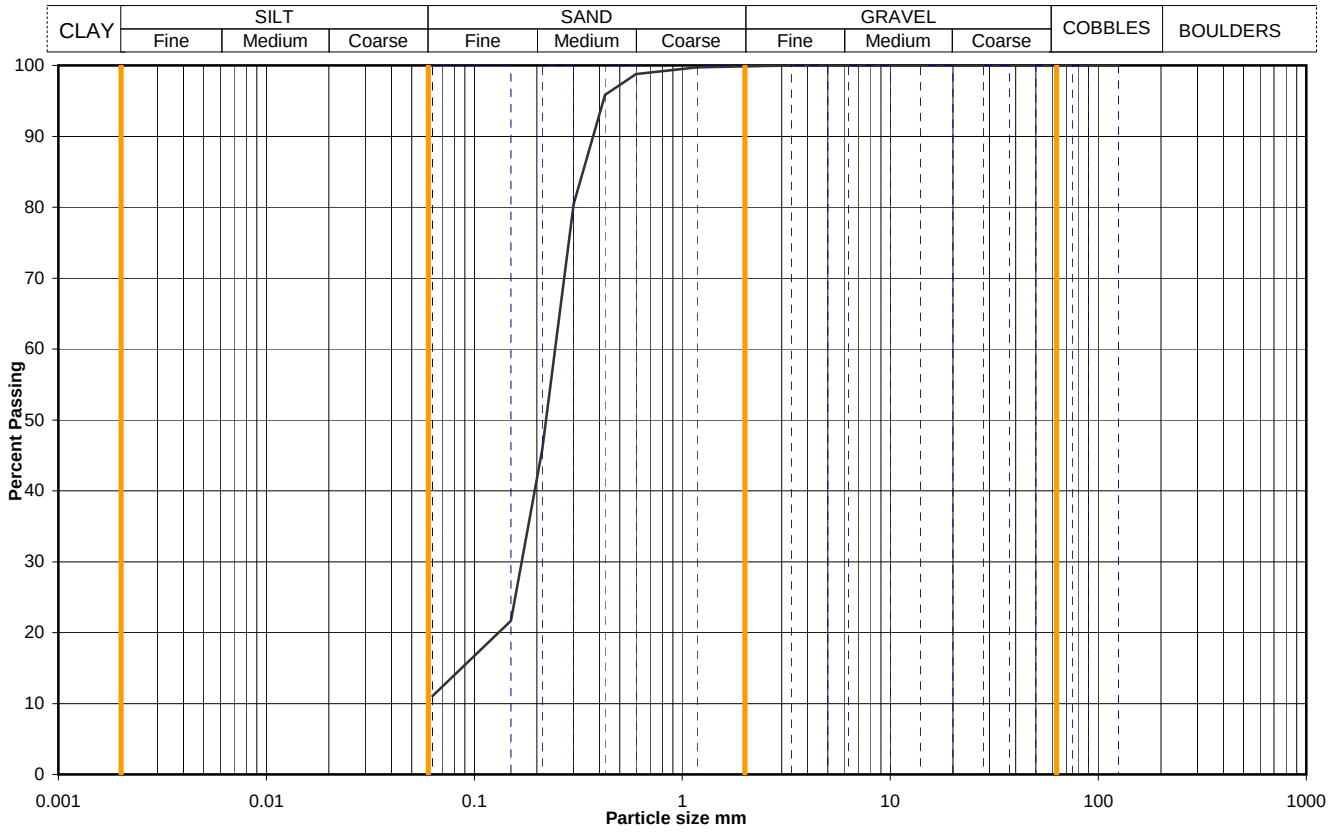
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/12/2014 10:38	**Figure** **PSD 28**

Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH22		
Project Name	Frodsham Wind Farm		Depth (m BGL)	13.00		
			Samp No	32	Type	B
			ID	ESGF4036-14201409220000001483		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5.0	100		
3.35	100		
2.00	100		
1.18	100		
0.600	99		
0.425	96		
0.300	80	Dry mass of sample, kg	
0.212	46		
0.150	22	6.9	
0.063	11		

Soil description	Grey silty SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	0	0
	Sand	89	89
	Silt	silt+clay =	
	Clay	11	11

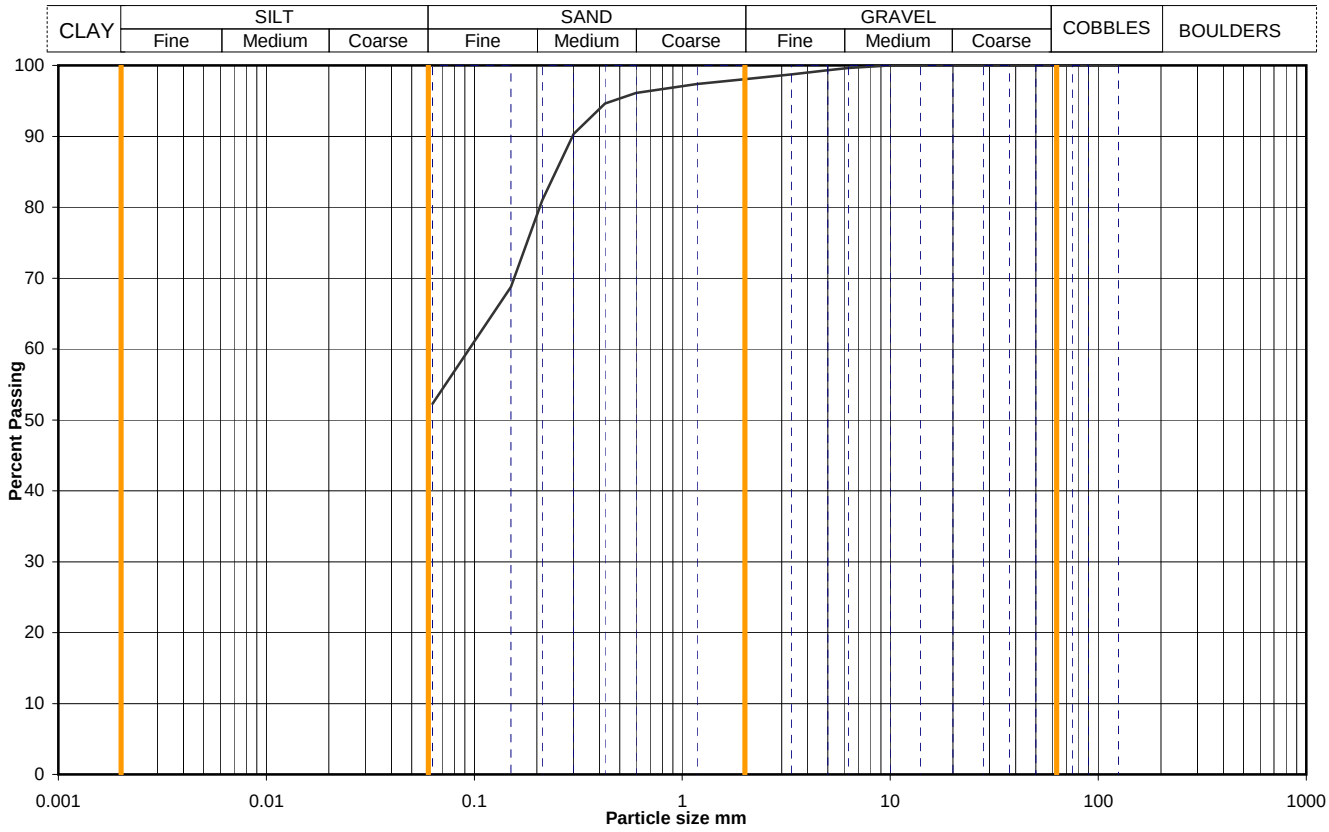
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/12/2014 10:38	**Figure** **PSD 29**

Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH23		
Project Name	Frodsham Wind Farm		Depth (m BGL)	6.00		
			Samp No	12	Type	B
			ID	ESGF4036-14201409260000001968		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5.0	99		
3.35	99		
2.00	98		
1.18	97		
0.600	96		
0.425	95		
0.300	90	Dry mass of sample, kg	
0.212	81		
0.150	69	0.6	
0.063	52		

Soil description	Greyish brown slightly gravelly sandy clayey SILT.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	2	2
	Sand	46	46
	Silt	silt+clay =	
	Clay	52	52

Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

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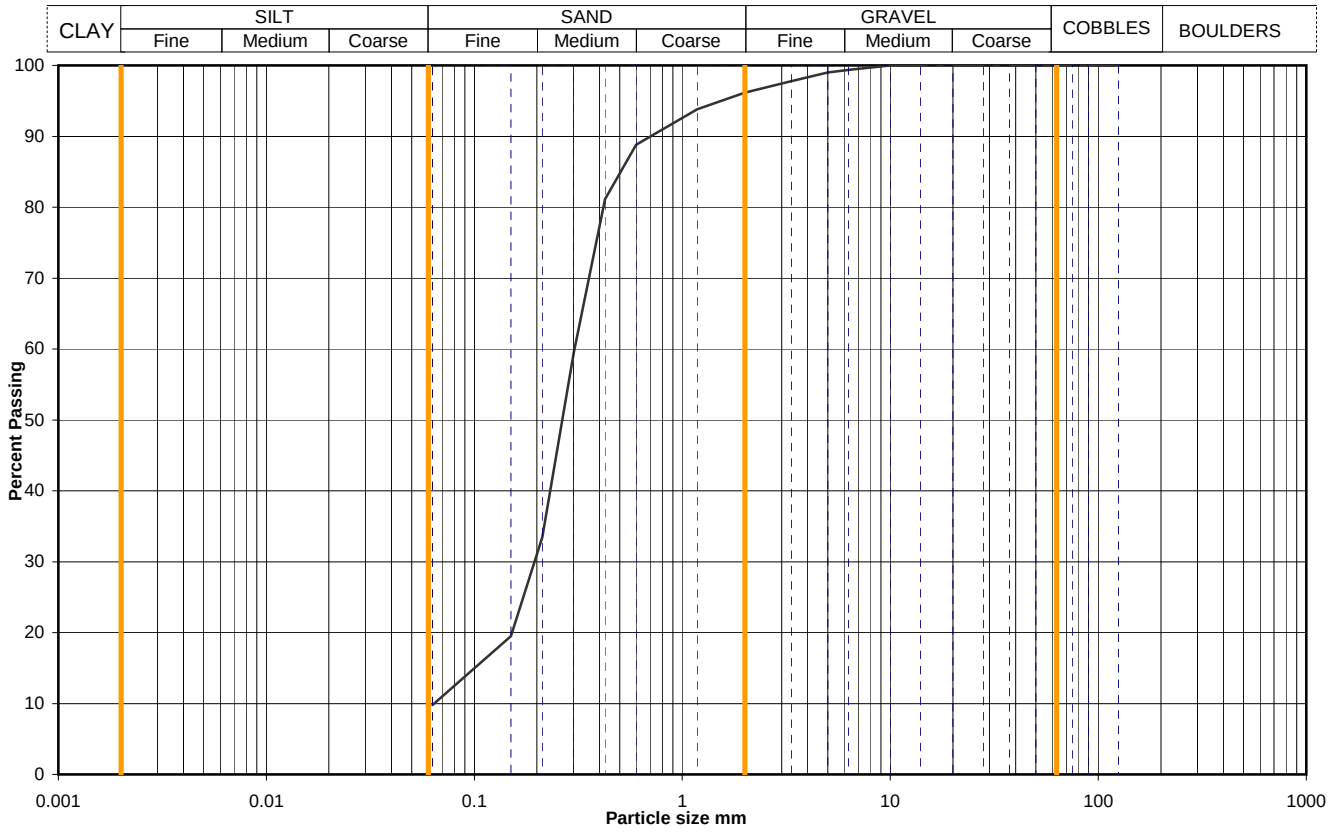
Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH24		
Project Name	Frodsham Wind Farm		Depth (m BGL)	12.00		
			Samp No	22	Type	B
			ID	ESGF4036-14201409170000001232		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	99		
5.0	99		
3.35	98		
2.00	96		
1.18	94		
0.600	89		
0.425	81		
0.300	59	Dry mass of sample, kg	
0.212	33		
0.150	20	6.0	
0.063	10		

Soil description	Brown and grey slightly gravelly clayey SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	4	4
	Sand	86	86
	Silt	silt+clay =	
	Clay	10	10

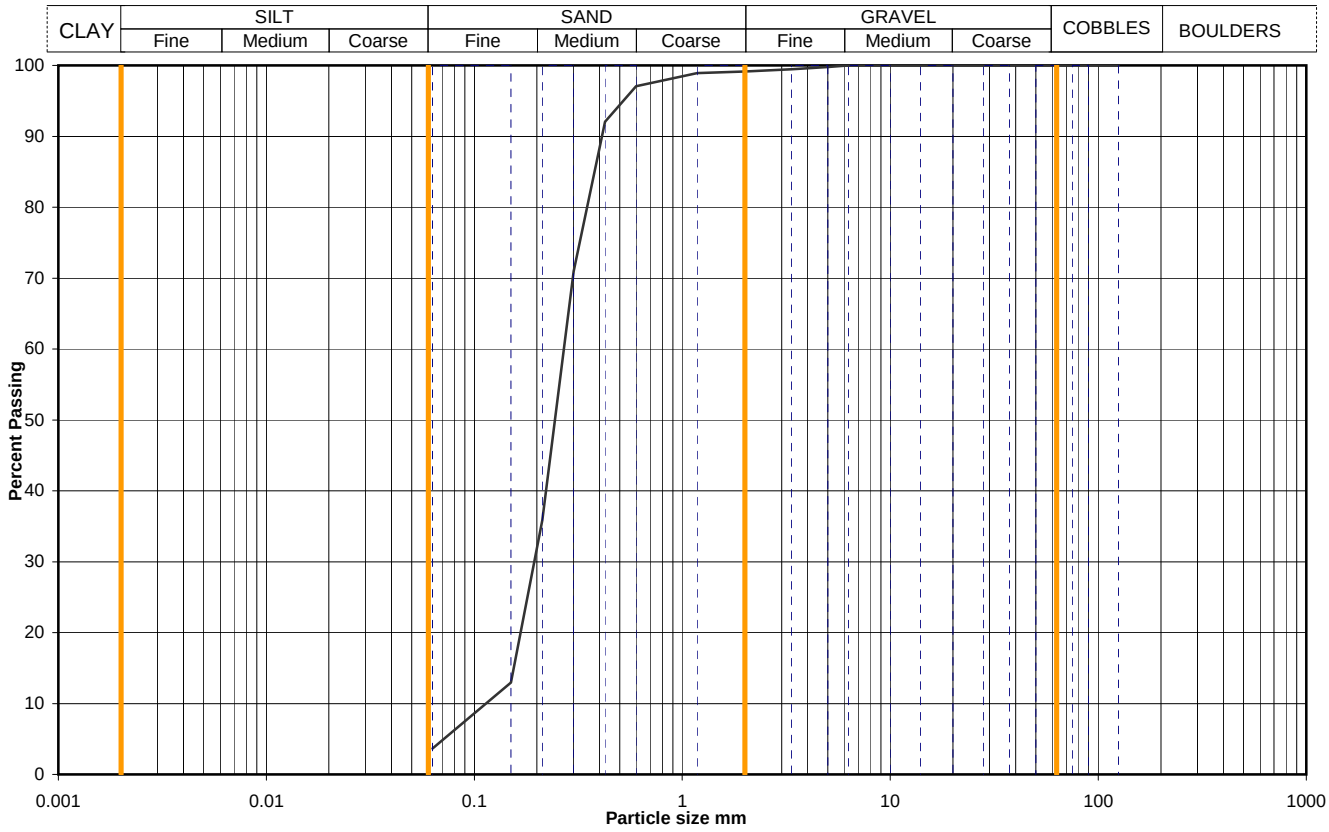
Uniformity Coefficient	D_{60} / D_{10}	5

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/12/2014 10:38	**Figure** **PSD 31**

Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH25		
Project Name	Frodsham Wind Farm		Depth (m BGL)	10.95		
			Samp No	18	Type	B
			ID	ESGF4036-14201409120000000862		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5.0	100		
3.35	99		
2.00	99		
1.18	99		
0.600	97		
0.425	92		
0.300	71	Dry mass of sample, kg	
0.212	36		
0.150	13	6.8	
0.063	4		

Soil description	Dark greyish brown slightly gravelly slightly silty SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	1	1
	Sand	96	96
	Silt	silt+clay =	
	Clay	3	3

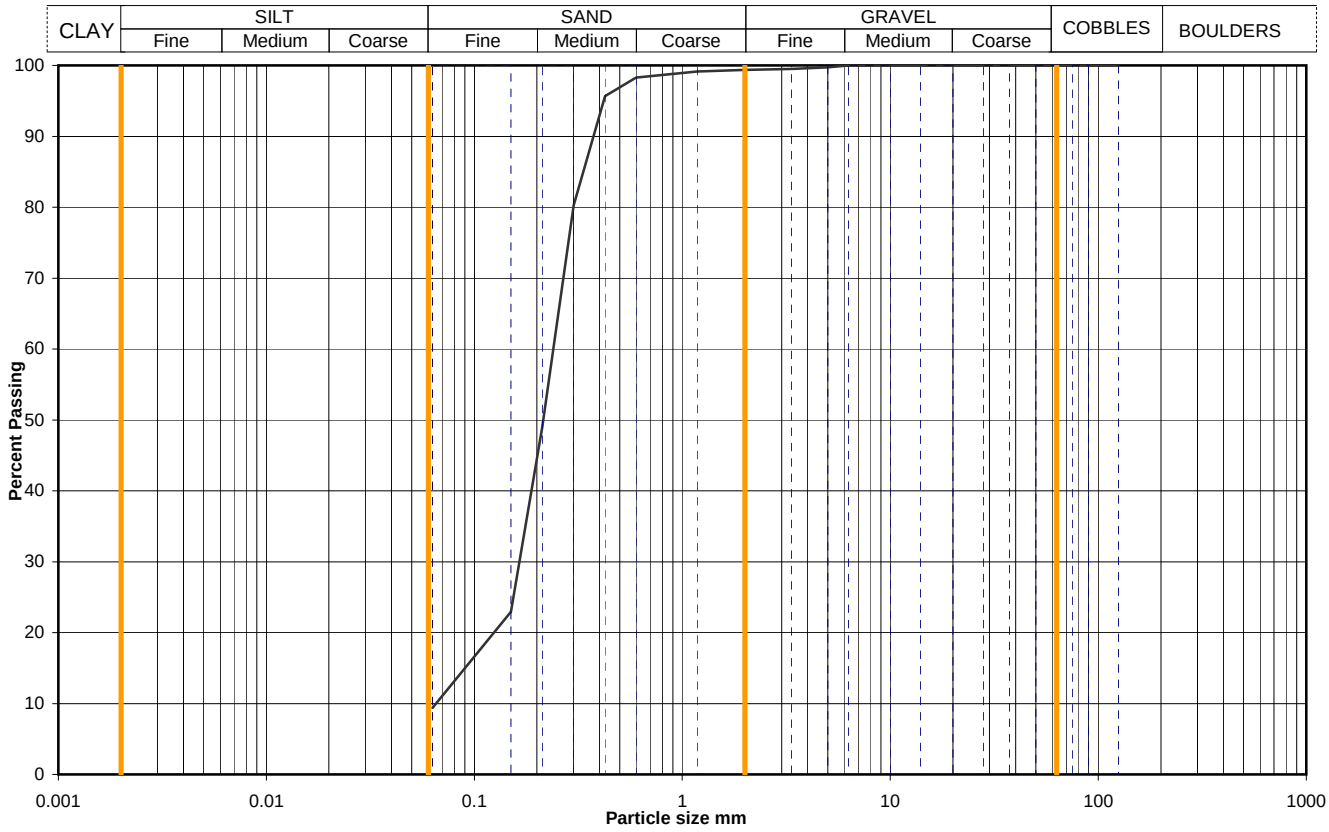
Uniformity Coefficient	D_{60} / D_{10}	2

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/12/2014 10:38	**Figure** **PSD 32**

Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH26		
Project Name	Frodsham Wind Farm		Depth (m BGL)	8.00		
			Samp No	15	Type	B
			ID	ESGF4036-14201409160000001053		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5.0	100		
3.35	100		
2.00	99		
1.18	99		
0.600	98		
0.425	96		
0.300	80	Dry mass of sample, kg	
0.212	49		
0.150	23	5.0	
0.063	9		

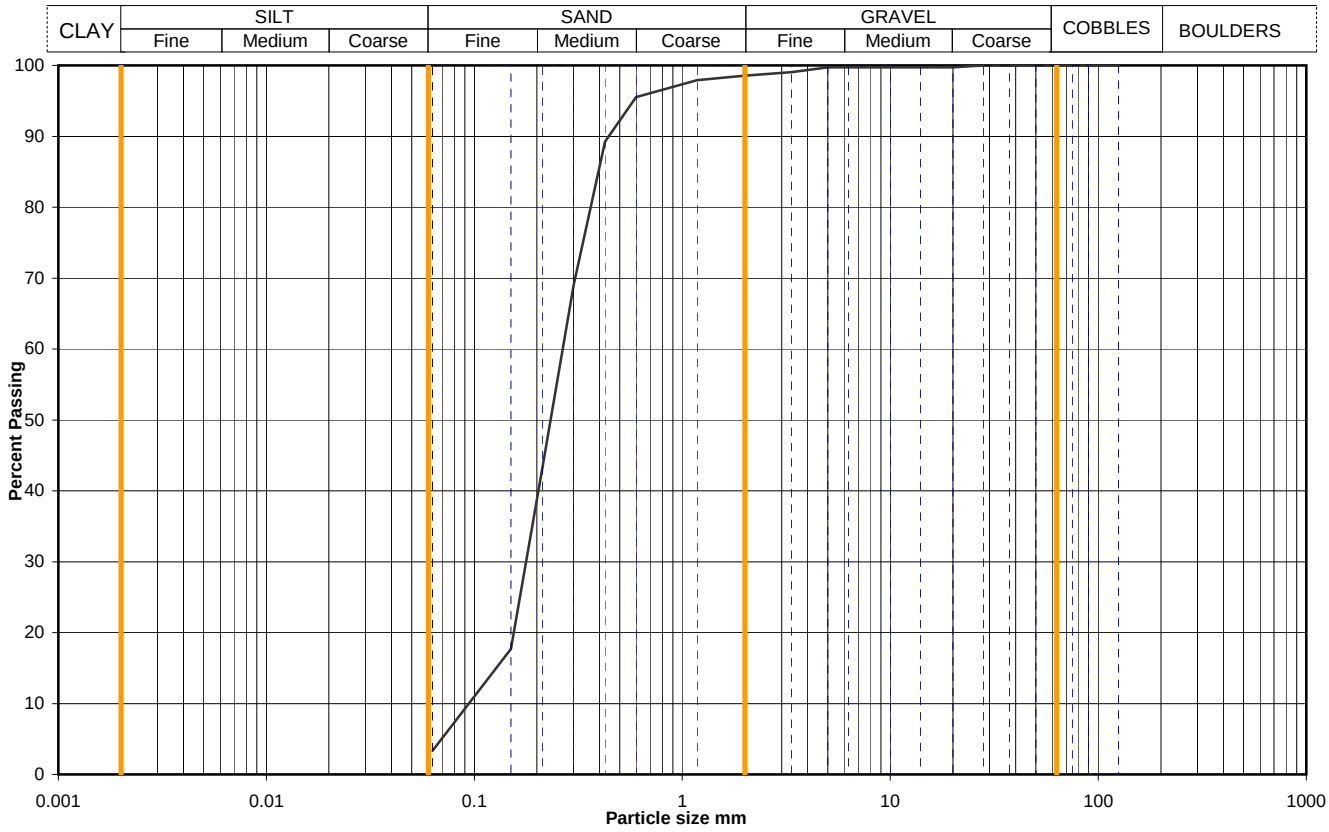
Soil description	Brown slightly gravelly silty SAND. Contains occasional fine rootlets.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	1	1
	Sand	90	90
	Silt	silt+clay =	
	Clay	9	9

Uniformity Coefficient	D_{60} / D_{10}	4

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH27		
Project Name	Frodsham Wind Farm		Depth (m BGL)	16.50		
			Samp No	44	Type	B
			ID	ESGF4036-14201409170000001287		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5.0	100		
3.35	99		
2.00	99		
1.18	98		
0.600	96		
0.425	89		
0.300	69	Dry mass of sample, kg	
0.212	43		
0.150	18	13.6	
0.063	3		

Soil description	Brown slightly gravelly SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	1	1
	Sand	95	95
	Silt	silt+clay =	
	Clay	4	4

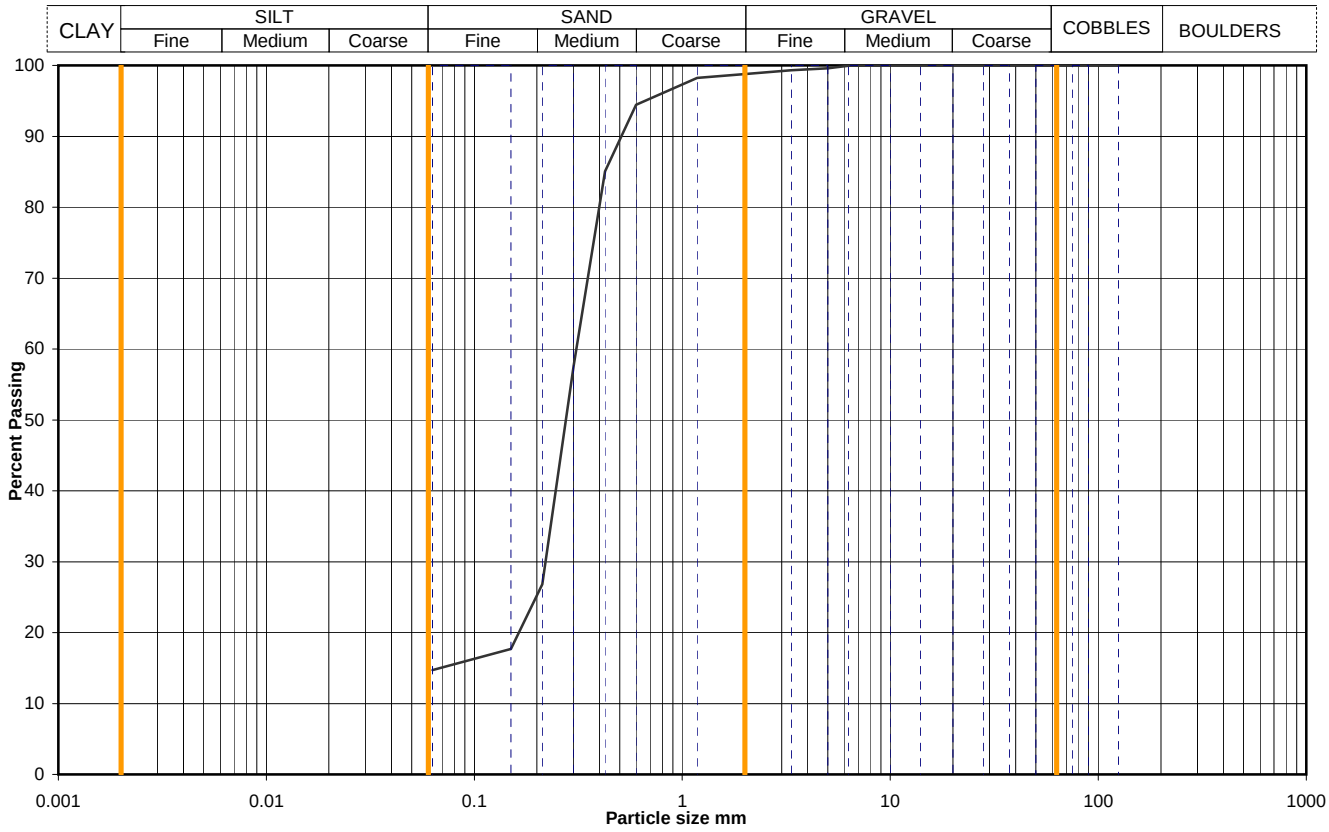
Uniformity Coefficient	D_{60} / D_{10}	3

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/12/2014 10:38	**Figure** **PSD 34**

Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH28		
Project Name	Frodsham Wind Farm		Depth (m BGL)	15.50		
			Samp No	19	Type	B
			ID	ESGF4036-14201409250000001743		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5.0	100		
3.35	99		
2.00	99		
1.18	98		
0.600	94		
0.425	85		
0.300	58	Dry mass of sample, kg	
0.212	27		
0.150	18	8.1	
0.063	15		

Soil description	Greyish brown silty SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	1	1
	Sand	84	84
	Silt	silt+clay =	
	Clay	15	15

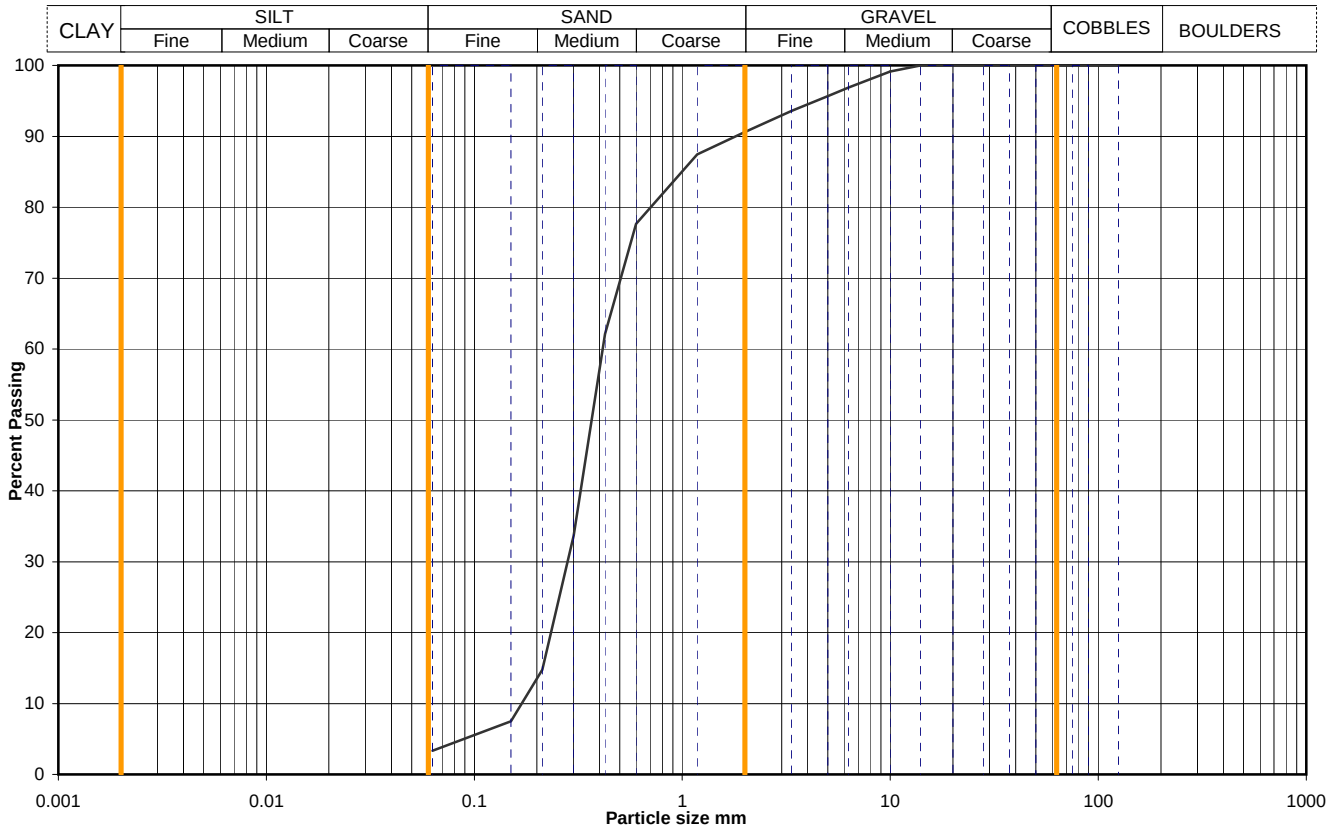
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/12/2014 10:38	**Figure** **PSD 35**

Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH29		
Project Name	Frodsham Wind Farm		Depth (m BGL)	19.50		
			Samp No	33	Type	B
			ID	ESGF4036-14201409250000001803		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	99		
6.3	97		
5.0	96		
3.35	94		
2.00	91		
1.18	87		
0.600	78		
0.425	62		
0.300	34	Dry mass of sample, kg	
0.212	15		
0.150	7	4.2	
0.063	3		

Soil description	Grey gravelly slightly silty SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	9	9
	Sand	87	87
	Silt	silt+clay =	
	Clay	4	4

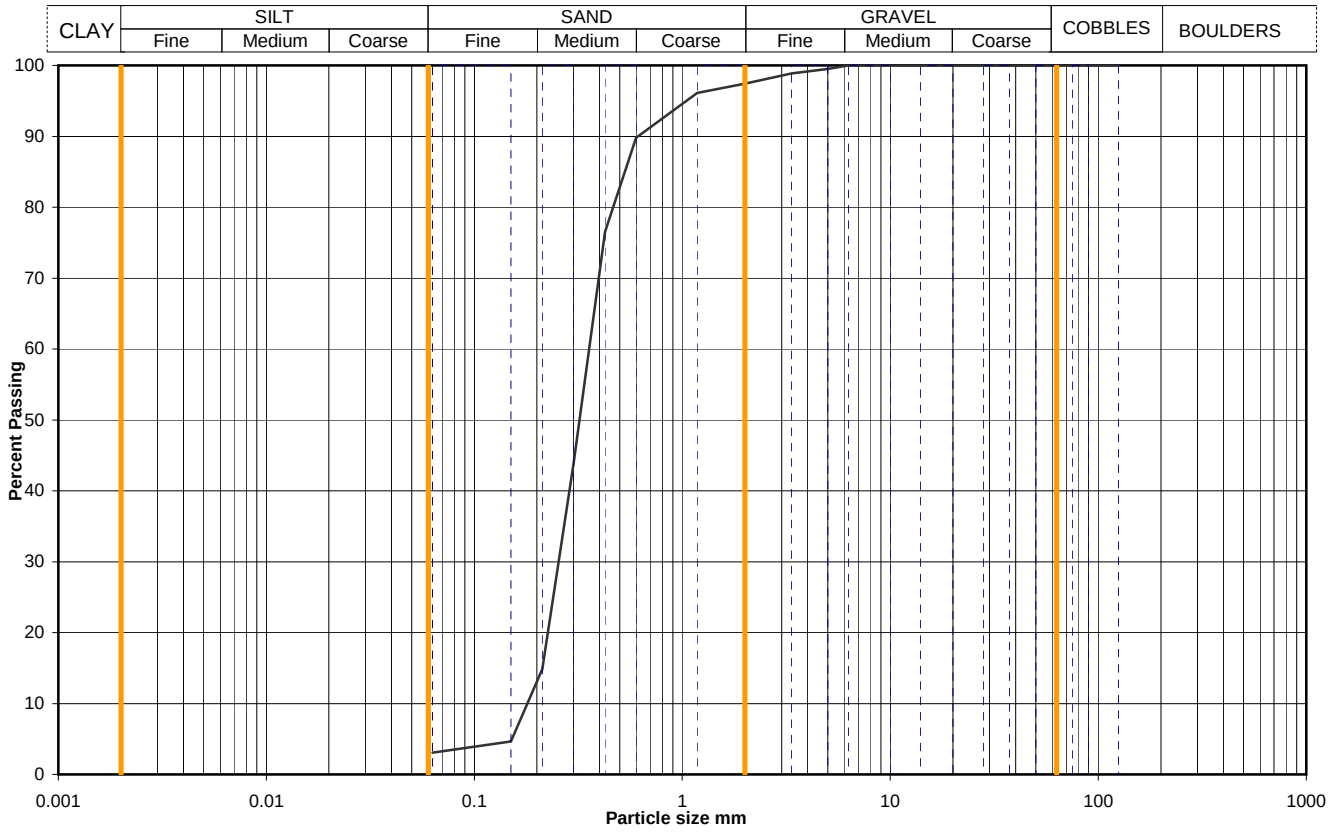
Uniformity Coefficient	D_{60} / D_{10}	3

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/12/2014 10:38	**Figure** **PSD 36**

Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BH30		
Project Name	Frodsham Wind Farm		Depth (m BGL)	14.50		
			Samp No	30	Type	B
			ID	ESGF4036-14201409250000001852		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5.0	100		
3.35	99		
2.00	97		
1.18	96		
0.600	90		
0.425	77		
0.300	44	Dry mass of sample, kg	
0.212	15		
0.150	5	9.4	
0.063	3		

Soil description	Grey slightly gravelly SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	3	3
	Sand	94	94
	Silt	silt+clay =	
	Clay	3	3

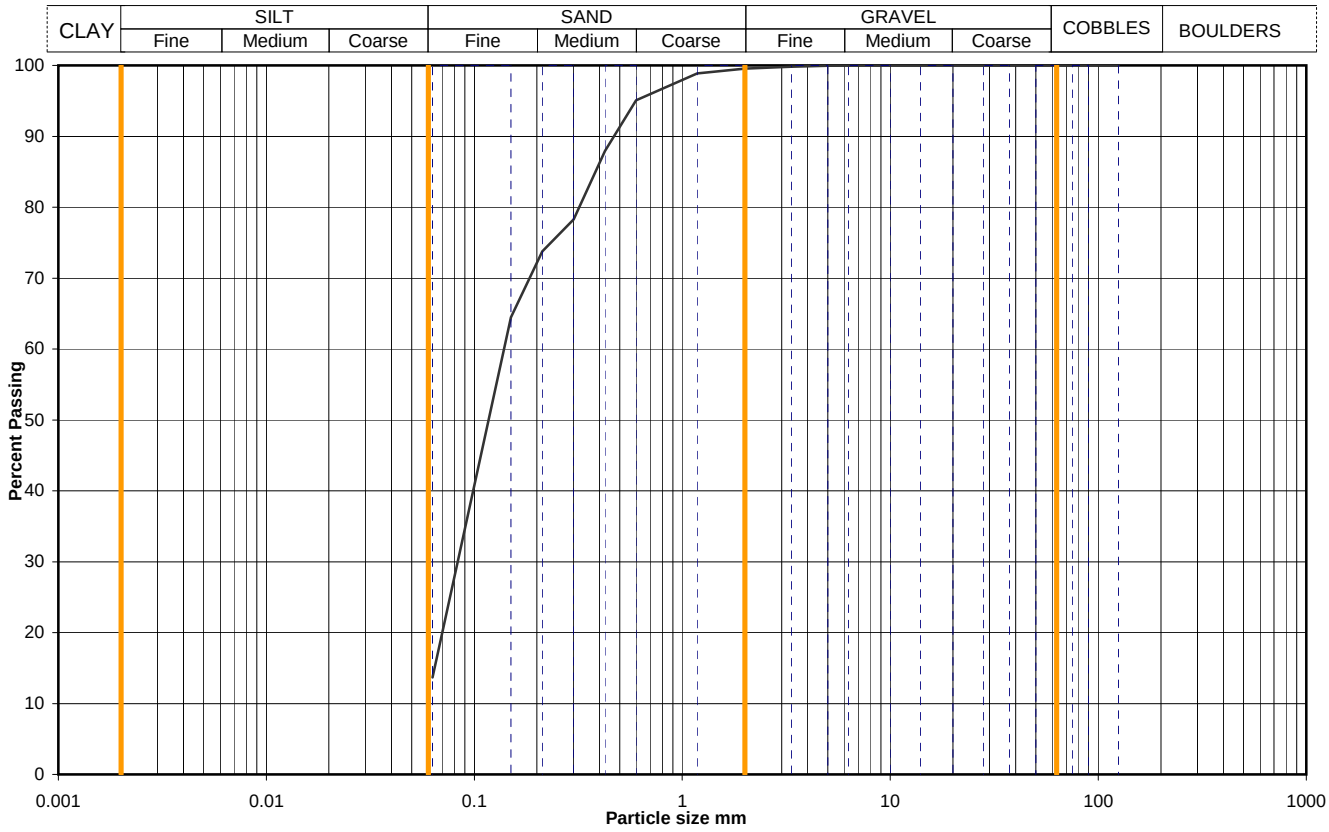
Uniformity Coefficient	D_{60} / D_{10}	2

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/12/2014 10:38	**Figure** **PSD 37**

Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BHMM		
Project Name	Frodsham Wind Farm		Depth (m BGL)	12.00		
			Samp No	31	Type	B
			ID	ESGF4036-14201409160000000995		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5.0	100		
3.35	100		
2.00	100		
1.18	99		
0.600	95		
0.425	88		
0.300	78	Dry mass of sample, kg	
0.212	74		
0.150	64	6.2	
0.063	14		

Soil description	Dark greyish brown silty SAND.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	0	0
	Sand	86	86
	Silt	silt+clay =	
	Clay	14	14

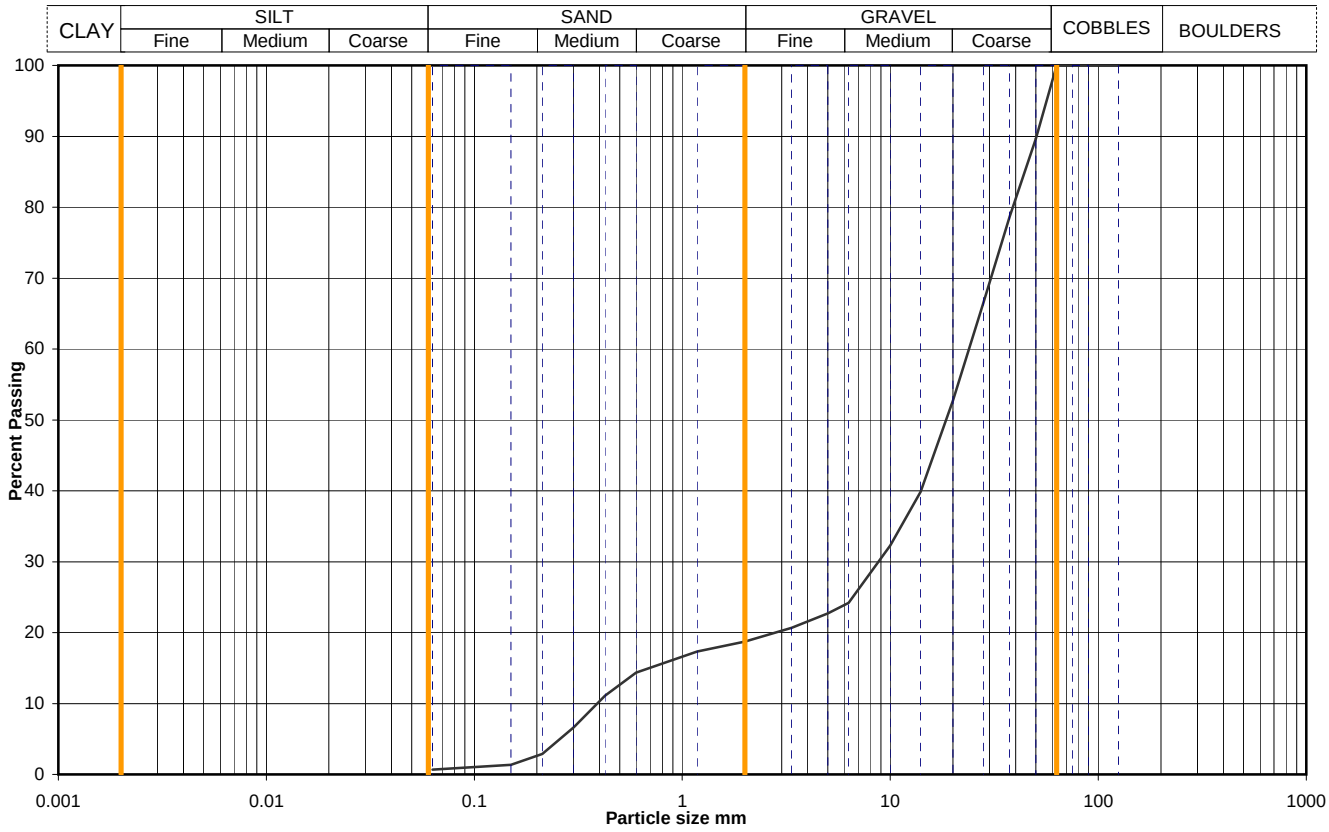
Uniformity Coefficient	D_{60} / D_{10}	Not applicable

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

QA Ref SLR 2,9 Rev 88 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/12/2014 10:38	**Figure** **PSD 38**

Particle Size Distribution Analysis

Project No	F4036-14	Sample Details:	Hole No	BHMM		
Project Name	Frodsham Wind Farm		Depth (m BGL)	19.50		
			Samp No	44	Type	B
			ID	ESGF4036-14201409160000001008		
			Spec Ref			



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	90		
37.5	79		
28	67		
20	53		
14	40		
10	32		
6.3	24		
5.0	23		
3.35	21		
2.00	19		
1.18	17		
0.600	14		
0.425	11		
0.300	7	Dry mass of sample, kg	
0.212	3		
0.150	1	12.7	
0.063	1		

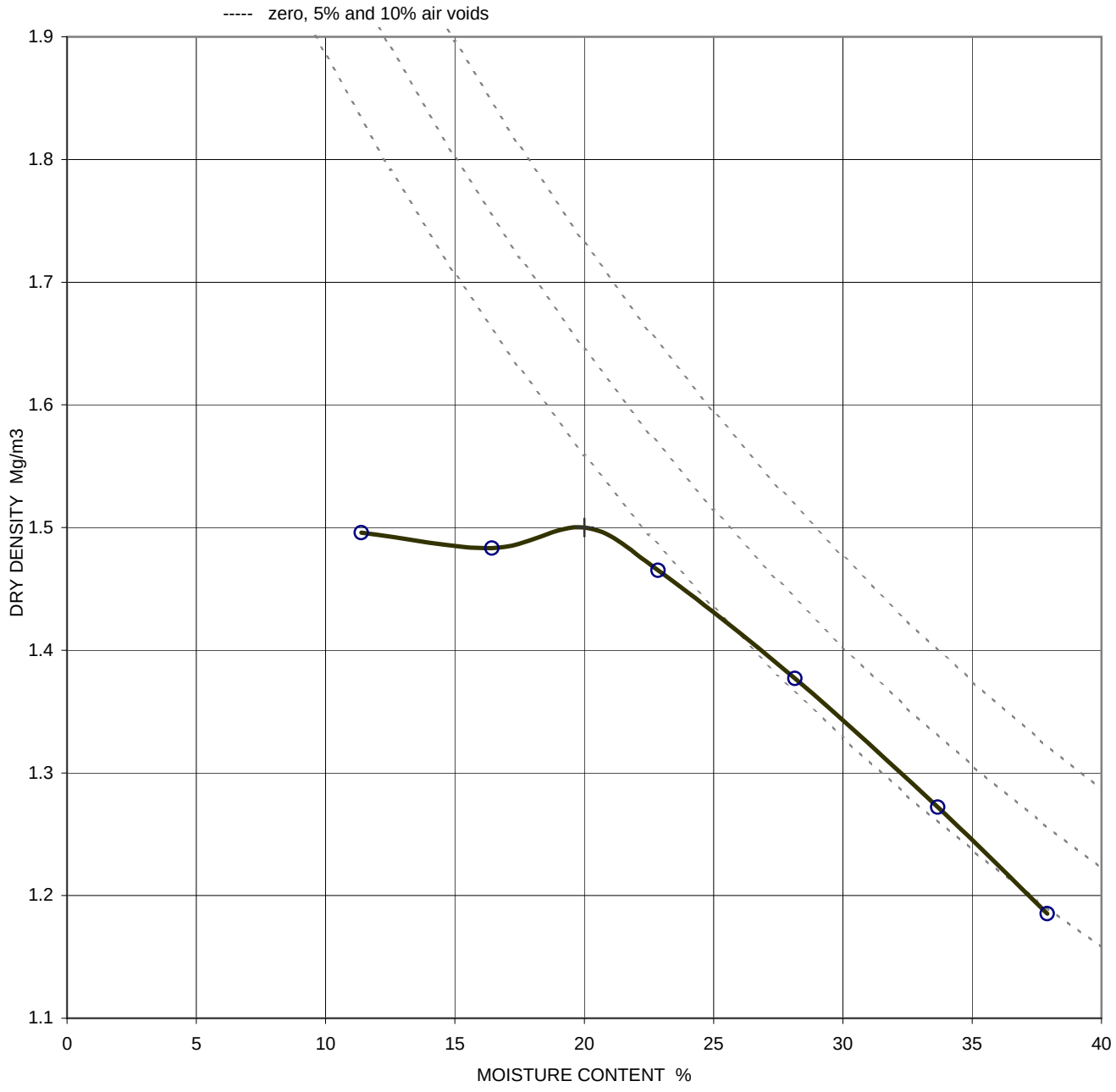
Soil description	Brownish grey sandy GRAVEL.		
Preparation / Pretreatment	Sieve: natural material		
Remarks			
Sample Proportions *<60mm values to aid description only		Whole	*<63mm
	Cobbles / boulders	0	0
	Gravel	81	81
	Sand	18	18
	Silt	silt+clay =	
	Clay	1	1

Uniformity Coefficient	D_{60} / D_{10}	61

Test Method	BS 1377 : Part 2 : 1990	
	Sieving	9.2 wet sieve
	Sedimentation	none

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377 : PART 4 : 1990 : HEAVY COMPACTION, 4.5 kg rammer

Project No	F4036-14	Sample Details:	Hole No	BH27		
Project Name	Frodsham Wind Farm		Depth (m BGL)	1.00		
			Samp No	5	Type	B
			ID	ESGF4036-14201409170000001247		
			Spec Ref			



Soil description	Greyish brown slightly gravelly silty SAND.		
Test method	BS 1377:part 4:1990: clause 3.5, 4.5 kg rammer in a 1 litre mould		
Preparation	Original material was natural, single sample tested		
Material > 37.5mm	1	%	
Material < 37.5mm > 20mm	0	%	
Particle density	2.65	assumed	
Remarks			

Derived Parameters +

Maximum dry density, Mg/m3

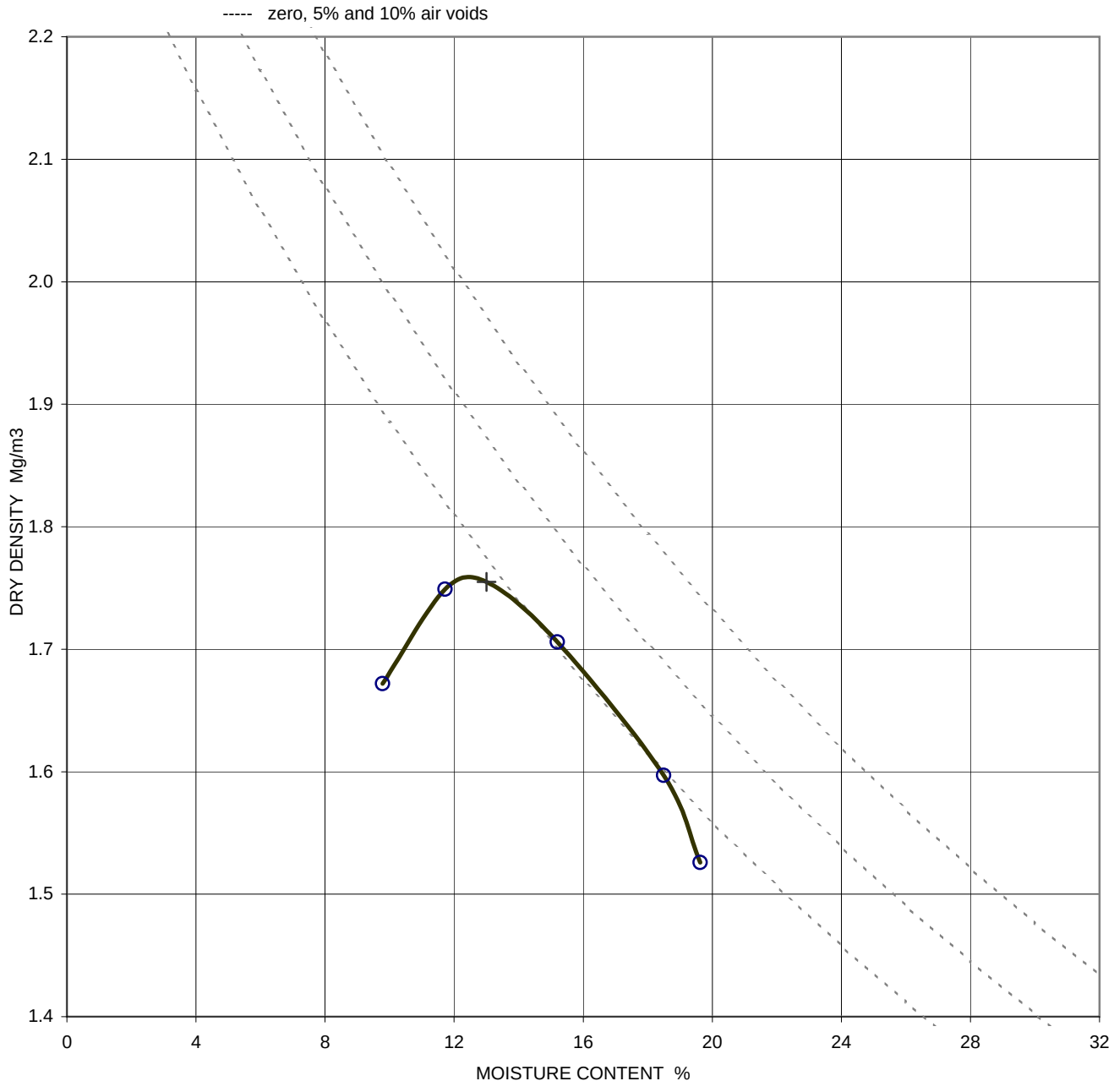
1.50

Optimum moisture content, %

20

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377 : PART 4 : 1990 : HEAVY COMPACTION, 4.5 kg rammer

Project No	F4036-14	Sample Details:	Hole No	BH27		
Project Name	Frodsham Wind Farm		Depth (m BGL)	5.00		
			Samp No	15	Type	B
			ID	ESGF4036-14201409170000001257		
			Spec Ref			



Soil description	Dark grey sandy silty CLAY.		
Test method	BS 1377:part 4:1990: clause 3.5, 4.5 kg rammer in a 1 litre mould		
Preparation	Original material was natural, single sample tested		
Material > 37.5mm	0	%	
Material < 37.5mm > 20mm	0	%	
Particle density	2.65	assumed	
Remarks			

Derived Parameters +

Maximum dry density, Mg/m3

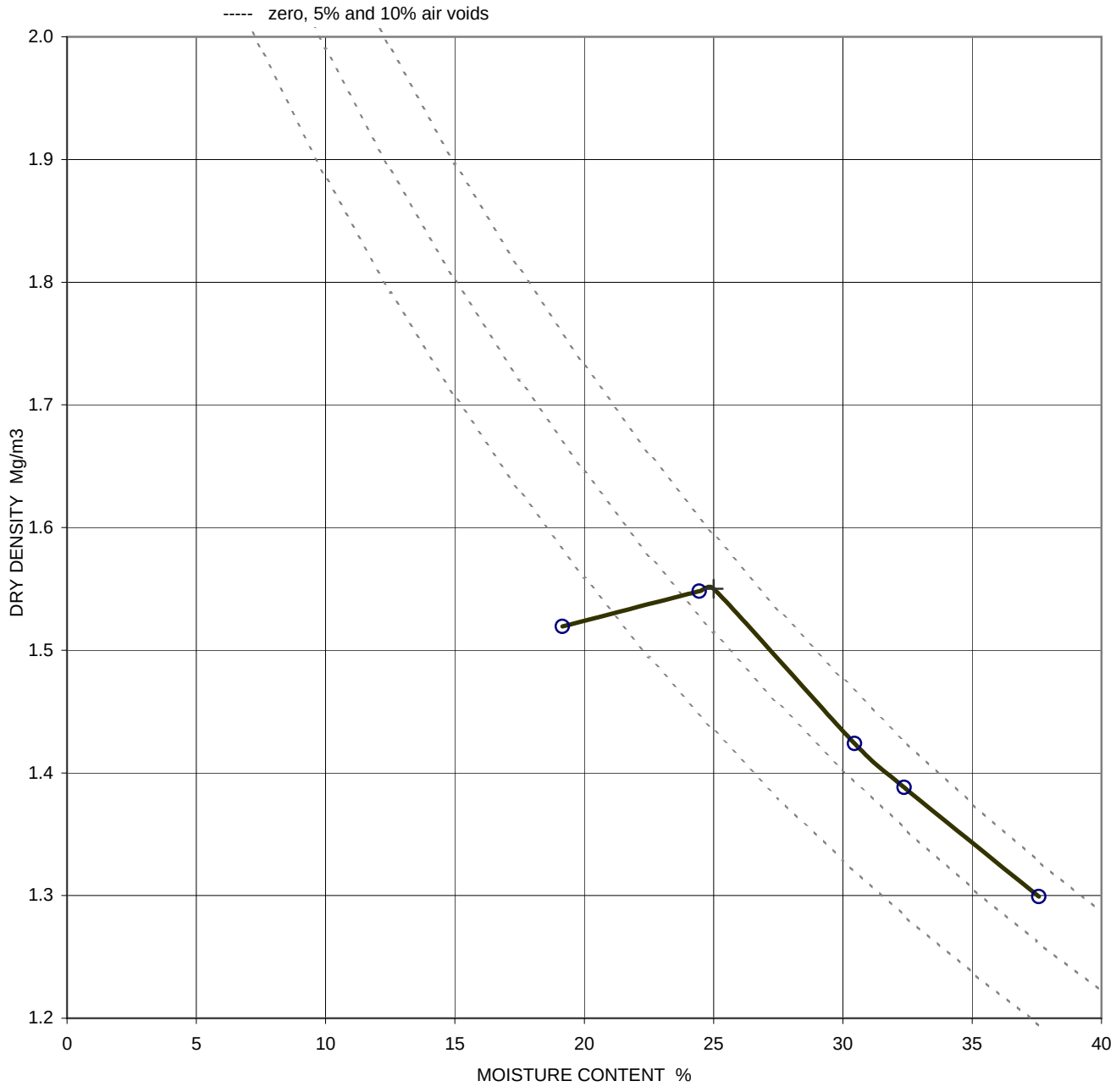
1.76

Optimum moisture content, %

13

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377 : PART 4 : 1990 : HEAVY COMPACTION, 4.5 kg rammer

Project No	F4036-14	Sample Details:	Hole No	BH28		
Project Name	Frodsham Wind Farm		Depth (m BGL)	1.00		
			Samp No	2	Type	B
			ID	ESGF4036-14201409250000001726		
			Spec Ref			



Soil description	Dark grey silty CLAY.		
Test method	BS 1377:part 4:1990: clause 3.5, 4.5 kg rammer in a 1 litre mould		
Preparation	Original material was natural, single sample tested		
Material > 37.5mm	2	%	
Material < 37.5mm > 20mm	0	%	
Particle density	2.65	assumed	
Remarks			

Derived Parameters +

Maximum dry density, Mg/m3

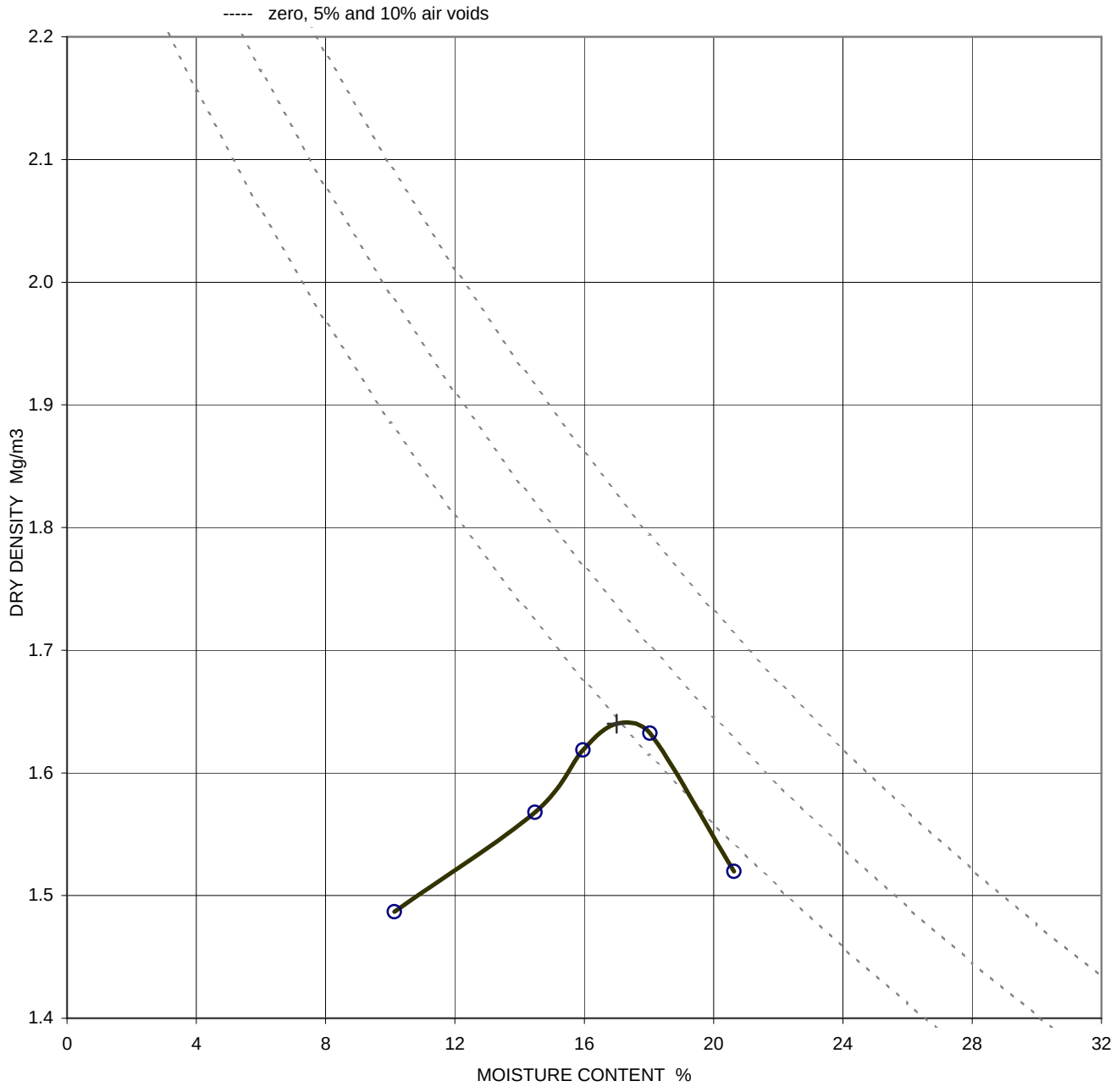
1.55

Optimum moisture content, %

25

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377 : PART 4 : 1990 : HEAVY COMPACTION, 4.5 kg rammer

Project No	F4036-14	Sample Details:	Hole No	BH28		
Project Name	Frodsham Wind Farm		Depth (m BGL)	7.00		
			Samp No	8	Type	B
			ID	ESGF4036-14201409250000001732		
			Spec Ref			



Soil description	Brownish grey slightly gravelly sandy CLAY.		
Test method	BS 1377:part 4:1990: clause 3.5, 4.5 kg rammer in a 1 litre mould		
Preparation	Original material was natural, single sample tested		
Material > 37.5mm	0	%	
Material < 37.5mm > 20mm	0	%	
Particle density	2.65	assumed	
Remarks			

Derived Parameters +

Maximum dry density, Mg/m3

1.64

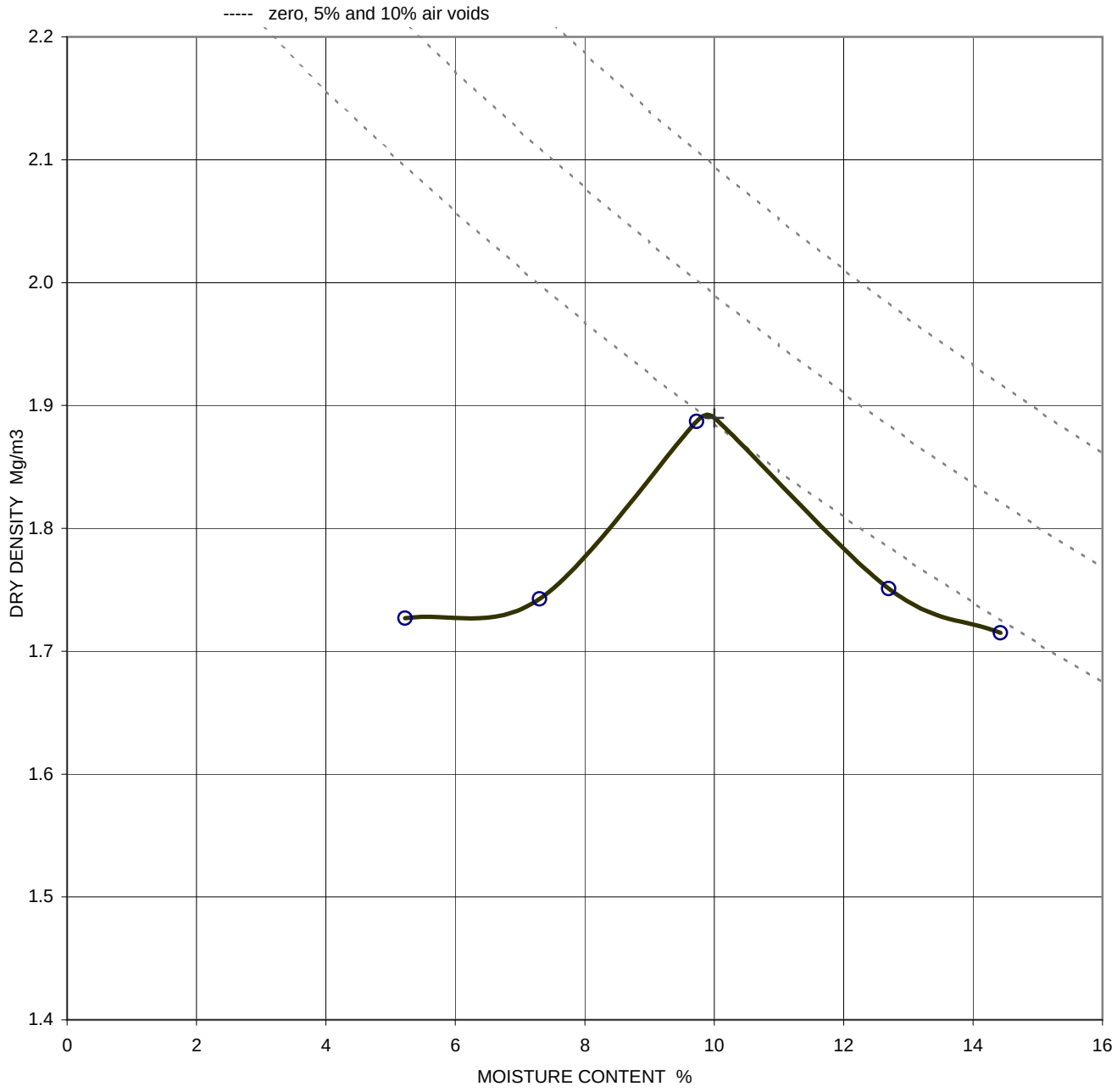
Optimum moisture content, %

17

QA Ref SLD 4, 3.5/6 Rev 66 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/12/2014 10:35	**Figure** **COMPH 4**

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377 : PART 4 : 1990 : HEAVY COMPACTION, 4.5 kg rammer

Project No	F4036-14	Sample Details:	Hole No	BH29		
Project Name	Frodsham Wind Farm		Depth (m BGL)	0.40		
			Samp No	2	Type	B
			ID	ESGF4036-14201409250000001771		
			Spec Ref			



Soil description	Brown slightly gravelly SAND with clay pockets.		
Test method	BS 1377:part 4:1990: clause 3.5, 4.5 kg rammer in a 1 litre mould		
Preparation	Original material was natural, single sample tested		
Material > 37.5mm	1	%	
Material < 37.5mm > 20mm	0	%	
Particle density	2.65	assumed	
Remarks			

Derived Parameters +

Maximum dry density, Mg/m3

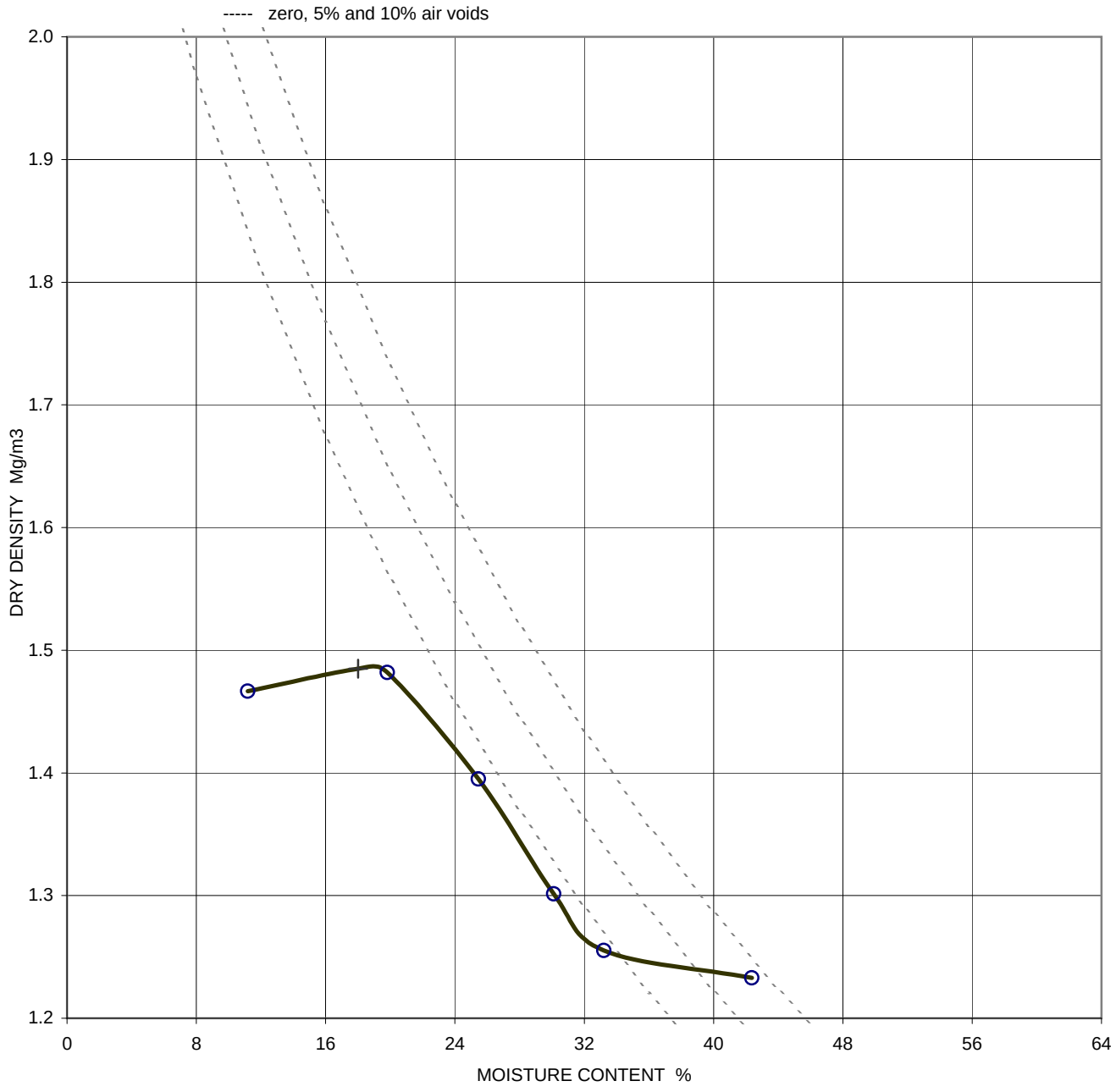
1.89

Optimum moisture content, %

10

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377 : PART 4 : 1990 : HEAVY COMPACTION, 4.5 kg rammer

Project No	F4036-14	Sample Details:	Hole No	BH29		
Project Name	Frodsham Wind Farm		Depth (m BGL)	2.00		
			Samp No	6	Type	B
			ID	ESGF4036-14201409250000001775		
			Spec Ref			



Soil description	Dark grey slightly sandy slightly gravelly silty CLAY.		
Test method	BS 1377:part 4:1990: clause 3.5, 4.5 kg rammer in a 1 litre mould		
Preparation	Original material was natural, single sample tested		
Material > 37.5mm	1	%	
Material < 37.5mm > 20mm	0	%	
Particle density	2.65	assumed	
Remarks			

Derived Parameters +

Maximum dry density, Mg/m3

1.49

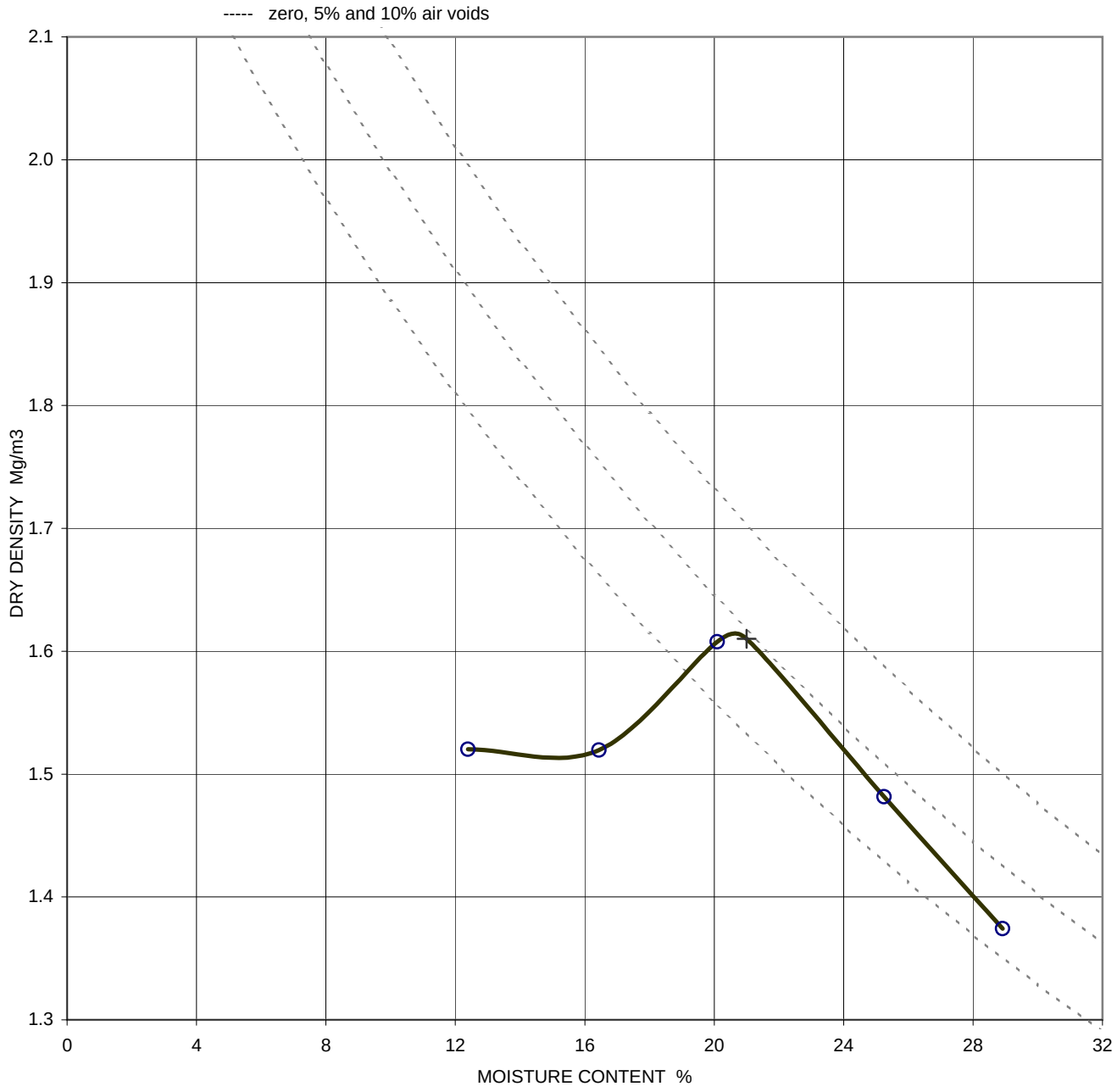
Optimum moisture content, %

18

QA Ref SLD 4, 3.5/6 Rev 66 Aug 11	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/12/2014 10:35	**Figure** **COMPH 6**

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377 : PART 4 : 1990 : HEAVY COMPACTION, 4.5 kg rammer

Project No	F4036-14	Sample Details:	Hole No	BH29		
Project Name	Frodsham Wind Farm		Depth (m BGL)	5.00		
			Samp No	12	Type	B
			ID	ESGF4036-14201409250000001781		
			Spec Ref			



Soil description	Greyish brown slightly sandy silty CLAY.		
Test method	BS 1377:part 4:1990: clause 3.5, 4.5 kg rammer in a 1 litre mould		
Preparation	Original material was natural, single sample tested		
Material > 37.5mm	0	%	
Material < 37.5mm > 20mm	0	%	
Particle density	2.65	assumed	
Remarks			

Derived Parameters +

Maximum dry density, Mg/m3

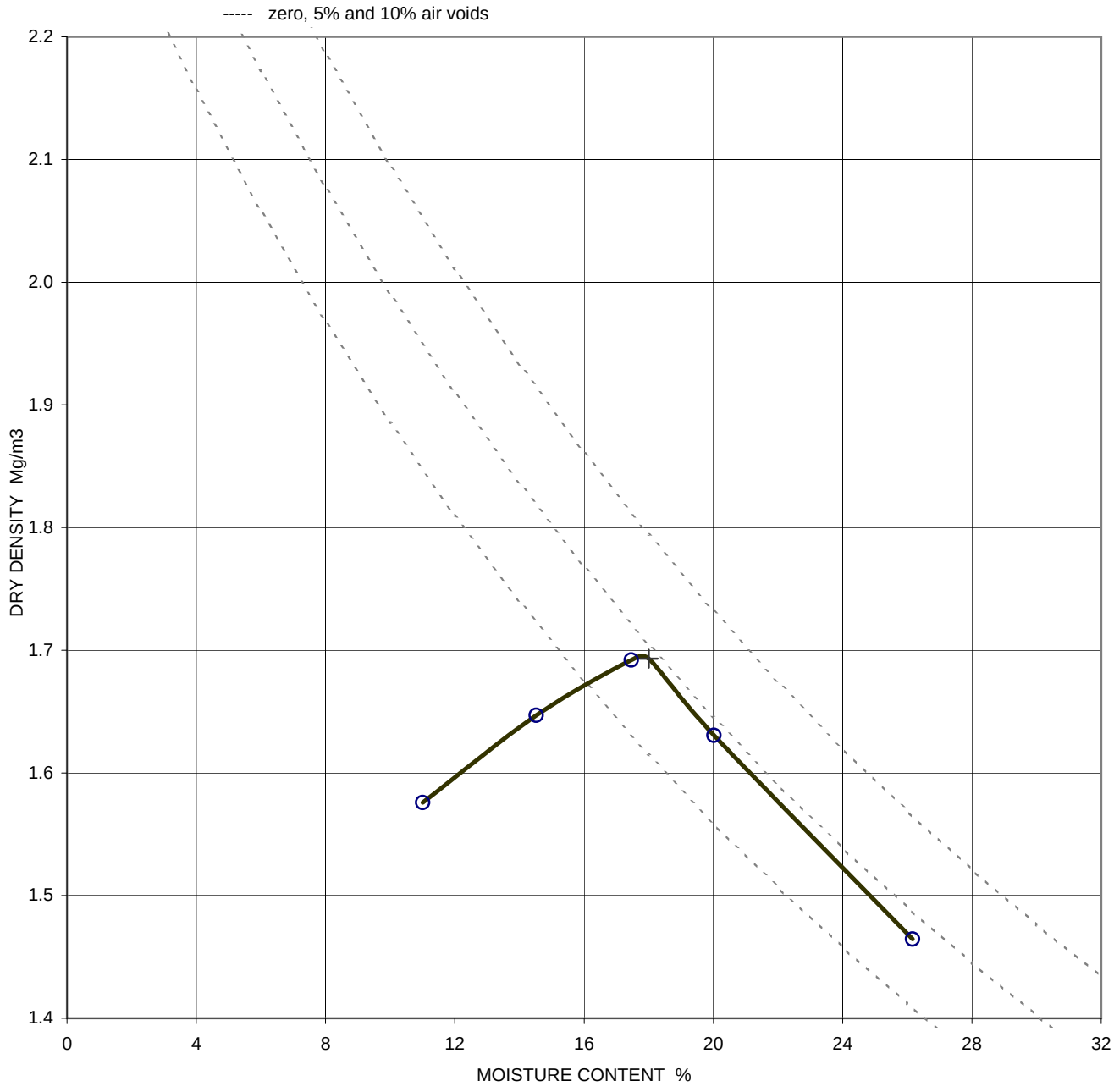
1.61

Optimum moisture content, %

21

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377 : PART 4 : 1990 : HEAVY COMPACTION, 4.5 kg rammer

Project No	F4036-14	Sample Details:	Hole No	BH31		
Project Name	Frodsham Wind Farm		Depth (m BGL)	0.30		
			Samp No	1	Type	B
			ID	ESGF4036-14201409260000001884		
			Spec Ref			



Soil description	Brown slightly sandy slightly gravelly CLAY.		
Test method	BS 1377:part 4:1990: clause 3.5, 4.5 kg rammer in a 1 litre mould		
Preparation	Original material was natural, single sample tested		
Material > 37.5mm	0	%	
Material < 37.5mm > 20mm	0	%	
Particle density	2.65	assumed	
Remarks			

Derived Parameters +

Maximum dry density, Mg/m3

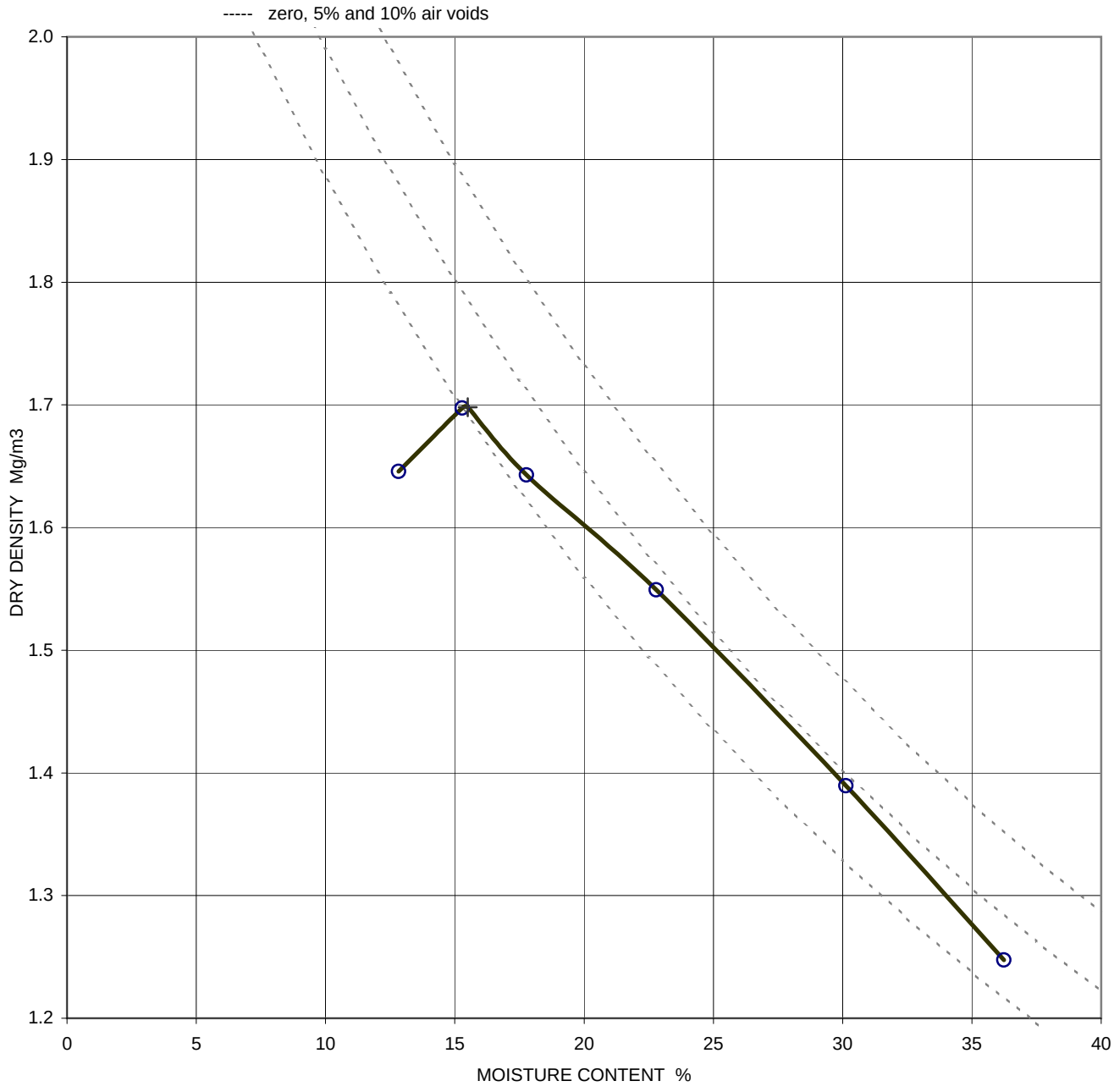
1.69

Optimum moisture content, %

18

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377 : PART 4 : 1990 : HEAVY COMPACTION, 4.5 kg rammer

Project No	F4036-14	Sample Details:	Hole No	BH31		
Project Name	Frodsham Wind Farm		Depth (m BGL)	6.00		
			Samp No	13	Type	B
			ID	ESGF4036-14201409260000001896		
			Spec Ref			



Soil description	Greyish brown slightly sandy CLAY.		
Test method	BS 1377:part 4:1990: clause 3.5, 4.5 kg rammer in a 1 litre mould		
Preparation	Original material was natural, single sample tested		
Material > 37.5mm	0	%	
Material < 37.5mm > 20mm	0	%	
Particle density	2.65	assumed	
Remarks			

Derived Parameters +

Maximum dry density, Mg/m3

1.70

Optimum moisture content, %

16

UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TESTS WITHOUT MEASUREMENT OF PORE PRESSURE - SUMMARY OF RESULTS

Project No	Project Name
F4036-14	Frodsham Wind Farm

Hole No.	Sample No.	Depth (m) from	Depth (m) to	type	Soil Description	Density bulk Mg/m³	Density dry Mg/m³	*w* %	Test type	Dia. mm	$ó_3$ kPa	At failure / end of stage: Axial strain %	$ó_1 - ó_3$ kPa	c_u kPa	MODE	Remarks
BH02	23	8.50	8.95	U	Soft grey and brown slightly sandy CLAY.	1.91	1.42	35	UUM	101.1	100	3.0	21	11		
										101.1	150	4.5	27	13	P	
										101.1	200	17.8	41	20		
BH05	52	24.00	24.45	U	Soft brown slightly sandy slightly gravelly CLAY.	2.20	1.87	18	UUM	101.8	300	9.6	65	32		
										101.8	400	12.6	73	37	P	
										101.8	500	20.1	82	41		
BH07	32	21.00	21.45	U	Stiff brown slightly sandy slightly gravelly CLAY.	2.18	1.85	18	UUM	101.7	250	19.7	315	158	P	Ran to 20% on stage 1
BH08	39	25.00	25.45	U	Very soft to soft brown sandy gravelly CLAY.	2.20	1.88	17	UUM	101.7	325	17.8	182	91		Ran to 20% on stage 2.
										101.7	425	19.8	185	93	P	
BH09	47	30.00	30.45	U	Soft to firm brown slightly sandy slighjtly gravelly CLAY with sand partings.	2.01	1.57	28	UUM	102.4	400	7.9	60	30		
										102.4	500	10.4	68	34	P	
										102.4	600	19.8	77	39		
BH10	15	6.50	6.95	U	Very soft dark grey slightly sandy CLAY.	1.46	0.80	83	UUM	103.7	75	2.0	3	2		
										103.7	125	3.5	4	2	P	
										103.7	175	8.4	6	3		
BH15	14	6.00	6.45	U	Soft to firm greyish brown slightly sandy slightly gravelly CLAY. Gravel is weak mudstone.	1.91	1.46	31	UUM	103.0	75	6.9	72	36		
										103.0	100	8.4	77	38	C	
										103.0	125	19.7	87	44		
BH18	23	9.50	9.95	U	Firm brown and grey slightly sandy CLAY.	2.07	1.67	24	UUM	101.3	125	7.4	63	32		
										101.3	175	12.4	79	40	P	
										101.3	225	19.3	91	45		
BH19	21	8.50	8.95	U	Soft brownish grey organic slightly sandy CLAY.	1.62	1.05	55	UUM	103.0	100	3.0	16	8		
										103.0	150	4.4	20	10	P	
										103.0	200	14.3	29	15		
BH21	17	6.00	6.50	U	Dark brown fibrous PEAT.	1.04	0.22	376	UUM	101.9	75	12.4	178	89		
										101.9	100	13.4	177	88	B	
										101.9	125	14.4	175	88		
BH22	16	5.50	6.00	U	Soft to firm grey silty CLAY.	1.95	1.50	30	UUM	103.3	75	2.0	8	4		
										103.3	100	3.5	12	6	P	
										103.3	125	19.3	33	16		
BH24	10	5.00	5.45	U	Soft brownish grey slightly sandy silty CLAY.	1.96	1.48	33	UUM	102.1	50	2.0	9	5		
										102.1	75	3.5	14	7	P	
										102.1	100	15.3	24	12		
BH25	23	15.00	15.45	U	Stiff brown slightly sandy slightly gravelly CLAY.	2.18	1.86	18	UUM	103.1	200	12.4	208	104		
										103.1	250	15.4	232	116	P	
										103.1	300	19.8	260	130		
BH28	31	25.00	25.45	U	Firm brown slightly sandy CLAY.	1.94	1.48	31	UUM	103.2	325	6.9	91	45		
										103.2	425	8.4	93	47	B	
										103.2	525	10.4	95	48		
BH29	17	8.00	8.45	U	Firm greyish brown slightly sandy CLAY.	1.97	1.54	28	UUM	103.3	100	10.4	68	34		
										103.3	150	11.9	72	36	P	
										103.3	200	19.8	84	42		
BH29	22	12.00	12.45	U	Firm brownish grey organic slightly sandy CLAY.	1.82	1.32	38	UUM	102.7	150	2.0	11	5		
										102.7	200	3.5	15	7	P	
										102.7	250	19.8	36	18		
BH30	56	28.00	28.45	U	Firm to stiff brown laminated slightly sandy CLAY.	1.91	1.48	29	UUM	103.0	350	16.4	145	73		
										103.0	450	17.4	148	74	C	
										103.0	550	18.9	149	74		
BH31	6	3.00	3.45	U	Firm greyish brown slightly sandy slightly gravelly CLAY.	1.95	1.52	28	UUM	103.3	50	5.4	44	22		
										103.3	75	7.4	50	25	P	
										103.3	100	16.3	60	30		
BH32	9	4.00	4.45	U	Soft brownish grey slightly sandy CLAY.	1.94	1.40	39	UUM	100.7	50	11.4	81	41		
										100.7	75	14.4	89	45	P	
										100.7	100	19.9	97	48		

General notes: Tests carried out in accordance with BS1377: Part 7: 1990, clause 8 for single stage, clause 9 for multistage tests. Specimens nominally 2:1 height diameter ratio and tested at a rate of strain of 2%/minute, unless annotated otherwise. See individual test reports for further details.

Legend

UU - single stage test (may be in sets of specimens)

UUM - multistage test on a single specimen

suffix R - remoulded or recompacted

$ó_3$ cell pressure

$ó_1 - ó_3$ deviator stress

c_u undrained shear strength

Mode of failure: P plastic; B brittle; C compound

Consolidated Drained Triaxial Compression test with Measurement of Volume Change (BS1377 : Part 8 : 1990) - Multistage test on a single specimen

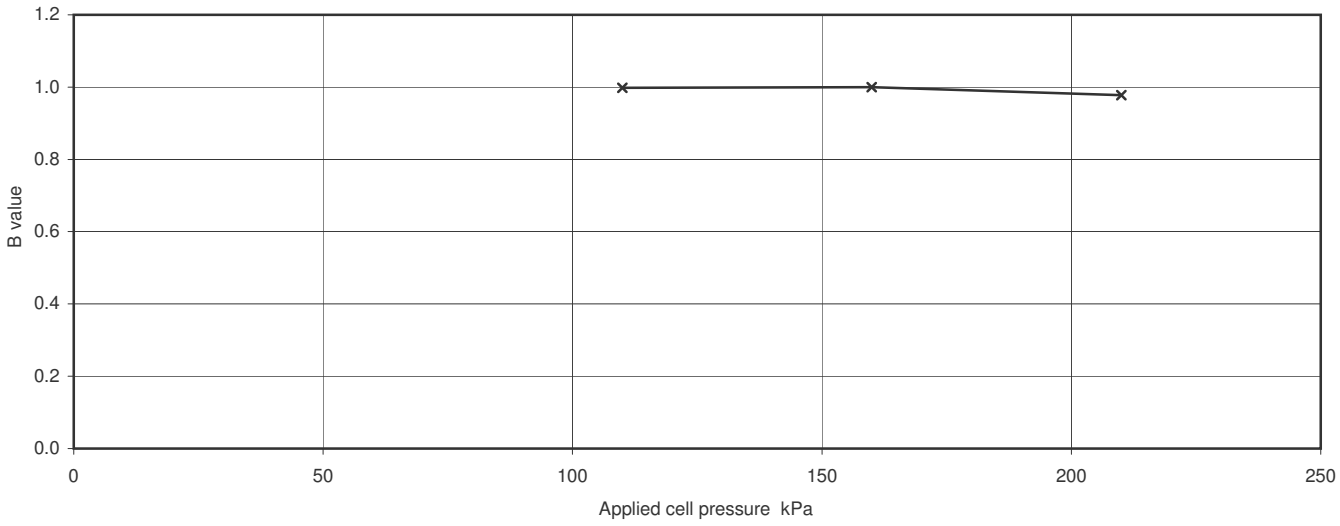
Project No	F4036-14	Sample Details:	Hole No		BH06	
Project Name	FRODSHAM WIND FARM (6,7,8)		Depth (m BGL)		7.50-7.95	
			No	14	Type	U
			ID			
			Spec Ref			

Specimen Details		
Initial		
Length	mm	204.2
Diameter	mm	102.2
Bulk Density	Mg/m³	1.82
Water Content	%	42.9
Dry density	Mg/m³	1.27
After test		
Bulk Density	Mg/m³	1.87
Water Content	%	33.2
Dry density	Mg/m³	1.41

Soil Description	Soft greyish brown slightly sandy CLAY
Specimen Type /Preparation	UNDISTURBED

Saturation Details		Method of Saturation
		Increments of cell pressure only
Cell pressure increments	kPa	50
Differential Pressure	kPa	
Final Cell Pressure	kPa	210
Final pore water pressure	kPa	
Final B Value		0.98

Saturation

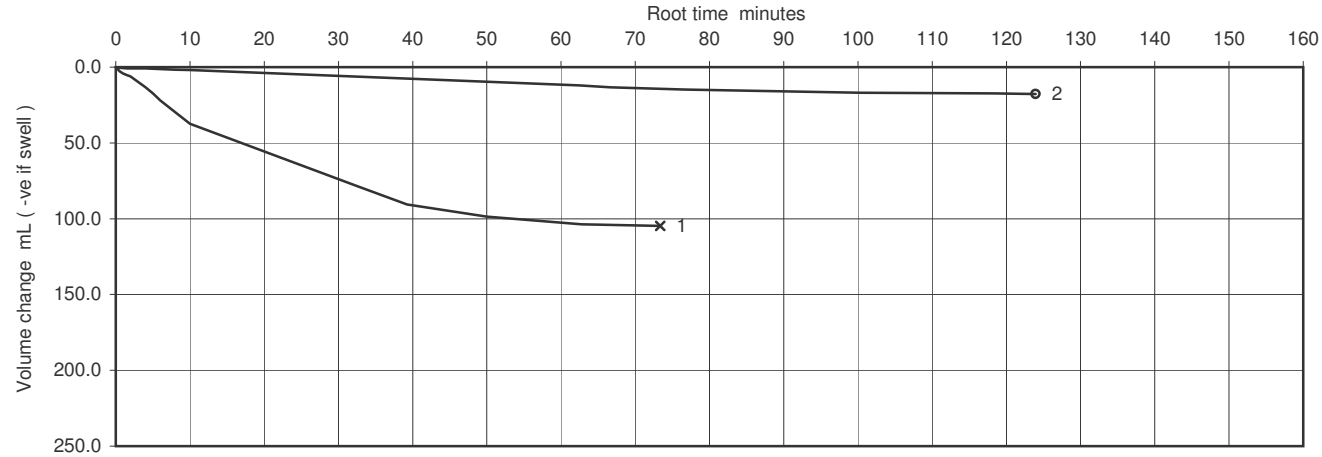


Consolidation Details see sheet 2 for plots	Drainage Conditions		From radial boundary and one end			
	Stage No.		1	2	3	
	Cell Pressure applied		400	450		kPa
	Back Pressure applied		300	300		kPa
	Effective Pressure		100	150		kPa
	Pore pressure at start of consolidation		383	354		kPa
	Pore pressure at end of consolidation		303	301		kPa
	Pore pressure dissipation at end of consolidation		97	99		%
Consolidation parameters (see note to BS1377 : pt 8, clause 6.3.4)	Coefficient of Consolidation	C_{vi}	0.27	0.02		m^2/year
	Coefficient of Compressibility	M_{vi}	0.85	0.23		m^2/MN
	Coefficient of Permeability (calculated)	k_{vi}	7.0E-11	1.6E-12		m/s

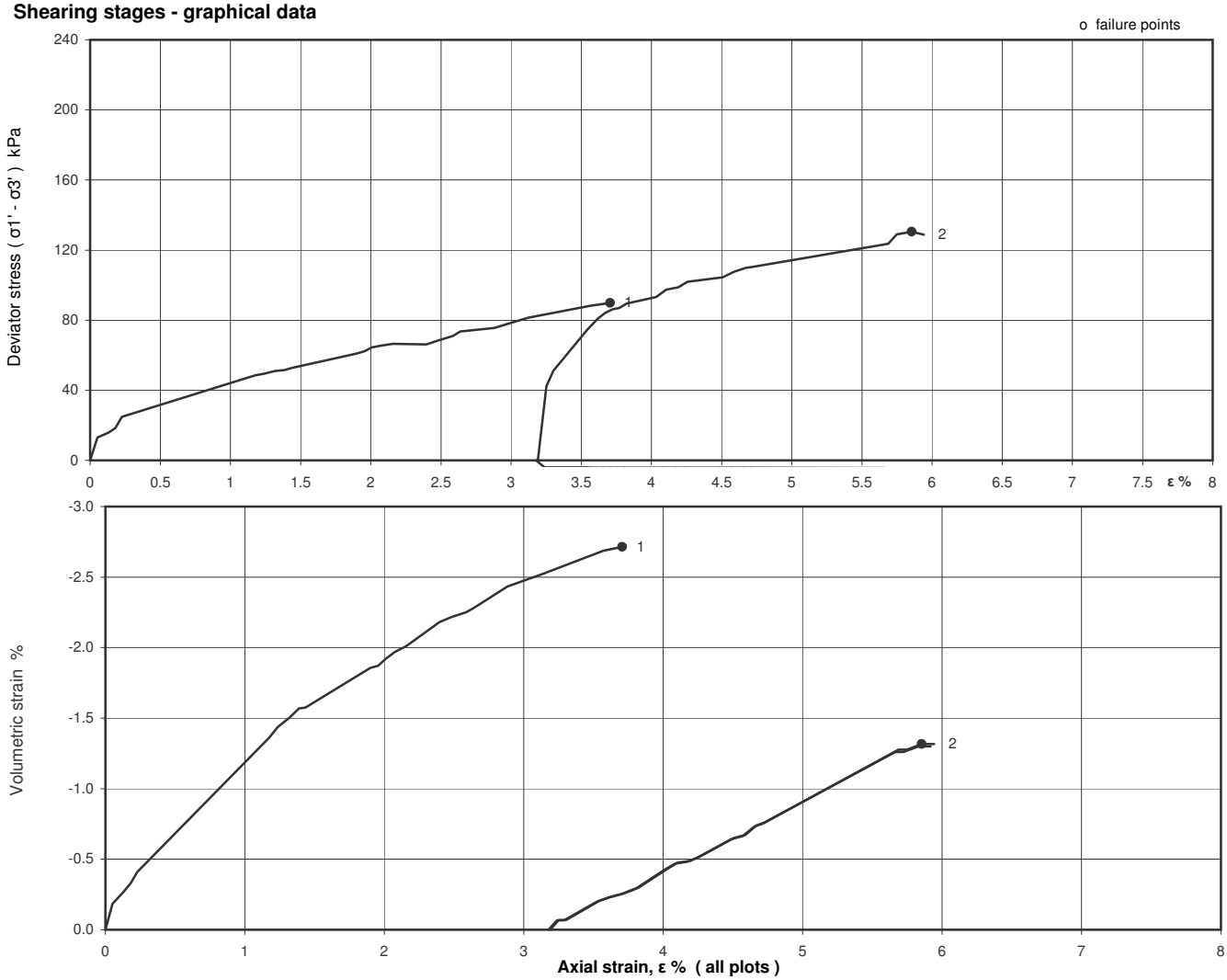
Consolidated Drained Triaxial Compression test with Measurement of Volume Change (BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	F4036-14	Sample Details:	Hole No		BH06	
Project Name	FRODSHAM WIND FARM (6,7,8)		Depth (m BGL)		7.50-7.95	
			No	14	Type	U
			ID			
			Spec Ref			

Consolidation



Shearing stages - graphical data

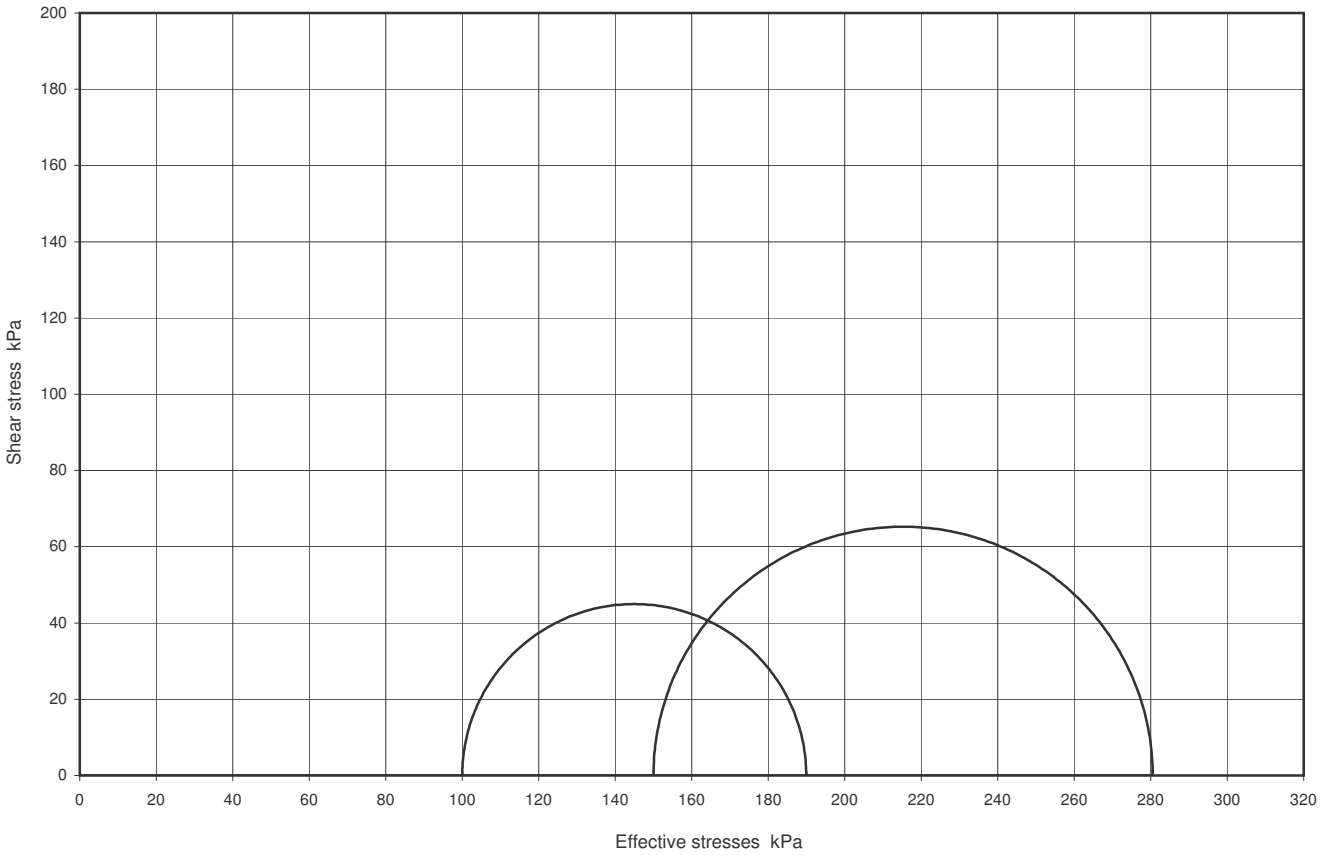


Ref			Figure
SLR8.2 Rev 85 Jan 10	ESG Environmental Scientifics Group	Printed:11/12/2014 10:52	**CD 1** sheet 2 of 3

Consolidated Drained Triaxial Compression test with Measurement of Volume Change (BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	F4036-14	Sample Details:	Hole No		BH06	
Project Name	FRODSHAM WIND FARM (6,7,8)		Depth (m BGL)		7.50-7.95	
			No	14	Type	U
			ID			
			Spec Ref			

Mohr Circles



Compression stages

Stage	1	2		
Cell pressure	400	450		kPa
Initial pwp	300	300		kPa
Initial σ_3'	100	150		kPa
Rate of strain	0.03	0.03		%/hr

Failure conditions

Criterion	Maximum deviator stress			
Axial strain	3.71	5.86		%
$(\sigma_1' - \sigma_3')_f$	89.9	130.5		kPa
Volumetric strain	-2.71	-1.32		%
$\sigma_3'_f$	100	150		kPa
$\sigma_1'_f$	190	281		kPa
Time to failure	123.6	195.2		hrs

Shear Strength Parameters

Linear regression

c '	kPa	not assessed
Ø '	degrees	not assessed

Manual re-assessment

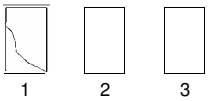
c '	kPa	-
Ø '	degrees	-

Notes :

Deviator stresses corrected for area change, vertical side drains and 0.4 mm thick rubber membrane(s)

Test cancelled by client request at 21.44 on 1.12.14

Mode of failure



Consolidated Drained Triaxial Compression test with Measurement of Volume Change (BS1377 : Part 8 : 1990) - Multistage test on a single specimen

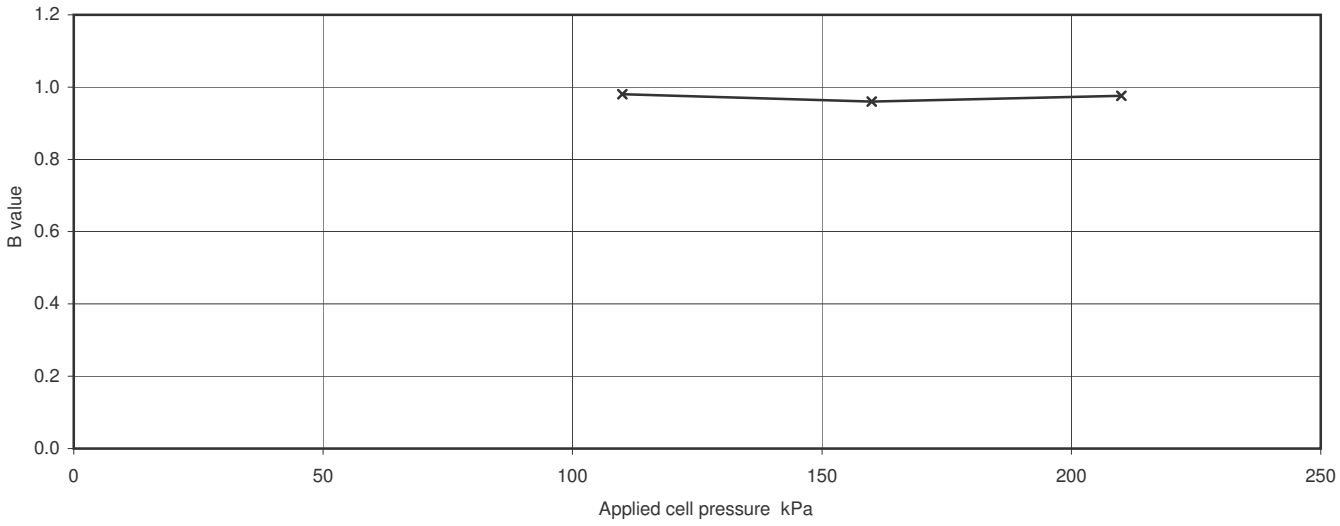
Project No	F4036-14	Sample Details:	Hole No		BH12	
Project Name	FRODSHAM WIND FARM (6,7,8)		Depth (m BGL)		4.00-4.45	
			No	9	Type	U
			ID			
			Spec Ref			

Specimen Details		
Initial		
Length	mm	203.9
Diameter	mm	103.5
Bulk Density	Mg/m³	1.80
Water Content	%	42.0
Dry density	Mg/m³	1.27
After test		
Bulk Density	Mg/m³	1.90
Water Content	%	31.5
Dry density	Mg/m³	1.44

Soil Description	Blackish grey silty CLAY with pockets of pseudo fibrous peat
Specimen Type /Preparation	UNDISTURBED

Saturation Details		Method of Saturation
		Increments of cell and back pressure
Cell pressure increments	kPa	50
Differential Pressure	kPa	
Final Cell Pressure	kPa	210
Final pore water pressure	kPa	
Final B Value		0.98

Saturation

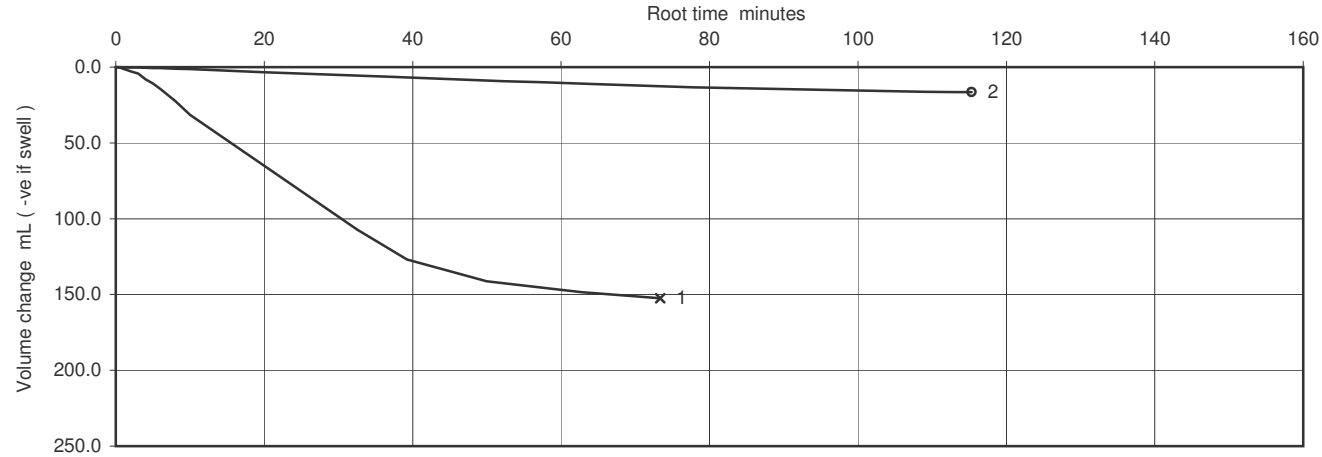


Consolidation Details see sheet 2 for plots	Drainage Conditions		From radial boundary and one end			
	Stage No.		1	2	3	
	Cell Pressure applied		350	375		kPa
	Back Pressure applied		300	300		kPa
	Effective Pressure		50	75		kPa
	Pore pressure at start of consolidation		347	332		kPa
	Pore pressure at end of consolidation		302	303		kPa
	Pore pressure dissipation at end of consolidation		96	90		%
Consolidation parameters (see note to BS1377 : pt 8, clause 6.3.4)	Coefficient of Consolidation	C_{vi}	0.11	0.02		m^2/year
	Coefficient of Compressibility	M_{vi}	2.08	0.38		m^2/MN
	Coefficient of Permeability (calculated)	k_{vi}	7.0E-11	2.9E-12		m/s

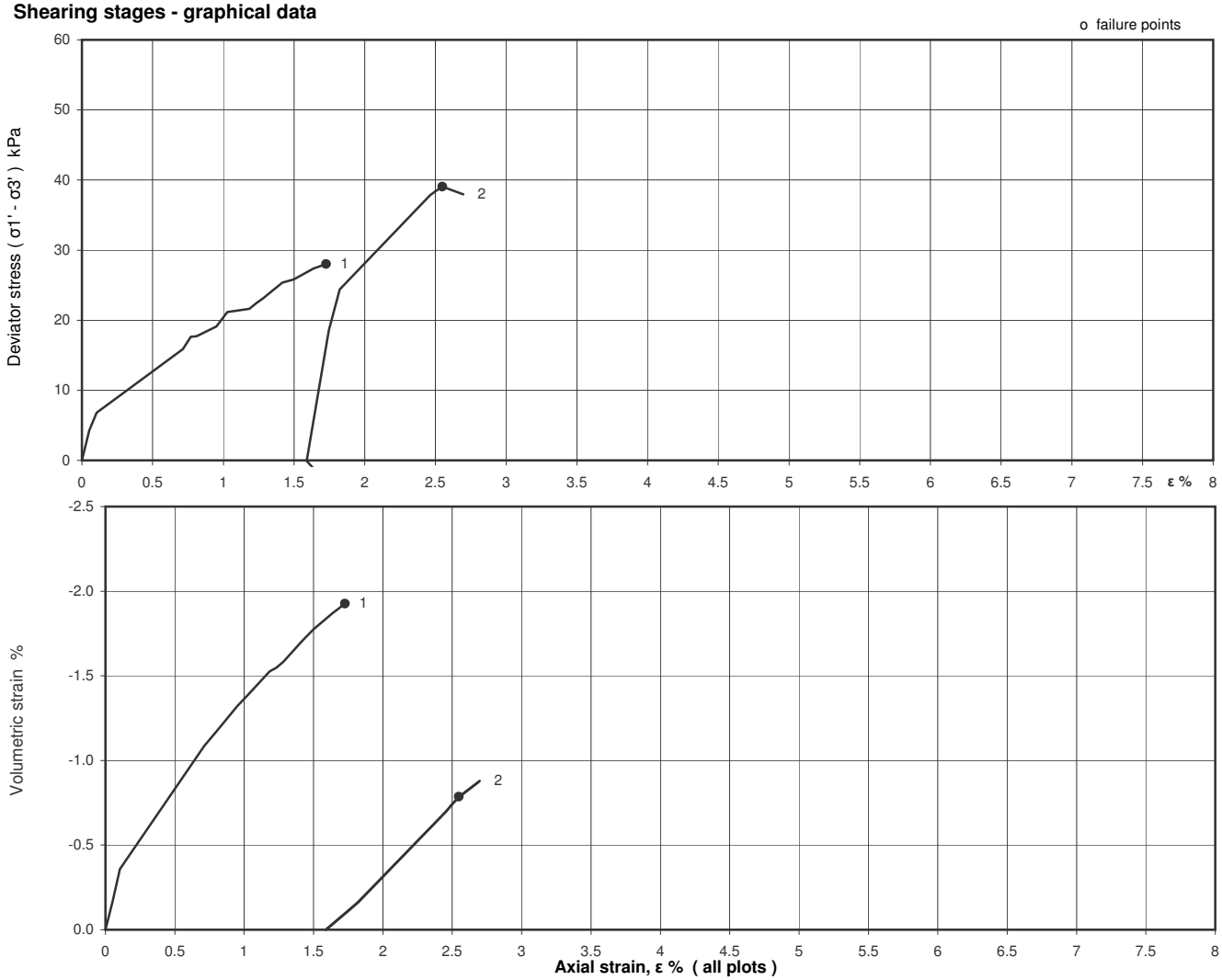
Consolidated Drained Triaxial Compression test with Measurement of Volume Change (BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	F4036-14	Sample Details:	Hole No		BH12	
Project Name	FRODSHAM WIND FARM (6,7,8)		Depth (m BGL)		4.00-4.45	
			No	9	Type	U
			ID			
			Spec Ref			

Consolidation



Shearing stages - graphical data

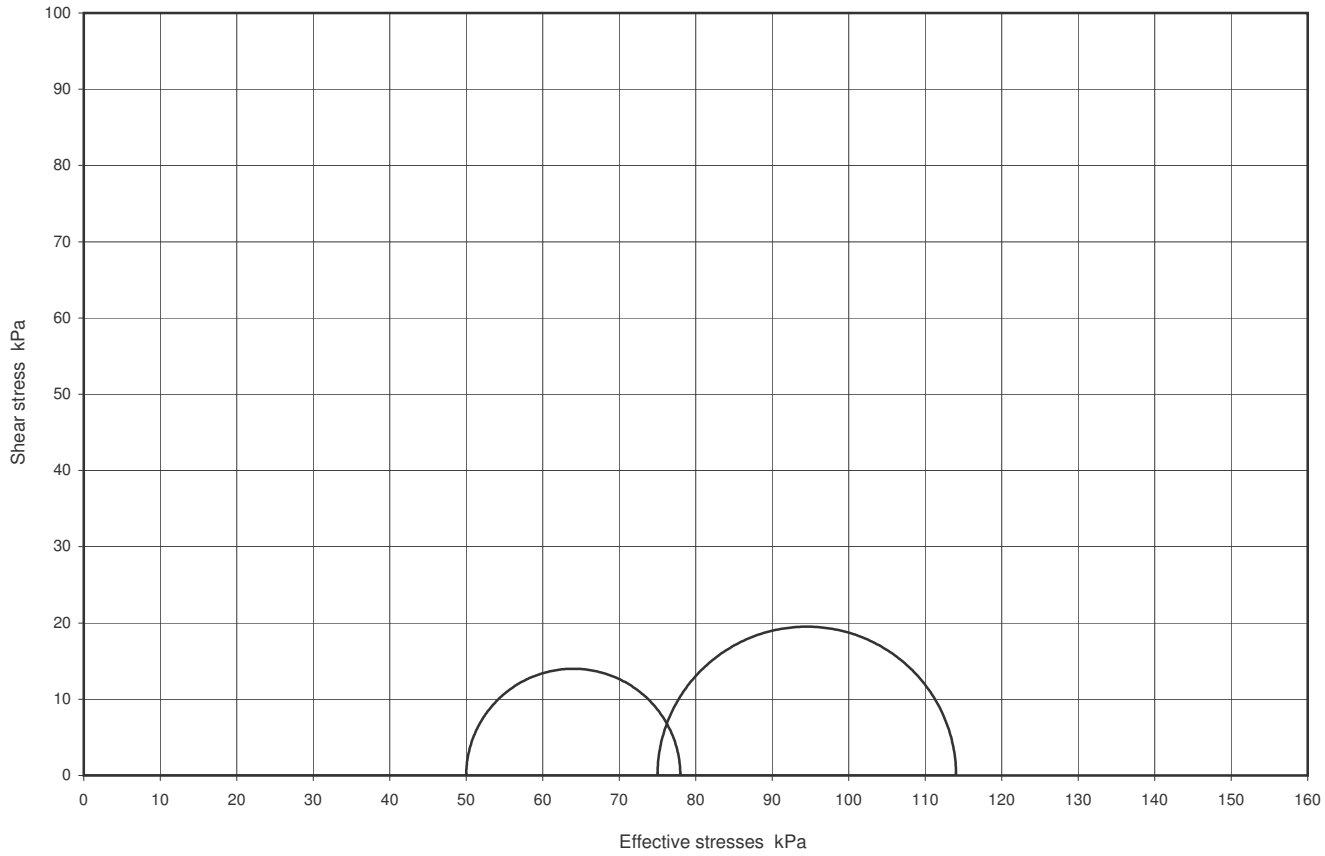


Ref			Figure
SLR8.2 Rev 85 Jan 10	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/12/2014 10:53	**CD 2** sheet 2 of 3

Consolidated Drained Triaxial Compression test with Measurement of Volume Change
(BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	F4036-14	Sample Details:	Hole No		BH12	
Project Name	FRODSHAM WIND FARM (6,7,8)		Depth (m BGL)		4.00-4.45	
			No	9	Type	U
			ID			
			Spec Ref			

Mohr Circles



Compression stages

Stage	1	2		
Cell pressure	350	375		kPa
Initial pwp	300	300		kPa
Initial σ_3'	50	75		kPa
Rate of strain	0.01	0.01		%/hr

Failure conditions

Criterion	Maximum deviator stress			
Axial strain	1.73	2.55		%
$(\sigma_1' - \sigma_3')_f$	28.0	39.0		kPa
Volumetric strain	-1.93	-0.79		%
$\sigma_3'_f$	50	75		kPa
$\sigma_1'_f$	78	114		kPa
Time to failure	172.6	254.9		hrs

Shear Strength Parameters

Linear regression

c '	kPa	not assessed
Ø '	degrees	not assessed

Manual re-assessment

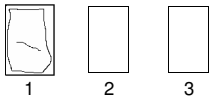
c '	kPa	-
Ø '	degrees	-

Notes :

Deviator stresses corrected for area change, vertical side drains and 0.4 mm thick rubber membrane(s)

Test cancelled by client request at 21.44 on 1.12.14

Mode of failure



Consolidated Drained Triaxial Compression test with Measurement of Volume Change (BS1377 : Part 8 : 1990) - Multistage test on a single specimen

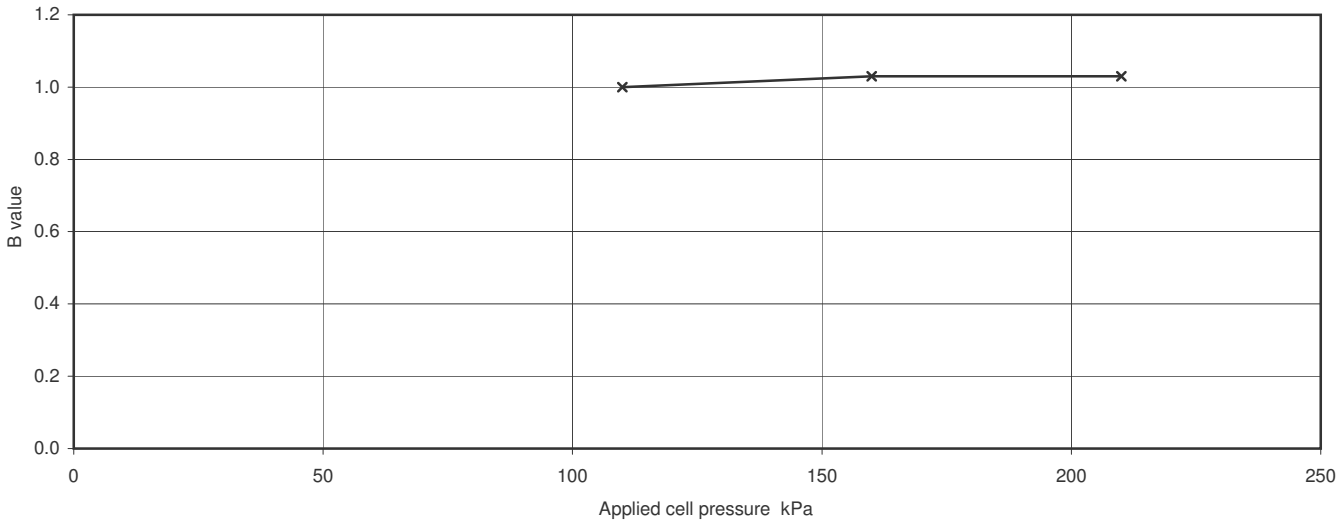
Project No	F4036-14	Sample Details:	Hole No		BH20	
Project Name	FRODSHAM WIND FARM (6,7,8)		Depth (m BGL)		4.50-5.00	
			No	11	Type	U
			ID			
			Spec Ref			

Specimen Details		
Initial		
Length	mm	202.9
Diameter	mm	103.3
Bulk Density	Mg/m³	1.91
Water Content	%	33.3
Dry density	Mg/m³	1.43
After test		
Bulk Density	Mg/m³	1.99
Water Content	%	25.1
Dry density	Mg/m³	1.59

Soil Description	Firm brown slightly sandy slightly gravelly CLAY
Specimen Type /Preparation	UNDISTURBED

Saturation Details		Method of Saturation
		Increments of cell and back pressure
Cell pressure increments	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	210
Final pore water pressure	kPa	0
Final B Value		1.03

Saturation

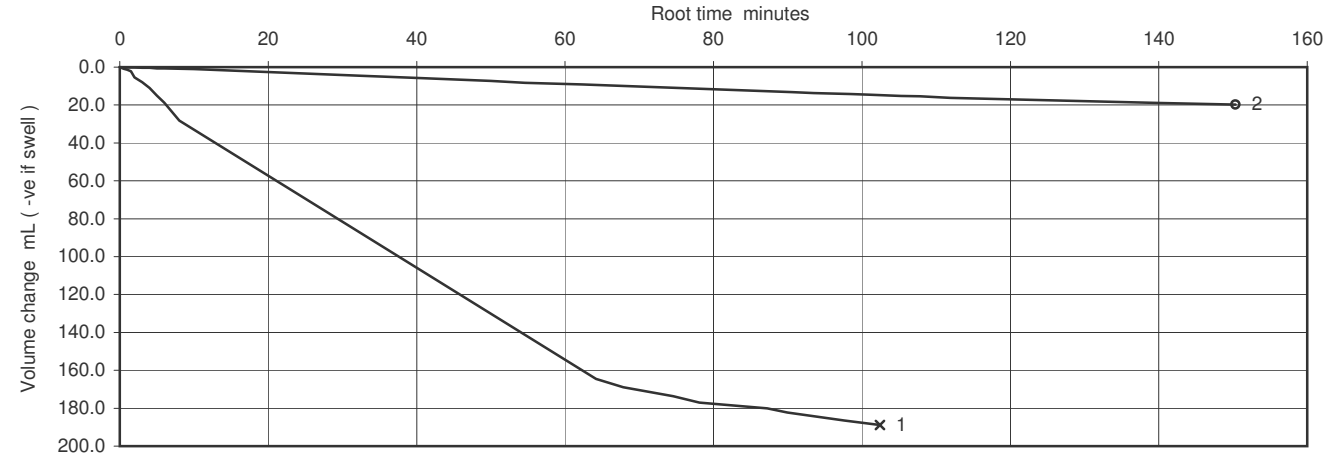


Consolidation Details see sheet 2 for plots	Drainage Conditions		From radial boundary and one end			
	Stage No.		1	2	3	
	Cell Pressure applied		350	375		kPa
	Back Pressure applied		300	300		kPa
	Effective Pressure		50	75	100	kPa
	Pore pressure at start of consolidation		352	322		kPa
	Pore pressure at end of consolidation		302	303		kPa
	Pore pressure dissipation at end of consolidation		97	88		%
Consolidation parameters (see note to BS1377 : pt 8, clause 6.3.4)	Coefficient of Consolidation	C_{vi}	0.04	0.01		m^2/year
	Coefficient of Compressibility	M_{vi}	2.31	0.68		m^2/MN
	Coefficient of Permeability (calculated)	k_{vi}	2.9E-11	2.7E-12		m/s

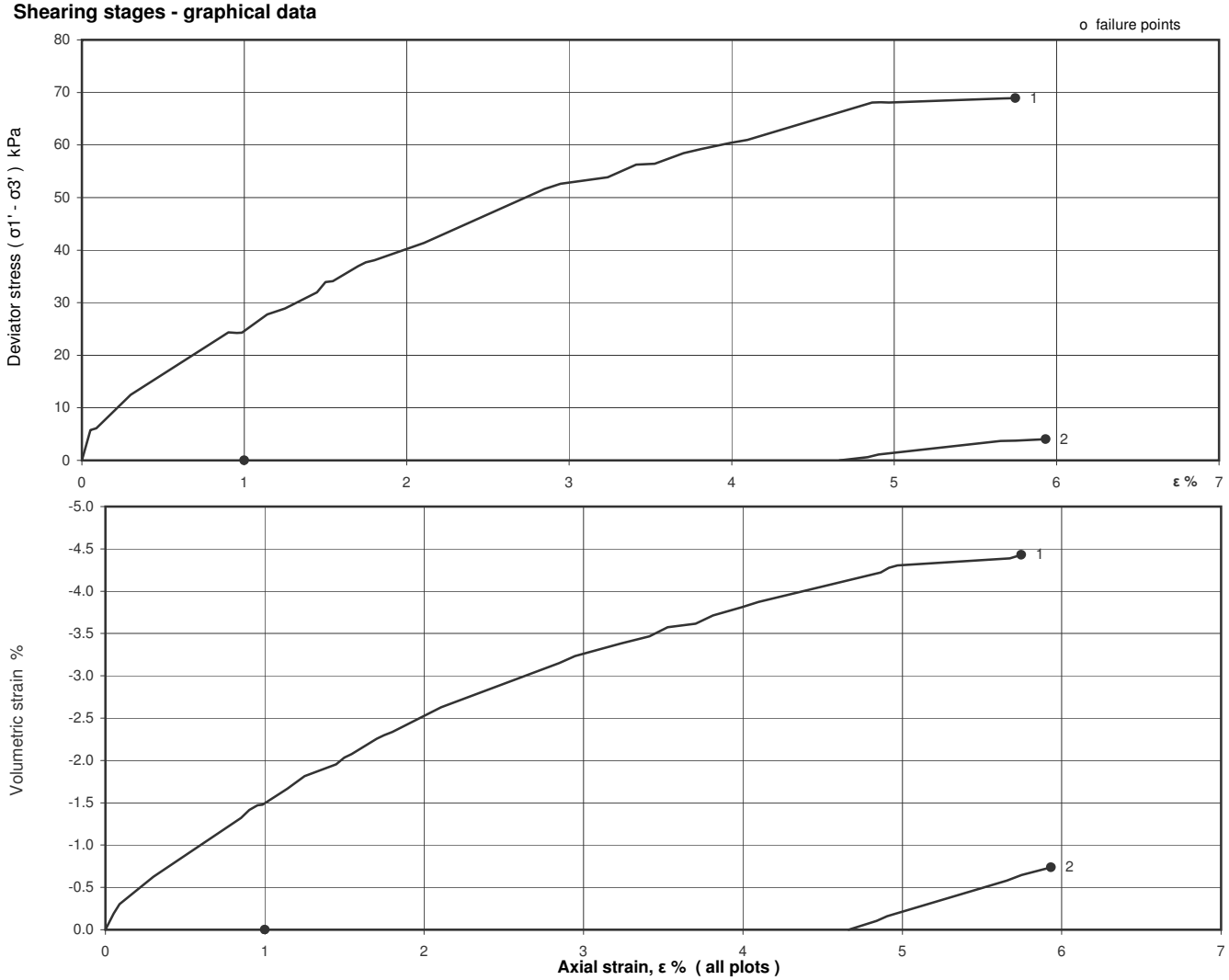
Consolidated Drained Triaxial Compression test with Measurement of Volume Change (BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	F4036-14	Sample Details:	Hole No		BH20	
Project Name	FRODSHAM WIND FARM (6,7,8)		Depth (m BGL)		4.50-5.00	
			No	11	Type	U
			ID			
			Spec Ref			

Consolidation



Shearing stages - graphical data

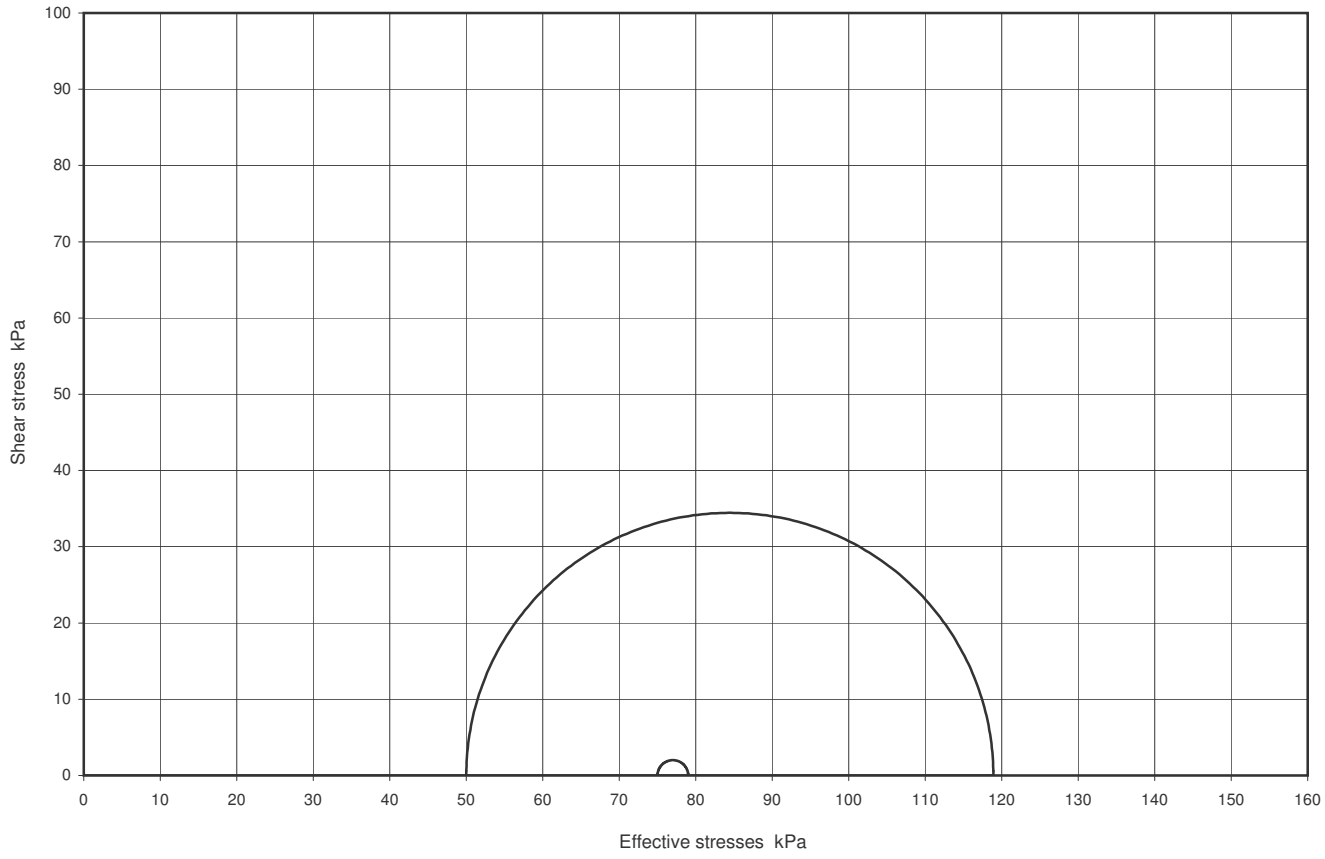


Ref			Figure
SLR8.2 Rev 85 Jan 10	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/12/2014 10:43	**CD 3** sheet 2 of 3

Consolidated Drained Triaxial Compression test with Measurement of Volume Change
(BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	F4036-14	Sample Details:	Hole No		BH20	
Project Name	FRODSHAM WIND FARM (6,7,8)		Depth (m BGL)		4.50-5.00	
			No	11	Type	U
			ID			
			Spec Ref			

Mohr Circles



Compression stages

Stage	1	2		
Cell pressure	350	375		kPa
Initial pwp	300	300		kPa
Initial σ_3'	50	75	100	kPa
Rate of strain	0.01	0.01	0.12	%/hr

Shear Strength Parameters

Linear regression

c '	kPa	#NUM!
Ø '	degrees	#NUM!

Manual re-assessment

c '	kPa	-
Ø '	degrees	-

Failure conditions

Criterion	Maximum deviator stress			
Axial strain	5.75	5.93		%
$(\sigma_1' - \sigma_3')_f$	68.9	4.0		kPa
Volumetric strain	-4.43	-0.74		%
$\sigma_3'_f$	50	75	100	kPa
$\sigma_1'_f$	119	79		kPa
Time to failure	478.9	494.4		hrs

Notes :

Deviator stresses corrected for area change, vertical side drains and 0.4 mm thick rubber membrane(s)

Test cancelled by client request at 21.44 on 1.12.14

Mode of failure

1 2 3

Ref			Figure
SLR8.2 Rev 85 Jan 10	ESG Environmental Scientifics Group	Printed:11/12/2014 10:43	**CD 3** sheet 3 of 3

Consolidated Drained Triaxial Compression test with Measurement of Volume Change (BS1377 : Part 8 : 1990) - Multistage test on a single specimen

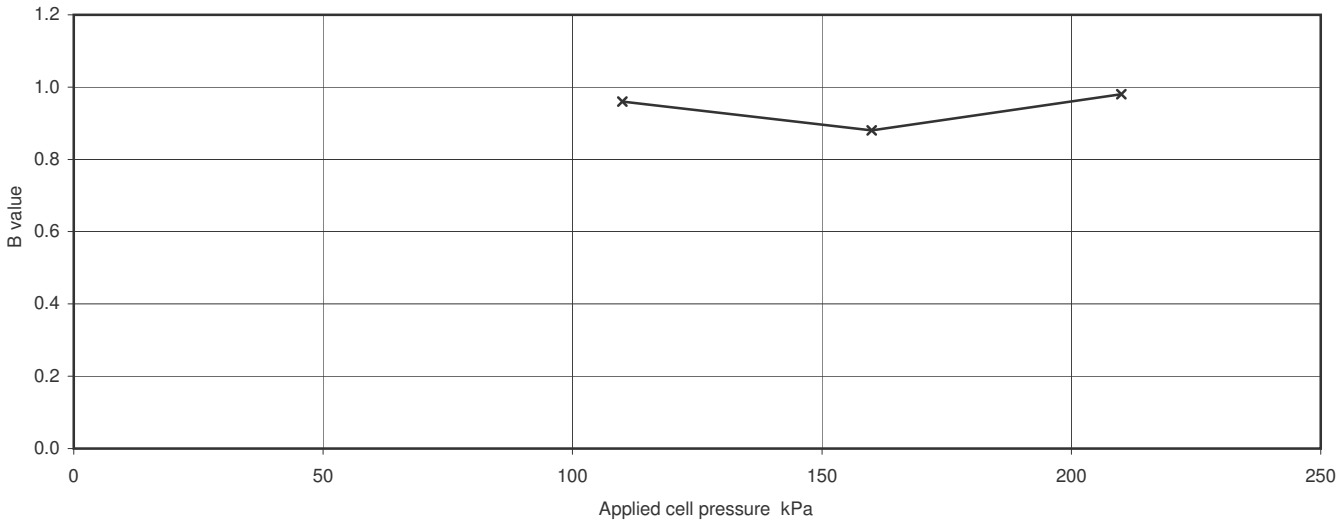
Project No	F4036-14	Sample Details:	Hole No		BH25	
Project Name	FRODSHAM WIND FARM (6,7,8)		Depth (m BGL)		2.00-2.45	
			No	3	Type	U
			ID			
			Spec Ref			

Specimen Details		
Initial		
Length	mm	204.5
Diameter	mm	103.6
Bulk Density	Mg/m³	1.79
Water Content	%	45.0
Dry density	Mg/m³	1.23
After test		
Bulk Density	Mg/m³	1.81
Water Content	%	38.4
Dry density	Mg/m³	1.31

Soil Description	Soft to firm brown slightly sandy CLAY
Specimen Type /Preparation	UNDISTURBED

Saturation Details		Method of Saturation
		Increments of cell and back pressure
Cell pressure increments	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	210
Final pore water pressure	kPa	206
Final B Value		0.98

Saturation

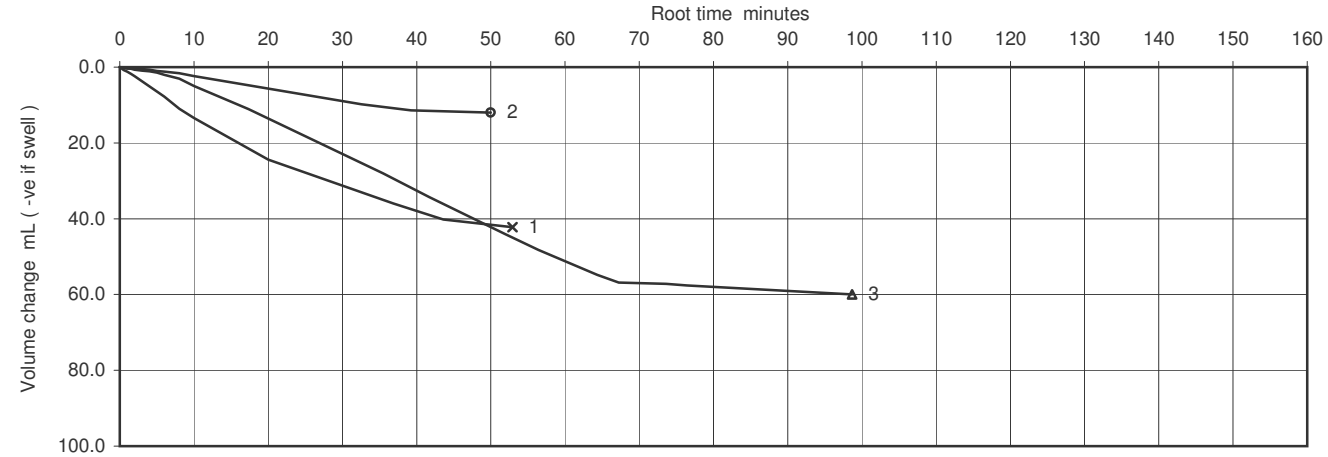


Consolidation Details see sheet 2 for plots	Drainage Conditions		From radial boundary and one end			
	Stage No.		1	2	3	
	Cell Pressure applied		325	350	375	kPa
	Back Pressure applied		300	300	300	kPa
	Effective Pressure		25	50	75	kPa
	Pore pressure at start of consolidation		322	321	326	kPa
	Pore pressure at end of consolidation		300	300	300	kPa
	Pore pressure dissipation at end of consolidation		100	100	100	%
Consolidation parameters (see note to BS1377 : pt 8, clause 6.3.4)	Coefficient of Consolidation	C_{vi}	0.23	0.14	0.05	m^2/year
	Coefficient of Compressibility	M_{vi}	1.19	0.35	1.39	m^2/MN
	Coefficient of Permeability (calculated)	k_{vi}	8.5E-11	1.5E-11	2.0E-11	m/s

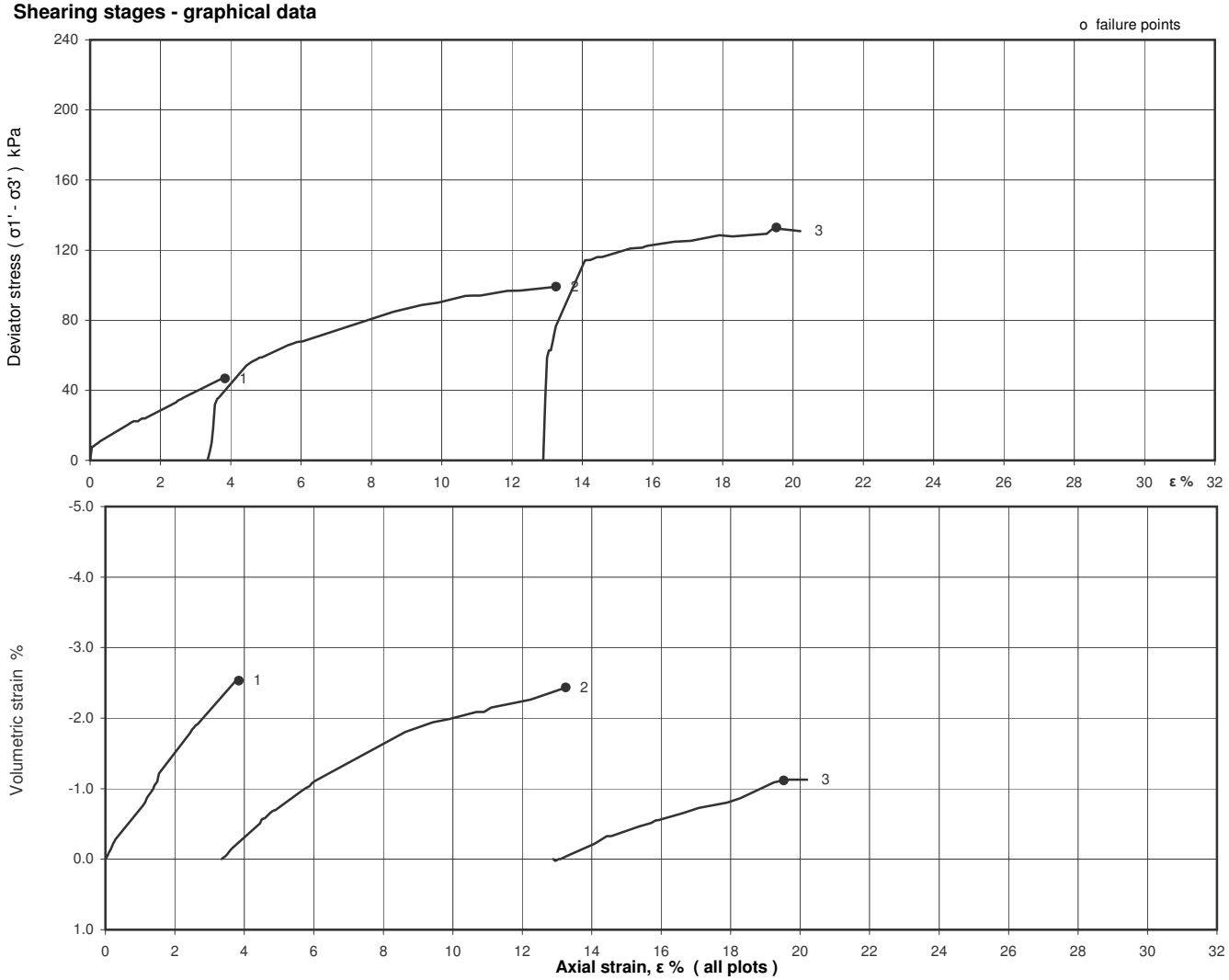
Consolidated Drained Triaxial Compression test with Measurement of Volume Change (BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	F4036-14	Sample Details:	Hole No		BH25	
Project Name	FRODSHAM WIND FARM (6,7,8)		Depth (m BGL)		2.00-2.45	
			No	3	Type	U
			ID			
			Spec Ref			

Consolidation



Shearing stages - graphical data

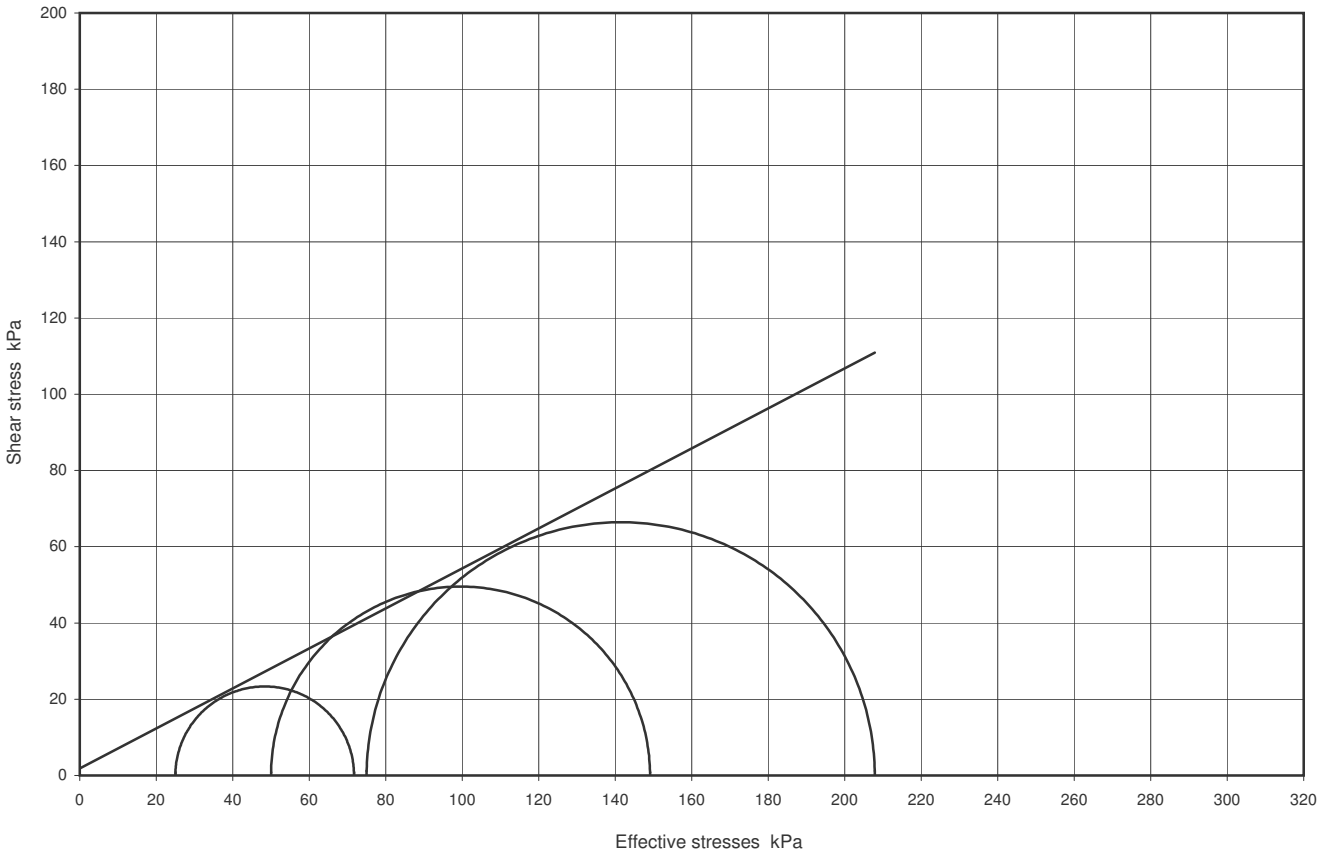


Ref			Figure
SLR8.2 Rev 85 Jan 10	ESG Environmental Scientifics Group	Printed:11/12/2014 10:43	**CD 4** sheet 2 of 3

Consolidated Drained Triaxial Compression test with Measurement of Volume Change (BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	F4036-14	Sample Details:	Hole No		BH25	
Project Name	FRODSHAM WIND FARM (6,7,8)		Depth (m BGL)		2.00-2.45	
			No	3	Type	U
			ID			
			Spec Ref			

Mohr Circles



Compression stages

Stage	1	2	3	
Cell pressure	325	350	375	kPa
Initial pwp	300	300	300	kPa
Initial σ_3'	25	50	75	kPa
Rate of strain	0.05	0.05	0.05	%/hr

Shear Strength Parameters

Linear regression

c '	kPa	1.8
Ø '	degrees	27.7

Manual re-assessment

c '	kPa	-
Ø '	degrees	-

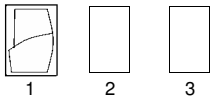
Failure conditions

Criterion	Maximum deviator stress			
Axial strain	3.85	13.26	19.53	%
$(\sigma_1' - \sigma_3')_f$	46.7	99.1	132.8	kPa
Volumetric strain	-2.53	-2.43	-1.11	%
$\sigma_3'_f$	25	50	75	kPa
$\sigma_1'_f$	72	149	208	kPa
Time to failure	76.9	265.1	390.6	hrs

Notes :

Deviator stresses corrected for area change, vertical side drains and 0.377 mm thick rubber membrane(s)

Mode of failure



Consolidated Drained Triaxial Compression test with Measurement of Volume Change (BS1377 : Part 8 : 1990) - Multistage test on a single specimen

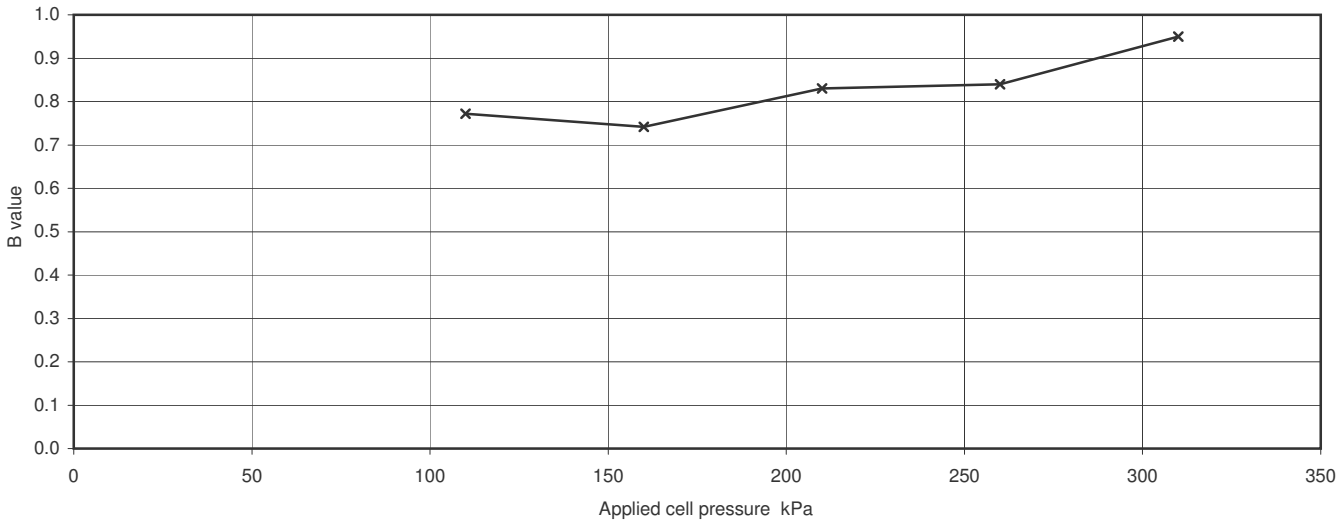
Project No	F4036-14	Sample Details:	Hole No		BH27	
Project Name	FRODSHAM WIND FARM (6,7,8)		Depth (m BGL)		3.00-3.45	
			No	9	Type	U
			ID			
			Spec Ref			

Specimen Details		
Initial		
Length	mm	203.5
Diameter	mm	104.6
Bulk Density	Mg/m³	1.95
Water Content	%	24.4
Dry density	Mg/m³	1.56
After test		
Bulk Density	Mg/m³	2.02
Water Content	%	23.3
Dry density	Mg/m³	1.64

Soil Description	Soft multicoloured laminated sandy CLAY.
Specimen Type /Preparation	UNDISTURBED

Saturation Details		Method of Saturation
		Increments of cell and back pressure
Cell pressure increments	kPa	50
Differential Pressure	kPa	10
Final Cell Pressure	kPa	310
Final pore water pressure	kPa	250
Final B Value		0.95

Saturation

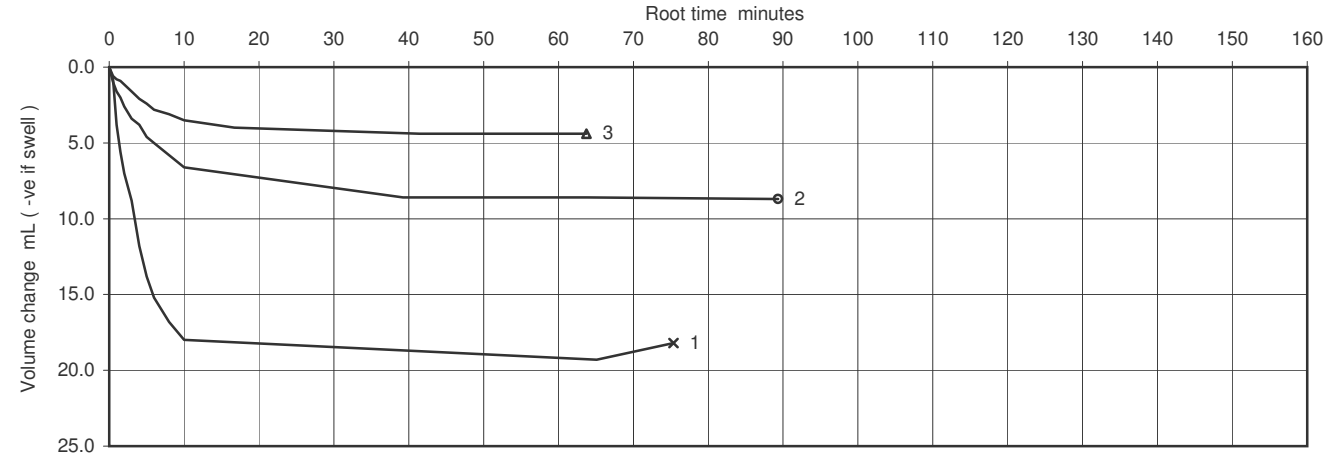


Consolidation Details see sheet 2 for plots	Drainage Conditions		From radial boundary and one end			
	Stage No.		1	2	3	
	Cell Pressure applied		350	375	400	kPa
	Back Pressure applied		300	300	300	kPa
	Effective Pressure		50	75	100	kPa
	Pore pressure at start of consolidation		337	336	334	kPa
	Pore pressure at end of consolidation		302	301	301	kPa
	Pore pressure dissipation at end of consolidation		96	98	98	%
Consolidation parameters (see note to BS1377 : pt 8, clause 6.3.4)	Coefficient of Consolidation	C_{vi}	4.93	1.98	2.28	m^2/year
	Coefficient of Compressibility	M_{vi}	0.31	0.15	0.08	m^2/MN
	Coefficient of Permeability (calculated)	k_{vi}	4.7E-10	9.0E-11	5.6E-11	m/s

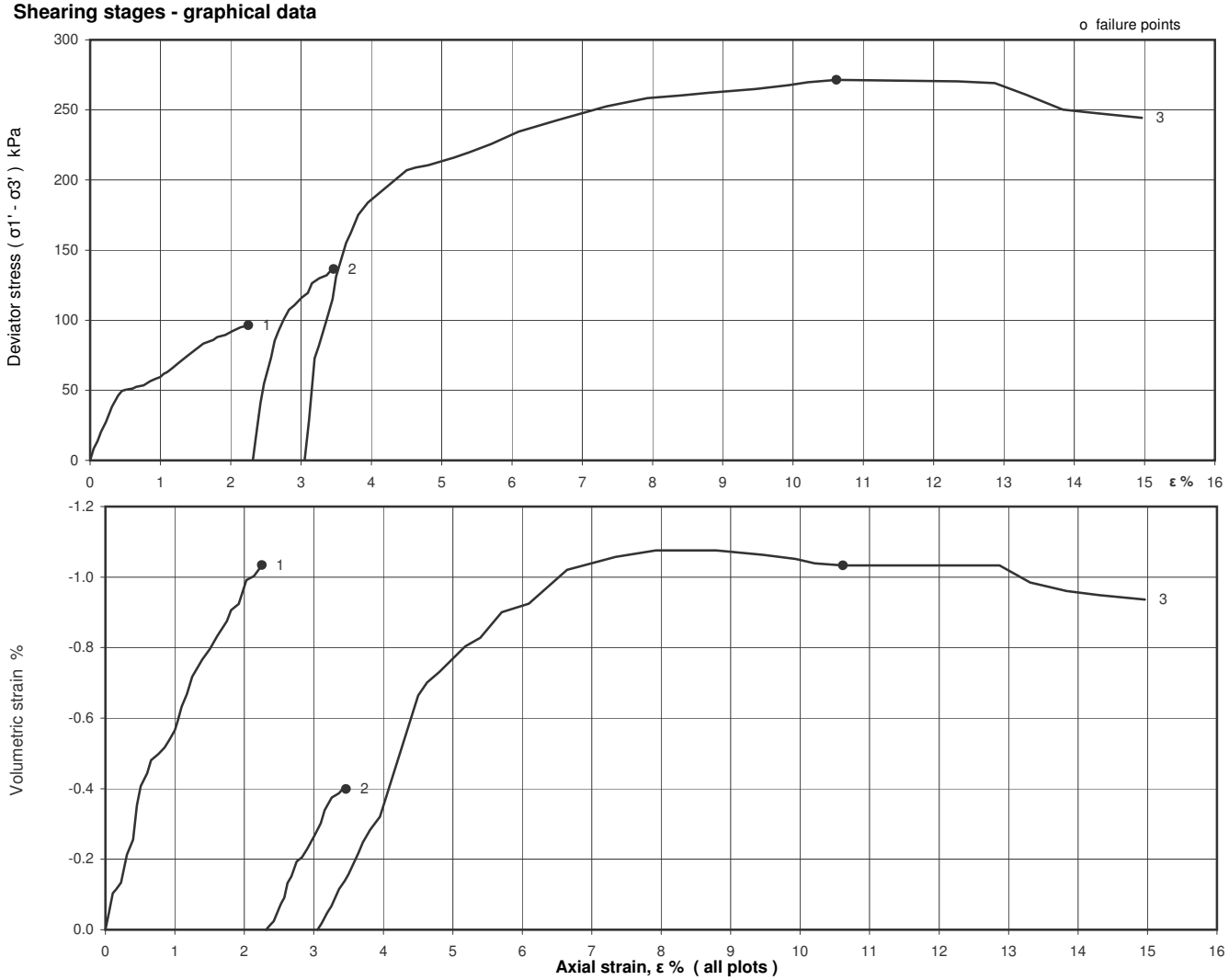
Consolidated Drained Triaxial Compression test with Measurement of Volume Change (BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	F4036-14	Sample Details:	Hole No		BH27	
Project Name	FRODSHAM WIND FARM (6,7,8)		Depth (m BGL)		3.00-3.45	
			No	9	Type	U
			ID			
			Spec Ref			

Consolidation



Shearing stages - graphical data

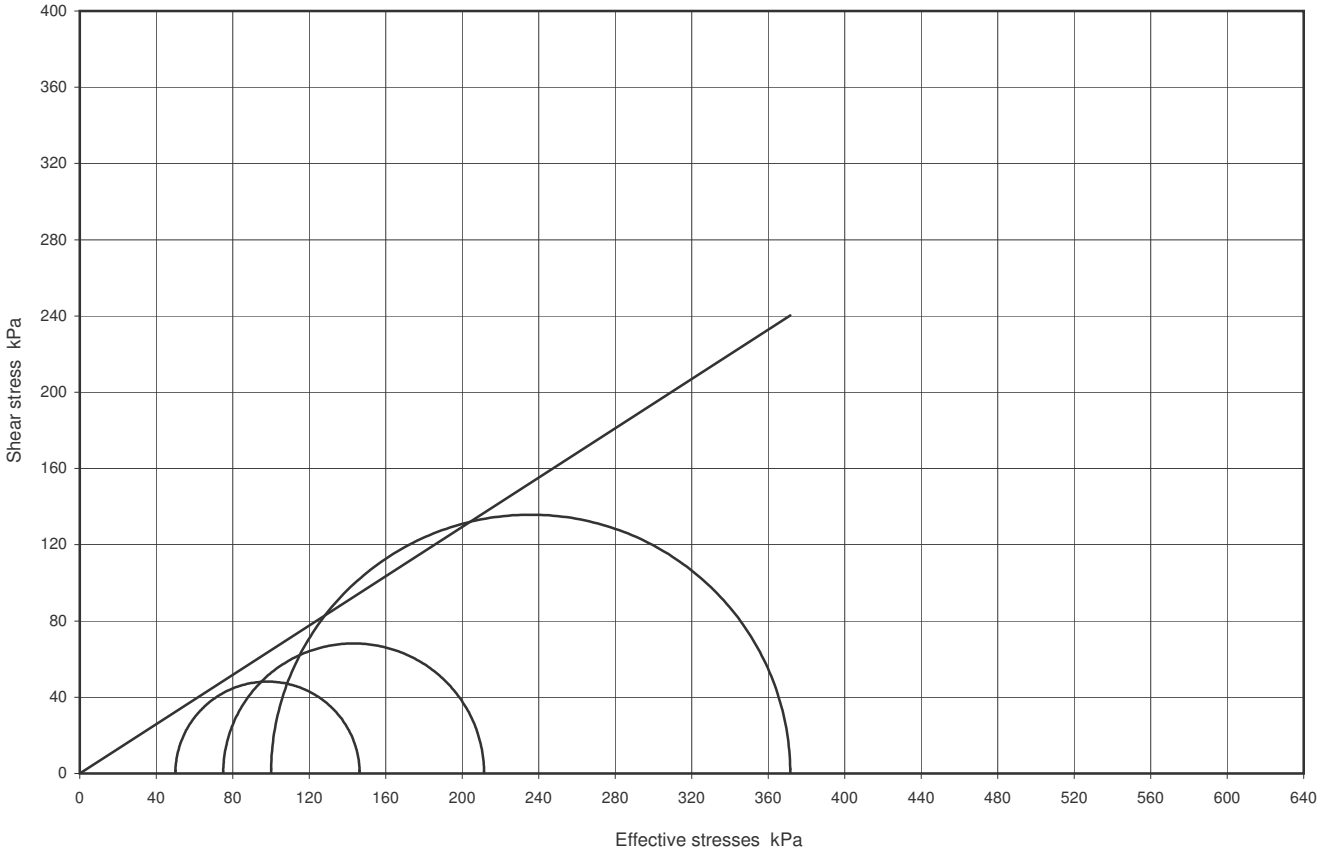


Ref			Figure
SLR8.2 Rev 85 Jan 10	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/12/2014 10:44	**CD 5** sheet 2 of 3

Consolidated Drained Triaxial Compression test with Measurement of Volume Change
(BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	F4036-14	Sample Details:	Hole No		BH27	
Project Name	FRODSHAM WIND FARM (6,7,8)		Depth (m BGL)		3.00-3.45	
			No	9	Type	U
			ID			
			Spec Ref			

Mohr Circles



Compression stages

Stage	1	2	3	
Cell pressure	350	375	400	kPa
Initial pwp	300	300	300	kPa
Initial σ_3'	50	75	100	kPa
Rate of strain	0.93	0.93	0.93	%/hr

Shear Strength Parameters

Linear regression

c '	kPa	(-25.6)
Ø '	degrees	(40.6)

Manual re-assessment

c '	kPa	0
Ø '	degrees	32.9

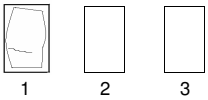
Failure conditions

Criterion	Maximum deviator stress			
Axial strain	2.25	3.46	10.62	%
$(\sigma_1' - \sigma_3')_f$	96.4	136.4	271.5	kPa
Volumetric strain	-1.03	-0.40	-1.03	%
$\sigma_3'_f$	50	75	100	kPa
$\sigma_1'_f$	146	211	372	kPa
Time to failure	2.4	3.7	11.4	hrs

Notes :

Deviator stresses corrected for area change, vertical side drains and 0.377 mm thick rubber membrane(s)

Mode of failure



Consolidated Drained Triaxial Compression test with Measurement of Volume Change (BS1377 : Part 8 : 1990) - Multistage test on a single specimen

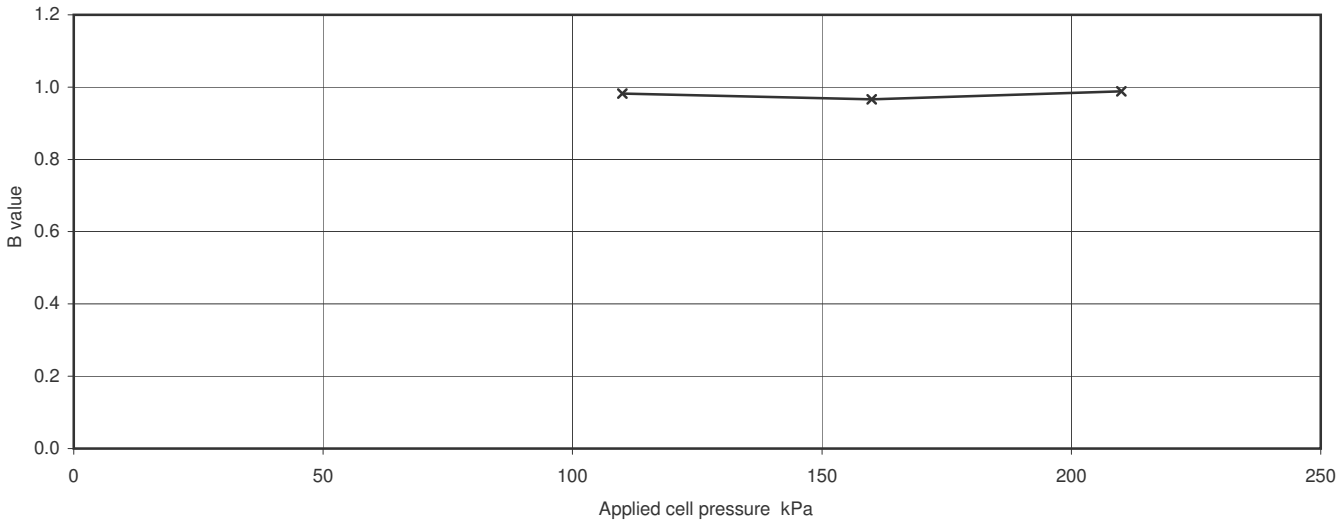
Project No	F4036-14	Sample Details:	Hole No		BH29	
Project Name	FRODSHAM WIND FARM (6,7,8)		Depth (m BGL)		4	
			No	9	Type	U
			ID			
			Spec Ref			

Specimen Details		
Initial		
Length	mm	204.4
Diameter	mm	102.2
Bulk Density	Mg/m³	2.00
Water Content	%	25.9
Dry density	Mg/m³	1.59
After test		
Bulk Density	Mg/m³	2.01
Water Content	%	23.9
Dry density	Mg/m³	1.62

Soil Description	Soft to firm greyish brown slightly sandy slightly gravelly CLAY.
Specimen Type /Preparation	UNDISTURBED

Saturation Details		Method of Saturation
		Increments of cell and back pressure
Cell pressure increments	kPa	50
Differential Pressure	kPa	
Final Cell Pressure	kPa	210
Final pore water pressure	kPa	195.8
Final B Value		0.99

Saturation

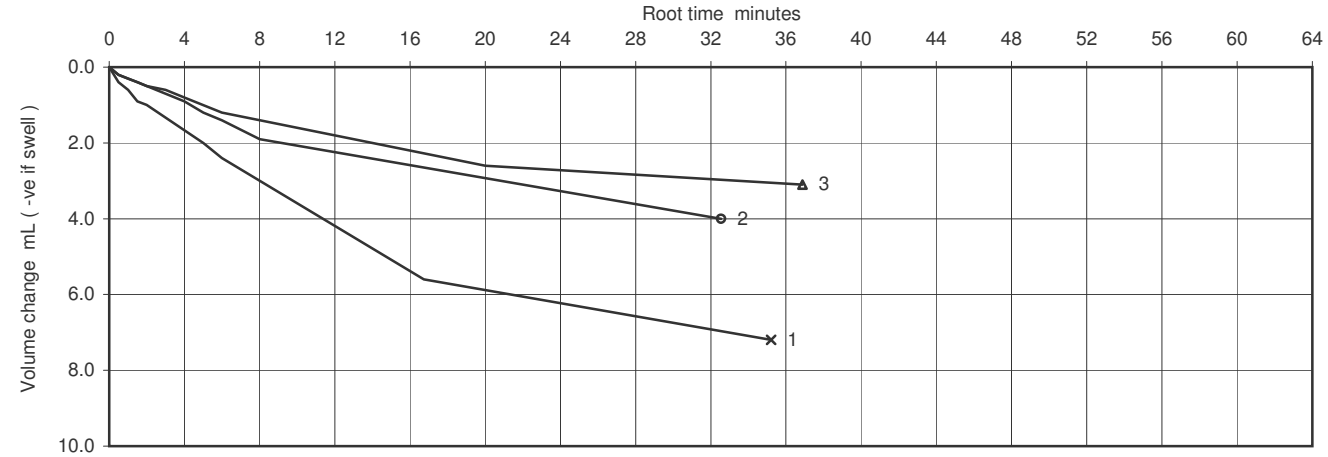


Consolidation Details see sheet 2 for plots	Drainage Conditions		From radial boundary and one end			
	Stage No.		1	2	3	
	Cell Pressure applied		350	375	400	kPa
	Back Pressure applied		300	300	300	kPa
	Effective Pressure		50	75	100	kPa
	Pore pressure at start of consolidation		333	319	373	kPa
	Pore pressure at end of consolidation		300	300	303	kPa
	Pore pressure dissipation at end of consolidation		100	98	97	%
Consolidation parameters (see note to BS1377 : pt 8, clause 6.3.4)	Coefficient of Consolidation	C_{vi}	0.56	0.70	0.79	m^2/year
	Coefficient of Compressibility	M_{vi}	0.13	0.13	0.03	m^2/MN
	Coefficient of Permeability (calculated)	k_{vi}	2.3E-11	2.8E-11	6.5E-12	m/s

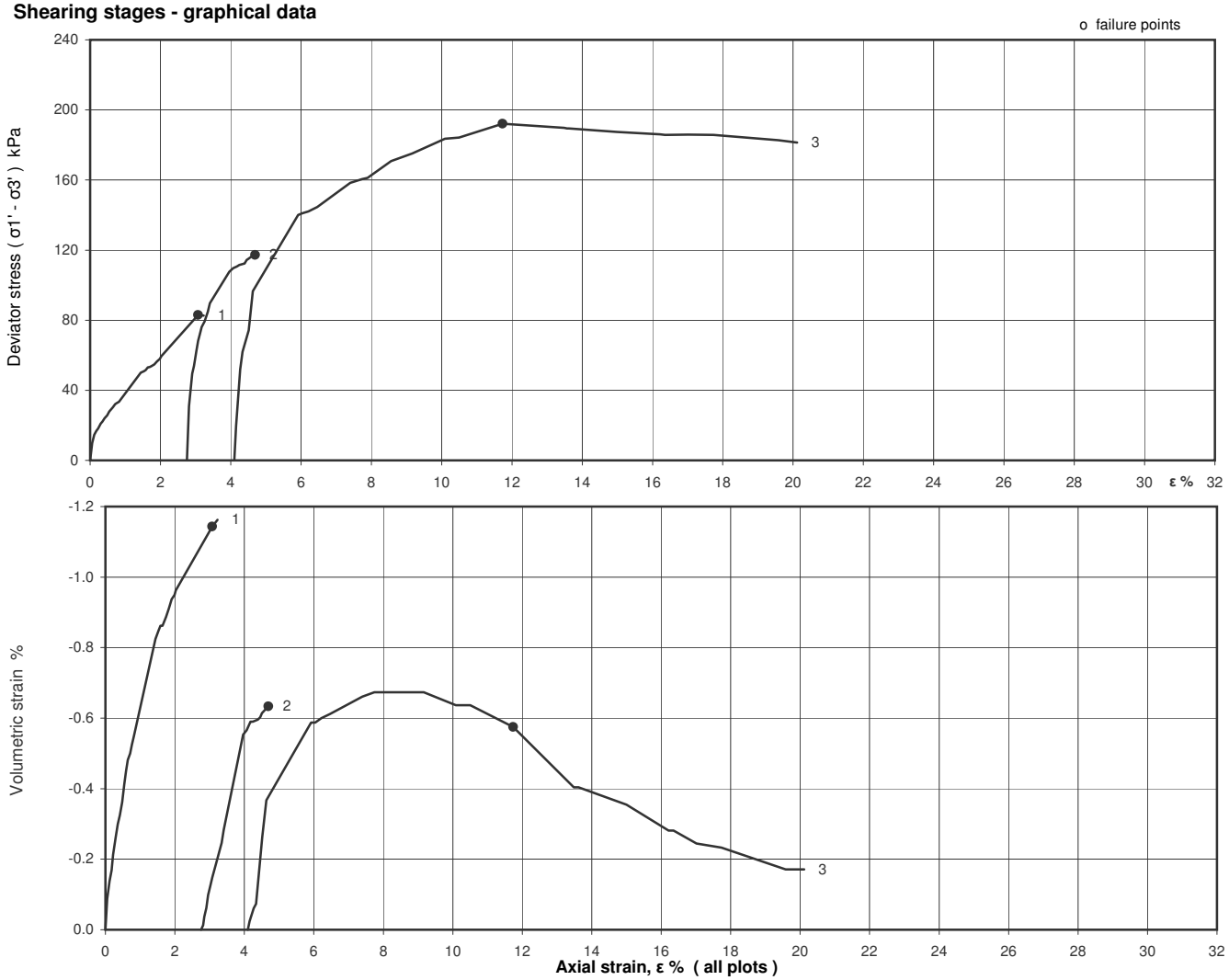
Consolidated Drained Triaxial Compression test with Measurement of Volume Change (BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	F4036-14	Sample Details:	Hole No		BH29	
Project Name	FRODSHAM WIND FARM (6,7,8)		Depth (m BGL)		4	
			No	9	Type	U
			ID			
			Spec Ref			

Consolidation



Shearing stages - graphical data

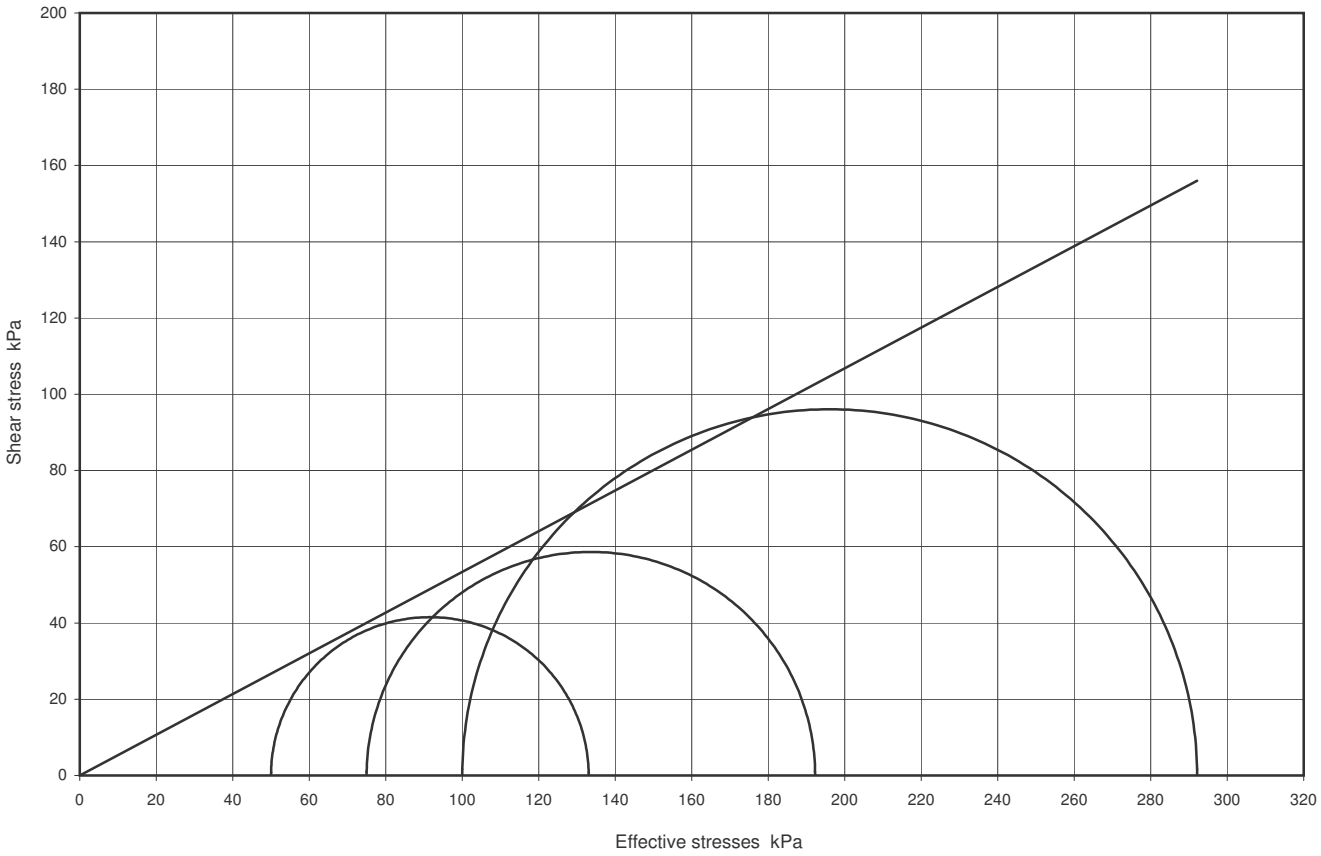


Ref			Figure
SLR8.2 Rev 85 Jan 10	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/12/2014 10:45	**CD 6** sheet 2 of 3

Consolidated Drained Triaxial Compression test with Measurement of Volume Change (BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	F4036-14	Sample Details:	Hole No		BH29	
Project Name	FRODSHAM WIND FARM (6,7,8)		Depth (m BGL)		4	
			No	9	Type	U
			ID			
			Spec Ref			

Mohr Circles



Compression stages

Stage	1	2	3	
Cell pressure	350	375	400	kPa
Initial pwp	300	300	300	kPa
Initial σ_3'	50	75	100	kPa
Rate of strain	0.11	0.11	0.11	%/hr

Shear Strength Parameters

Linear regression

c '	kPa	(-10.2)
Ø '	degrees	(31.8)

Manual re-assessment

c '	kPa	0
Ø '	degrees	28.1

Failure conditions

Criterion	Maximum deviator stress			
Axial strain	3.07	4.69	11.74	%
$(\sigma_1' - \sigma_3')_f$	83.0	117.3	192.1	kPa
Volumetric strain	-1.14	-0.63	-0.58	%
$\sigma_3'_f$	50	75	100	kPa
$\sigma_1'_f$	133	192	292	kPa
Time to failure	27.9	42.7	106.7	hrs

Notes :

Deviator stresses corrected for area change, vertical side drains and 0.4 mm thick rubber membrane(s)

Mode of failure

1 2 3

Consolidated Drained Triaxial Compression test with Measurement of Volume Change (BS1377 : Part 8 : 1990) - Multistage test on a single specimen

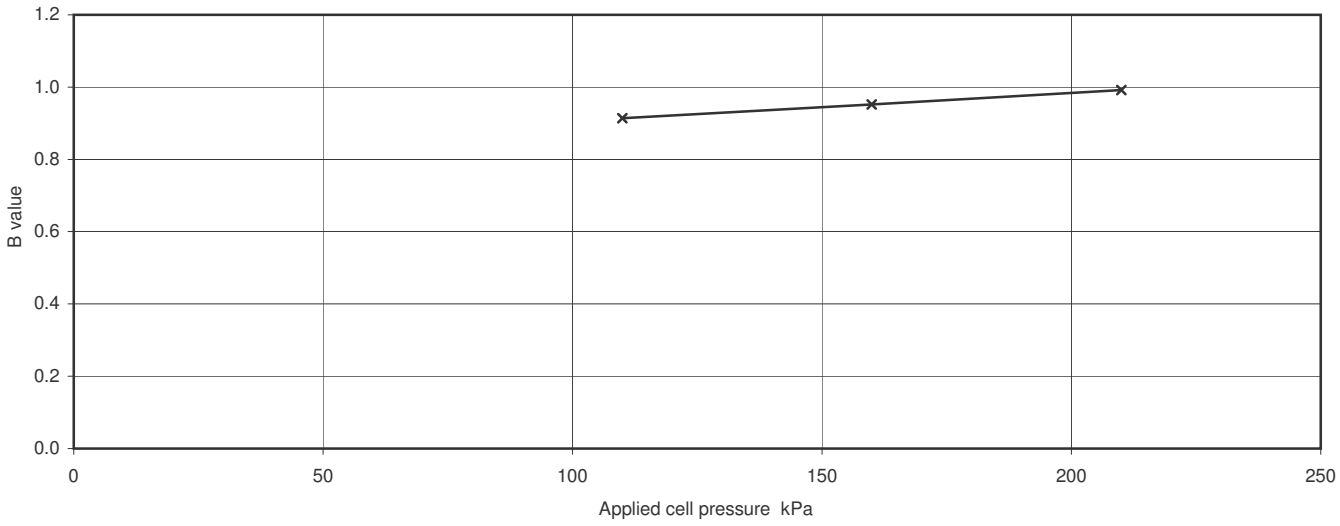
Project No	F4036-14	Sample Details:	Hole No		BHMM	
Project Name	Frodsham Wind Farm		Depth (m BGL)		8.00-8.45	
			No	22	Type	U
			ID			
			Spec Ref			

Specimen Details		
Initial		
Length	mm	204.0
Diameter	mm	102.8
Bulk Density	Mg/m³	1.72
Water Content	%	48.1
Dry density	Mg/m³	1.16
After test		
Bulk Density	Mg/m³	1.84
Water Content	%	35.0
Dry density	Mg/m³	1.36

Soil Description	Soft to firm greyish brown slightly sandy silty organic CLAY.
Specimen Type /Preparation	UNDISTURBED

Saturation Details		Method of Saturation
		Increments of cell and back pressure
Cell pressure increments	kPa	50
Differential Pressure	kPa	
Final Cell Pressure	kPa	210
Final pore water pressure	kPa	196.2
Final B Value		0.99

Saturation

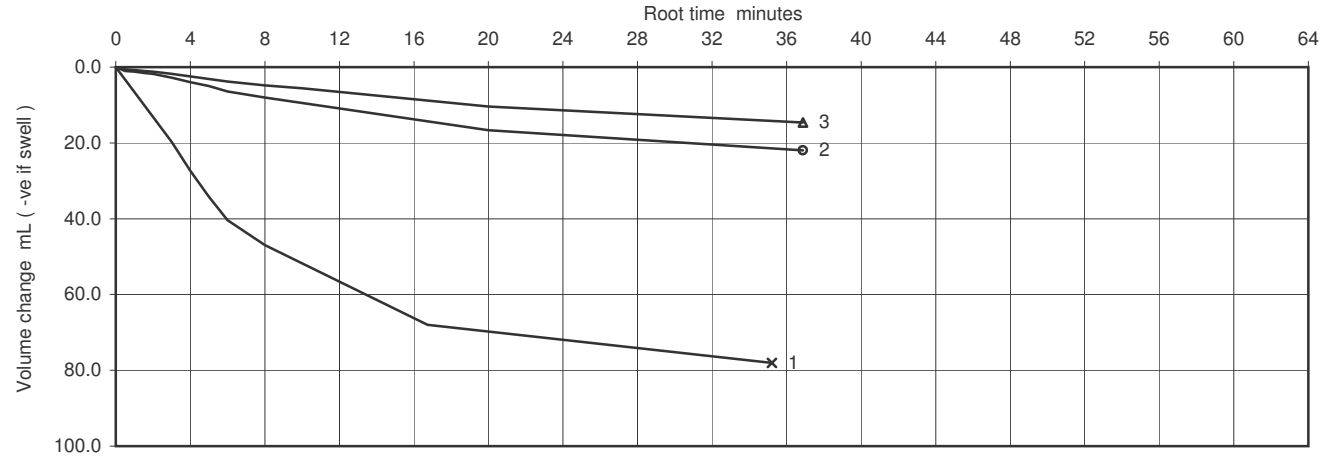


Consolidation Details see sheet 2 for plots	Drainage Conditions		From radial boundary and one end			
	Stage No.		1	2	3	
	Cell Pressure applied		400	450	500	kPa
	Back Pressure applied		300	300	300	kPa
	Effective Pressure		100	150	200	kPa
	Pore pressure at start of consolidation		384	393	407	kPa
	Pore pressure at end of consolidation		300	303	305	kPa
	Pore pressure dissipation at end of consolidation		100	97	95	%
Consolidation parameters (see note to BS1377 : pt 8, clause 6.3.4)	Coefficient of Consolidation	C_{vi}	1.47	0.39	0.29	m^2/year
	Coefficient of Compressibility	M_{vi}	0.68	0.17	0.10	m^2/MN
	Coefficient of Permeability (calculated)	k_{vi}	3.1E-10	2.1E-11	9.1E-12	m/s

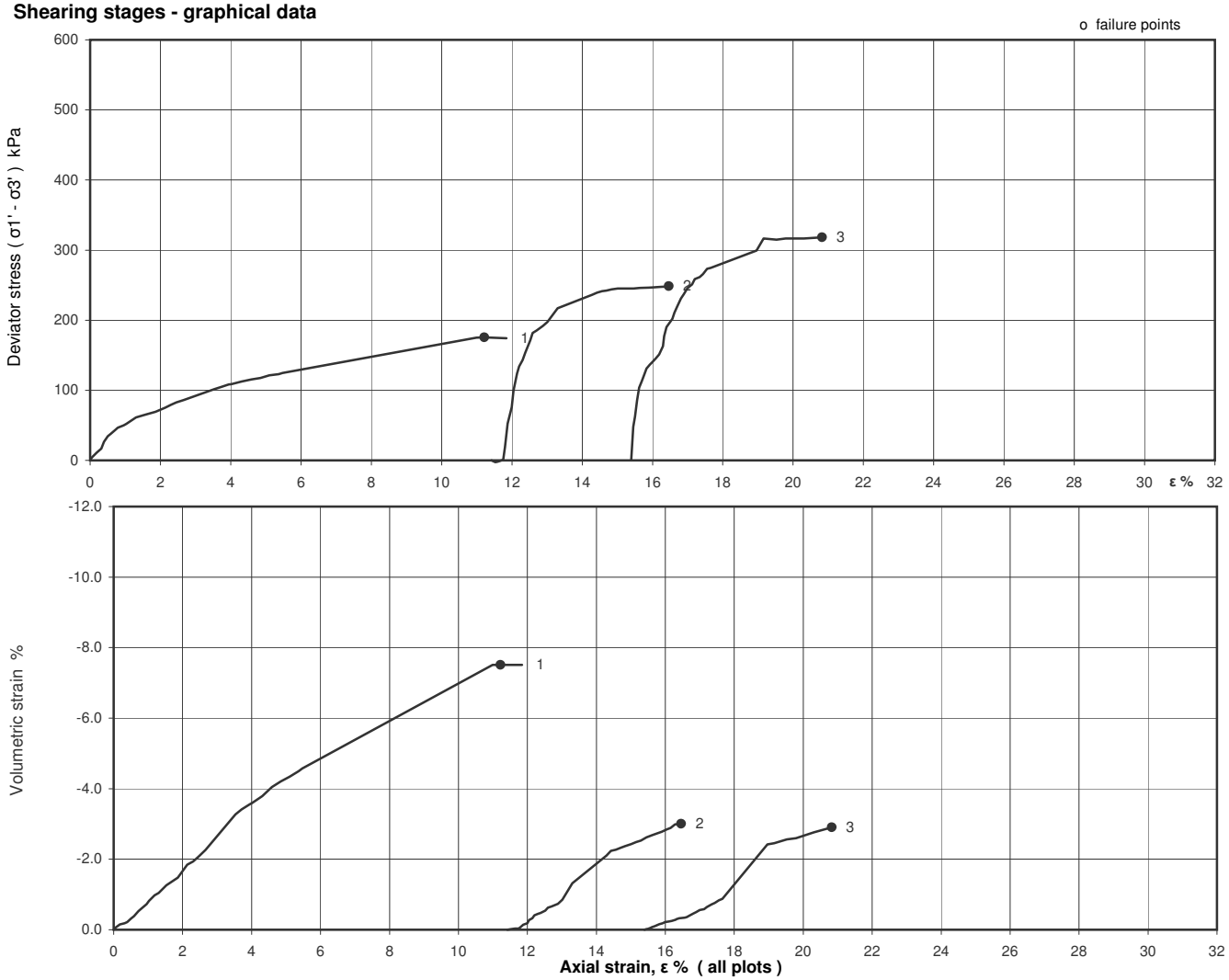
Consolidated Drained Triaxial Compression test with Measurement of Volume Change (BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	F4036-14	Sample Details:	Hole No		BHMM	
Project Name	Frodsham Wind Farm		Depth (m BGL)		8.00-8.45	
			No	22	Type	U
			ID			
			Spec Ref			

Consolidation



Shearing stages - graphical data

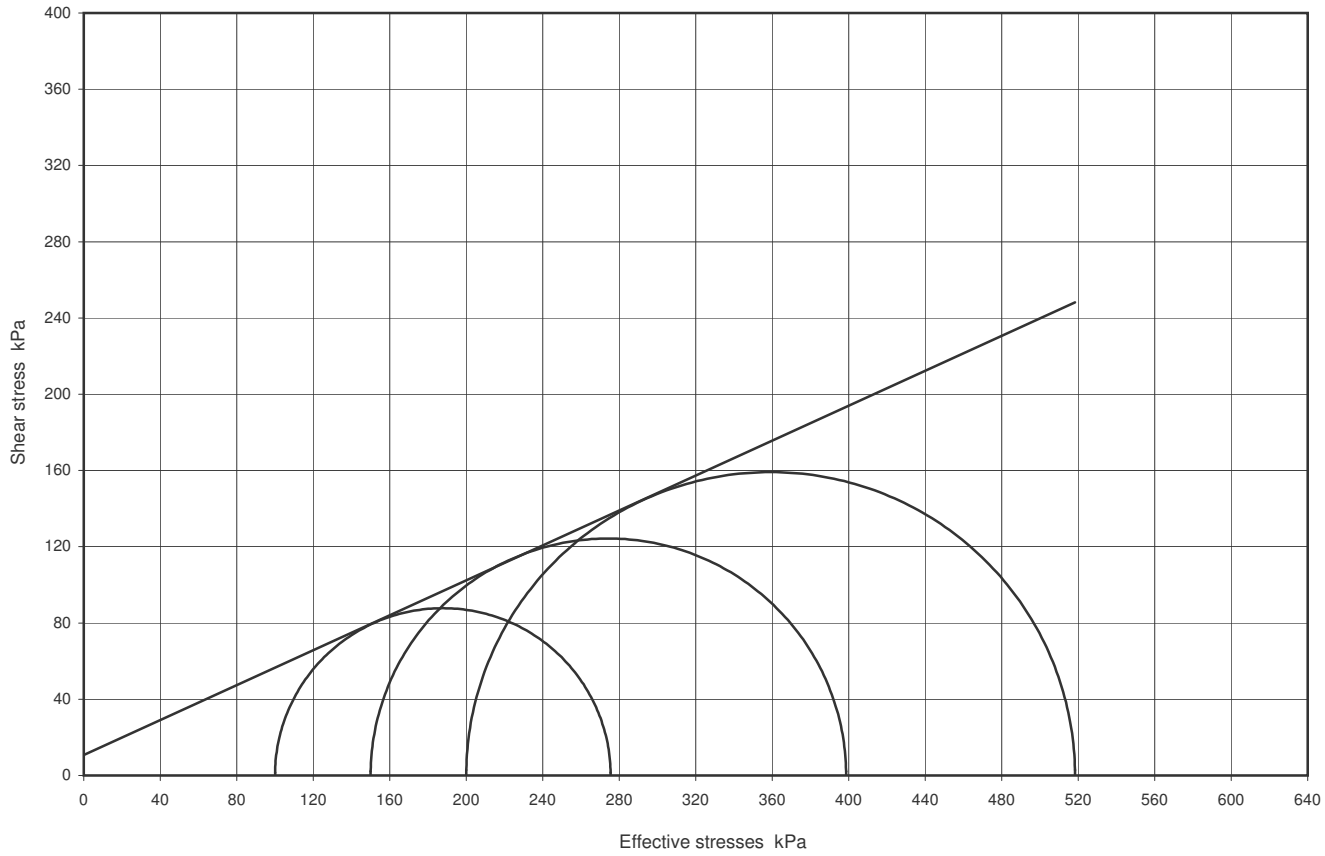


Ref			Figure
SLR8.2 Rev 85 Jan 10	ESG Environmental Scientifics Group	Printed:11/12/2014 10:46	**CD 7** sheet 2 of 3

Consolidated Drained Triaxial Compression test with Measurement of Volume Change
(BS1377 : Part 8 : 1990) - Multistage test on a single specimen

Project No	F4036-14	Sample Details:	Hole No		BHMM	
Project Name	Frodsham Wind Farm		Depth (m BGL)		8.00-8.45	
			No	22	Type	U
			ID			
			Spec Ref			

Mohr Circles



Compression stages

Stage	1	2	3	
Cell pressure	400	450	500	kPa
Initial pwp	300	300	300	kPa
Initial σ_3'	100	150	200	kPa
Rate of strain	0.33	0.33	0.33	%/hr

Shear Strength Parameters

Linear regression

c '	kPa	10.7
Ø '	degrees	24.6

Manual re-assessment

c '	kPa	-
Ø '	degrees	-

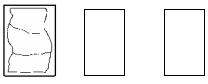
Failure conditions

Criterion	Maximum deviator stress			
Axial strain	11.22	16.46	20.83	%
$(\sigma_1' - \sigma_3')_f$	175.5	248.6	318.3	kPa
Volumetric strain	-7.51	-3.01	-2.91	%
$\sigma_3'_f$	100	150	200	kPa
$\sigma_1'_f$	276	399	518	kPa
Time to failure	34.0	49.9	63.1	hrs

Notes :

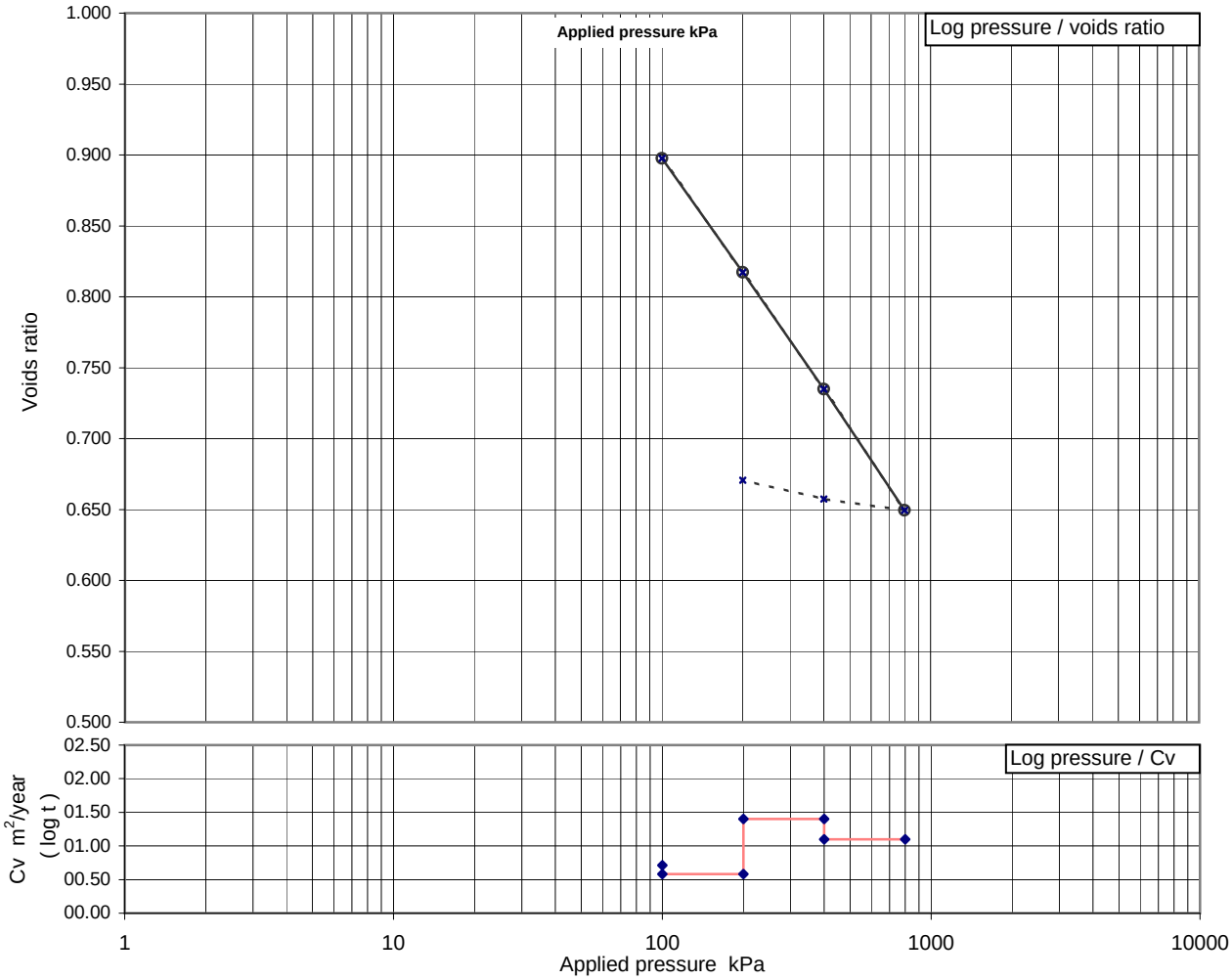
Deviator stresses corrected for area change, vertical side drains and 0.4 mm thick rubber membrane(s)

Mode of failure



ONE DIMENSIONAL CONSOLIDATION TEST
BS 1377 : Part 5 : 1990 : clause 3

Project No	F4036-14	Sample Details:	Hole No	BH01		
Project Name	Frodsham Wind Farm		Depth (m BGL)	13.50		
			Samp No	23	Type	U
			ID	ESGF4036-14201409110000000590		
			Spec Ref			



Soil description: Stiff grey organic CLAY.

Preparation: Undisturbed

Index properties (if available): Liquid limit % | Plastic limit %

Specimen details	Initial	Final	
Particle density	2.65	assumed	Mg/m³
Diameter	74.93		mm
Height	19.06	14.95	mm
Voids ratio	1.131	0.671	
Moisture content	44	27	%
Bulk density	1.79	2.01	Mg/m³
Dry density	1.24	1.59	Mg/m³
Saturation	102	105	%
Average temperature for test	20		°C

Swelling pressure: not measured kPa

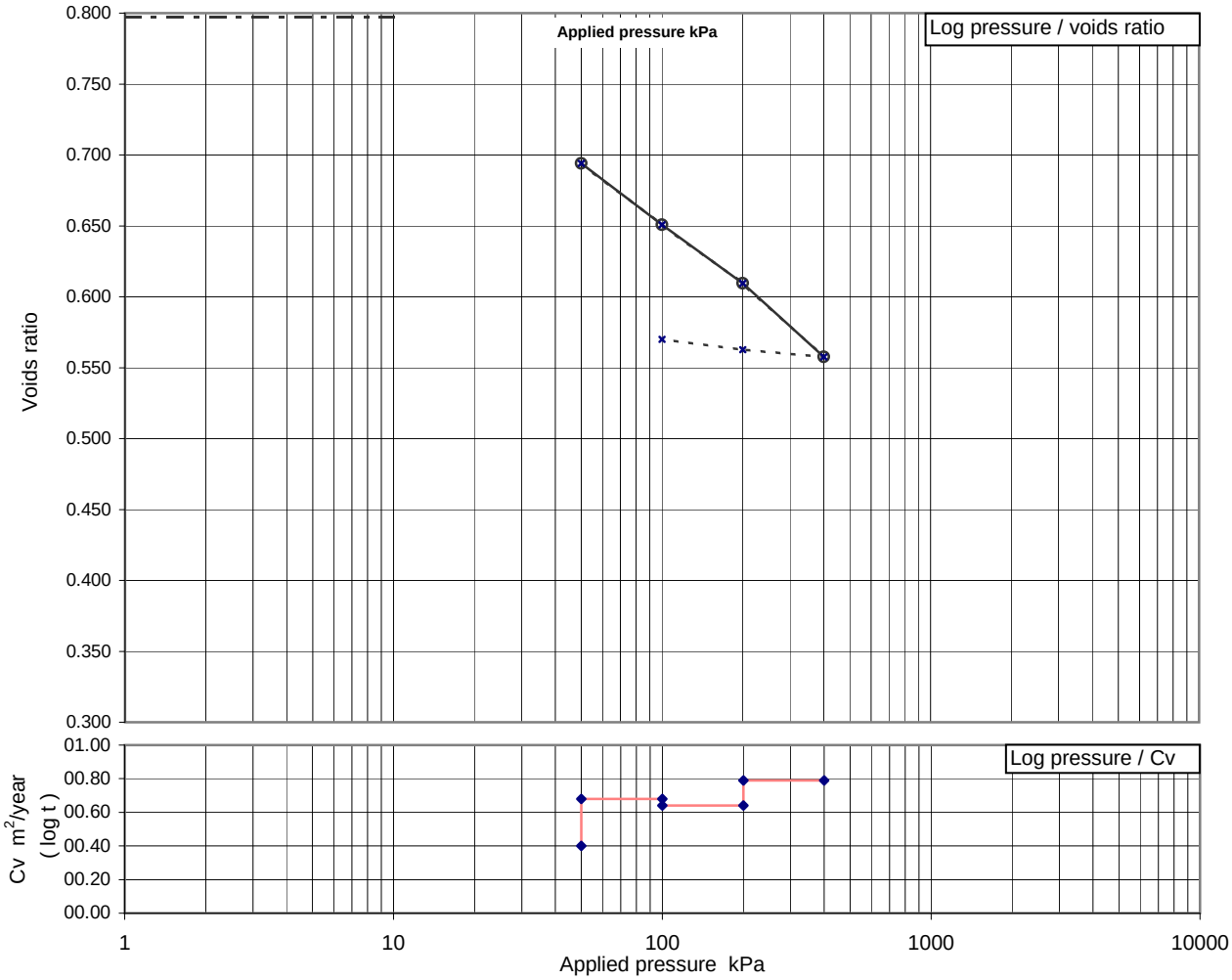
Notes :

Specimen taken 10 mm from base of sample

Applied Pressure kPa	Voids ratio	M_v m²/MN	C_v ($t_{50, log}$) m²/year	C_v ($t_{90, root}$) m²/year	
0	1.1307				
100	0.8976	1.094	0.71	0.75	
200	0.8173	0.423	0.58	0.61	
400	0.7348	0.227	1.4	1.5	
800	0.6494	0.123	1.1	1.2	
400	0.6575	0.012	-	-	
200	0.6707	0.040	-	-	

ONE DIMENSIONAL CONSOLIDATION TEST
BS 1377 : Part 5 : 1990 : clause 3

Project No	F4036-14	Sample Details:	Hole No	BH03		
Project Name	Frodsham Wind Farm		Depth (m BGL)	10.00		
			Samp No	22	Type	U
			ID	ESGF4036-14201409050000000276		
			Spec Ref			



Soil description: Soft to firm grey organic CLAY.

Preparation: Undisturbed

Index properties (if available): Liquid limit % | Plastic limit %

Specimen details	Initial	Final	
Particle density	2.65	assumed	Mg/m³
Diameter	75.00		mm
Height	19.00	16.60	mm
Voids ratio	0.797	0.570	
Moisture content	30	19	%
Bulk density	1.92	2.01	Mg/m³
Dry density	1.47	1.69	Mg/m³
Saturation	100	90	%
Average temperature for test	20		°C

Swelling pressure: not measured kPa

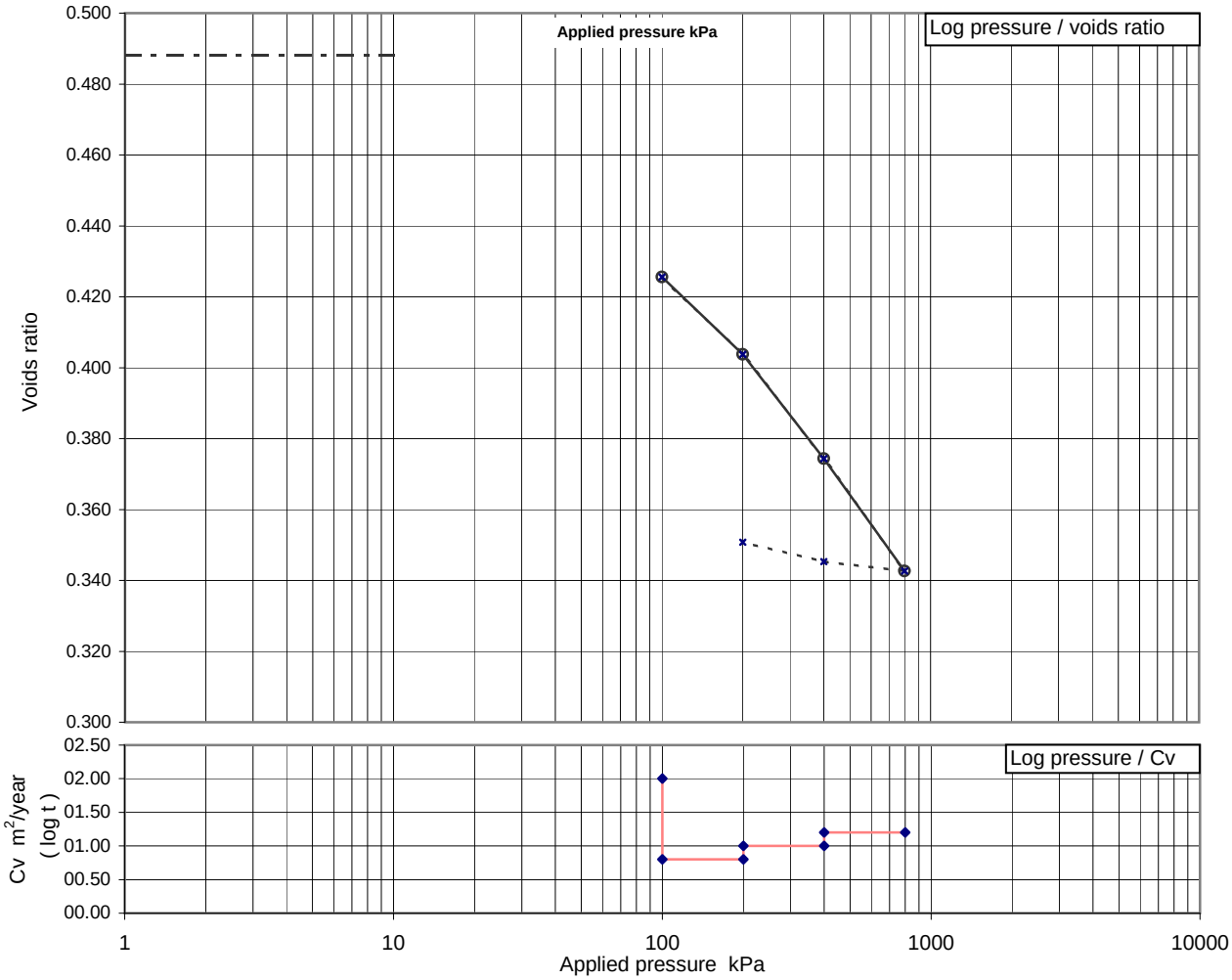
Notes :

Specimen taken 10 mm from base of sample

Applied Pressure kPa	Voids ratio	M_v m²/MN	C_v ($t_{50, log}$) m²/year	C_v ($t_{90, root}$) m²/year	
0	0.7969				
50	0.6941	1.144	0.4	0.44	
100	0.6508	0.511	0.68	0.71	
200	0.6095	0.250	0.64	0.68	
400	0.5575	0.161	0.79	0.84	
200	0.5626	0.016	-	-	
100	0.5700	0.047	-	-	

ONE DIMENSIONAL CONSOLIDATION TEST
BS 1377 : Part 5 : 1990 : clause 3

Project No	F4036-14	Sample Details:	Hole No	BH07		
Project Name	Frodsham Wind Farm		Depth (m BGL)	18.00		
			Samp No	28	Type	U
			ID	ESGF4036-14201408290000000222		
			Spec Ref			



Soil description: Firm brown slightly gravelly CLAY.

Preparation: Undisturbed

Index properties (if available): Liquid limit % | Plastic limit %

Specimen details	Initial	Final	
Particle density	2.65	assumed	Mg/m³
Diameter	74.92		mm
Height	19.00	17.24	mm
Voids ratio	0.488	0.351	
Moisture content	17	14	%
Bulk density	2.09	2.23	Mg/m³
Dry density	1.78	1.96	Mg/m³
Saturation	94	105	%
Average temperature for test	21		°C

Swelling pressure: not measured kPa

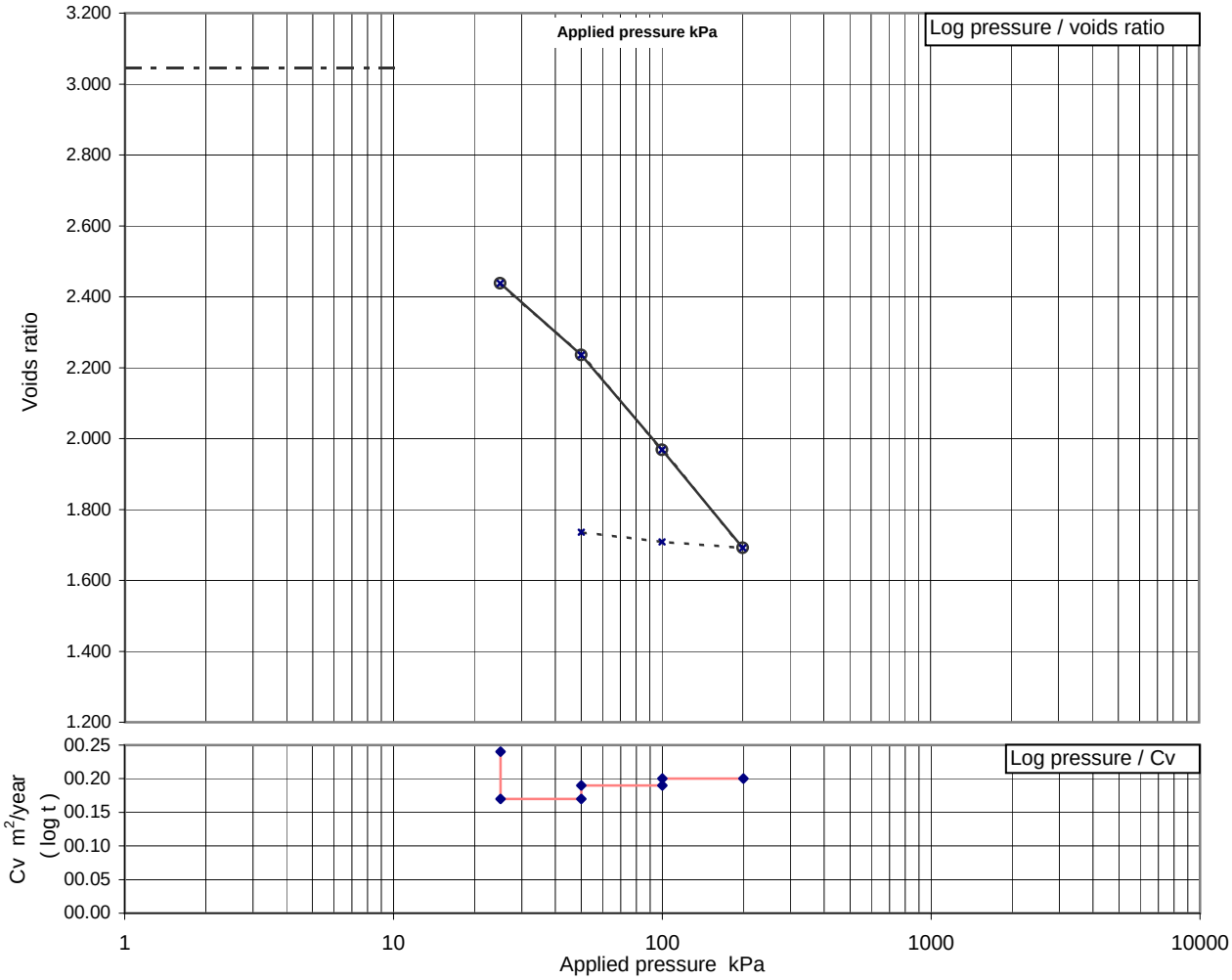
Notes :

Specimen taken 10 mm from base of sample

Applied Pressure kPa	Voids ratio	M_v m²/MN	C_v ($t_{50, log}$) m²/year	C_v ($t_{90, root}$) m²/year	
0	0.4882				
100	0.4255	0.421	2	2	
200	0.4038	0.153	0.8	0.75	
400	0.3744	0.105	1	1.1	
800	0.3427	0.058	1.2	1.2	
400	0.3453	0.005	-	-	
200	0.3508	0.020	-	-	

ONE DIMENSIONAL CONSOLIDATION TEST
BS 1377 : Part 5 : 1990 : clause 3

Project No	F4036-14	Sample Details:	Hole No	BH08		
Project Name	Frodsham Wind Farm		Depth (m BGL)	4.00		
			Samp No	8	Type	U
			ID	ESGF4036-14201408280000000082		
			Spec Ref			



Soil description: Dark grey slightly sandy organic CLAY.

Preparation: Undisturbed

Index properties (if available): Liquid limit % | Plastic limit %

Specimen details	Initial	Final	
Particle density	2.65	assumed	Mg/m³
Diameter	74.94		mm
Height	18.99	12.84	mm
Voids ratio	3.046	1.736	
Moisture content	105	61	%
Bulk density	1.34	1.56	Mg/m³
Dry density	0.65	0.97	Mg/m³
Saturation	91	93	%
Average temperature for test	21		°C

Swelling pressure: not measured kPa

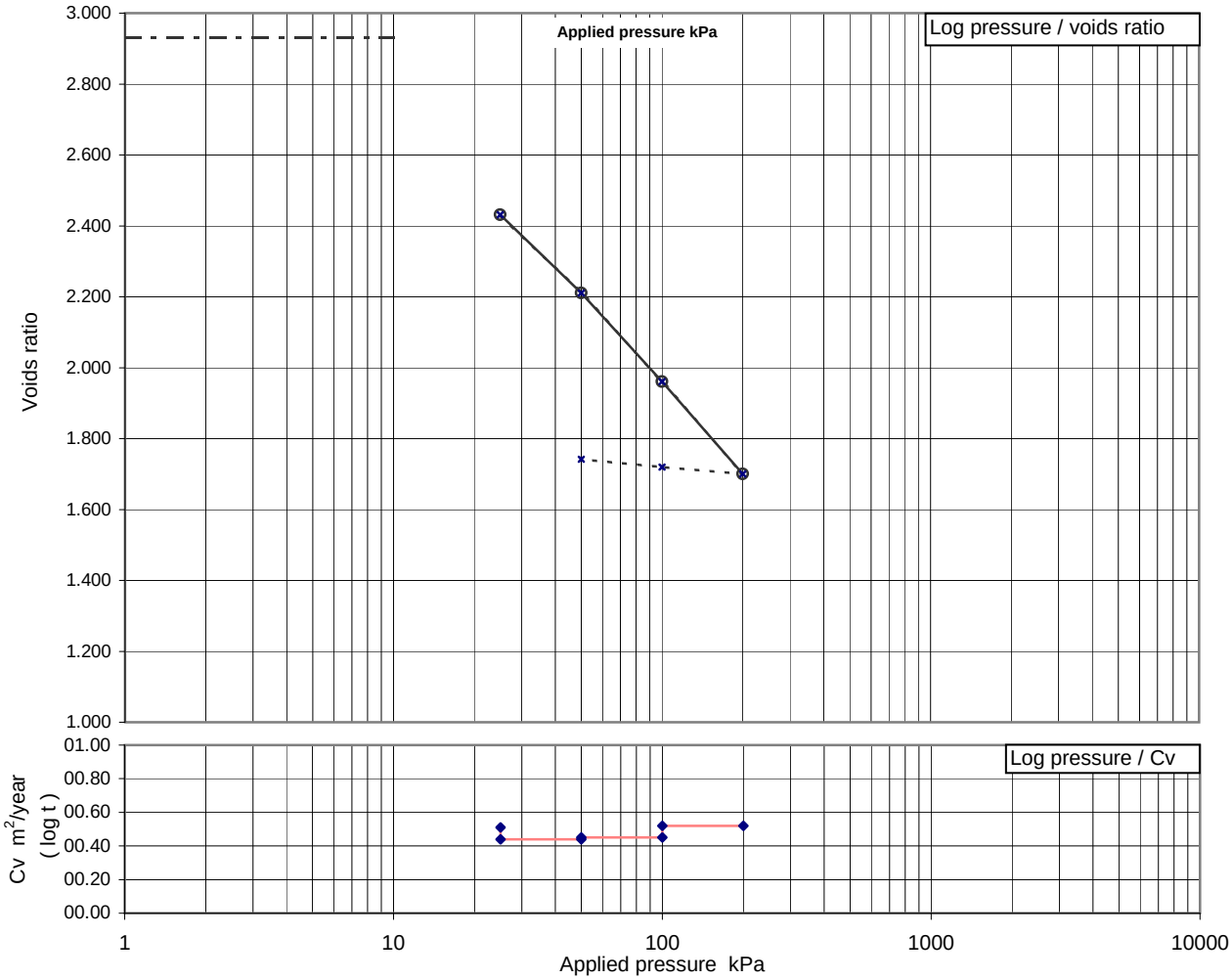
Notes :

Specimen taken 10 mm from base of sample

Applied Pressure kPa	Voids ratio	M_v m²/MN	C_v ($t_{50, log}$) m²/year	C_v ($t_{90, root}$) m²/year	
0	3.0459				
25	2.4381	6.009	0.24	0.27	
50	2.2357	2.354	0.17	0.18	
100	1.9682	1.654	0.19	0.2	
200	1.6919	0.931	0.2	0.2	
100	1.7089	0.063	-	-	
50	1.7362	0.201	-	-	

ONE DIMENSIONAL CONSOLIDATION TEST
BS 1377 : Part 5 : 1990 : clause 3

Project No	F4036-14	Sample Details:	Hole No	BH09		
Project Name	Frodsham Wind Farm		Depth (m BGL)	5.00		
			Samp No	10	Type	U
			ID	ESGF4036-14201408280000000135		
			Spec Ref			



Soil description	Soft dark grey CLAY.
Preparation	Undisturbed
Index properties (if available)	Liquid limit % [ ] Plastic limit % [ ]

Specimen details	Initial	Final	
Particle density	2.65	assumed	Mg/m^3
Diameter	74.91		mm
Height	18.91	13.19	mm
Voids ratio	2.931	1.741	
Moisture content	102	60	%
Bulk density	1.36	1.54	Mg/m^3
Dry density	0.67	0.97	Mg/m^3
Saturation	92	91	%
Average temperature for test	20		°C

Swelling pressure: not measured kPa

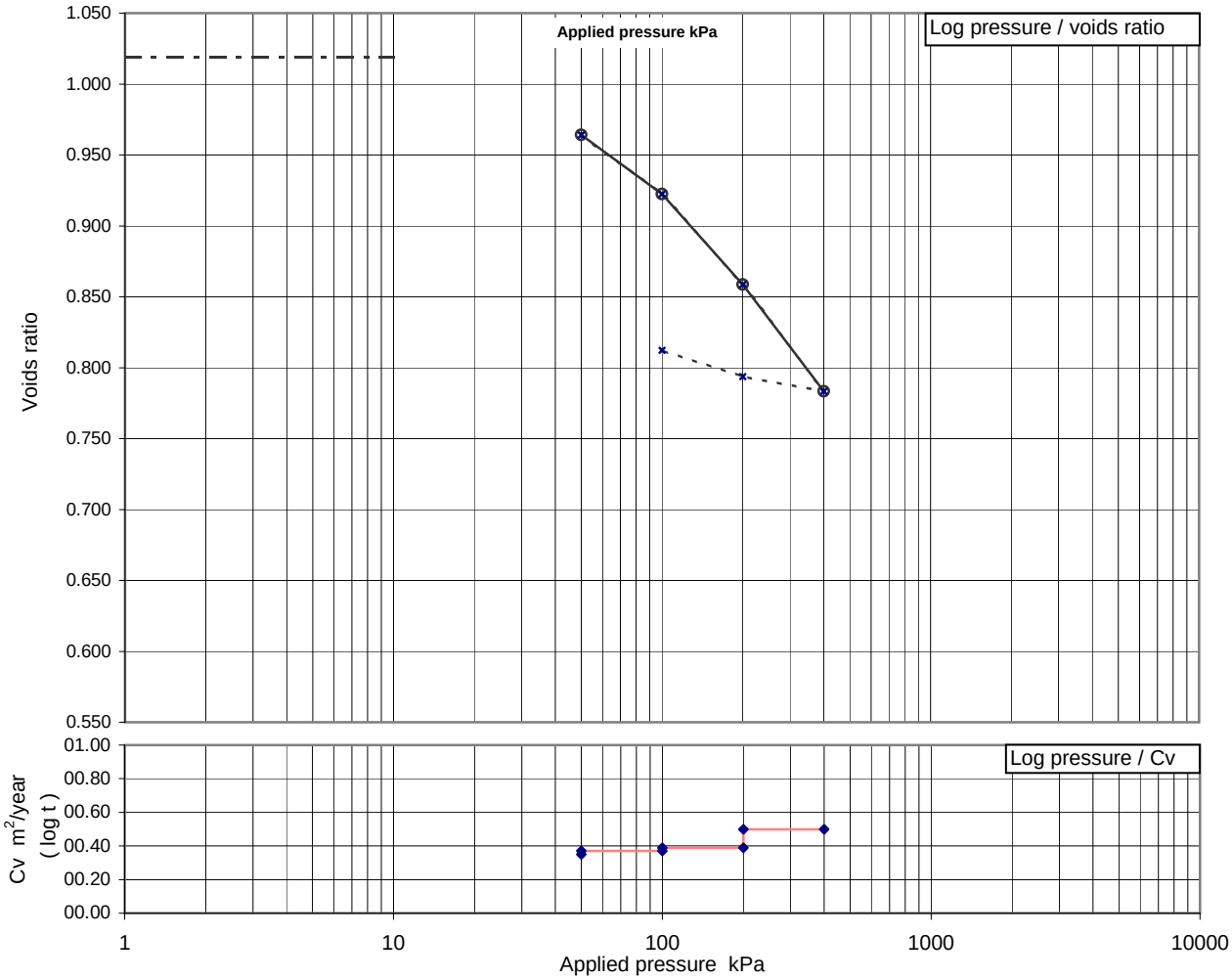
Notes :

Specimen taken 60 mm from base of sample

Applied Pressure kPa	Voids ratio	M_v m^2/MN	C_v ($t_{50, log}$) m^2/year	C_v ($t_{90, root}$) m^2/year	
0	2.9307				
25	2.4312	5.083	0.51	0.5	
50	2.2102	2.576	0.44	0.52	
100	1.9606	1.555	0.45	0.46	
200	1.6999	0.880	0.52	0.63	
100	1.7195	0.072	-	-	
50	1.7413	0.161	-	-	

ONE DIMENSIONAL CONSOLIDATION TEST
BS 1377 : Part 5 : 1990 : clause 3

Project No	F4036-14	Sample Details:	Hole No	BH10		
Project Name	Frodsham Wind Farm		Depth (m BGL)	9.50		
			Samp No	20	Type	U
			ID	ESGF4036-14201409080000000327		
			Spec Ref			



Soil description	Firm to stiff grey CLAY.
Preparation	Undsturbed
Index properties (if available)	Liquid limit % [ ] Plastic limit % [ ]

Specimen details	Initial	Final	
Particle density	2.65	assumed	Mg/m³
Diameter	74.93		mm
Height	18.90	16.97	mm
Voids ratio	1.019	0.812	
Moisture content	39	32	%
Bulk density	1.83	1.93	Mg/m³
Dry density	1.31	1.46	Mg/m³
Saturation	103	105	%
Average temperature for test	21		°C

Swelling pressure: not measured kPa

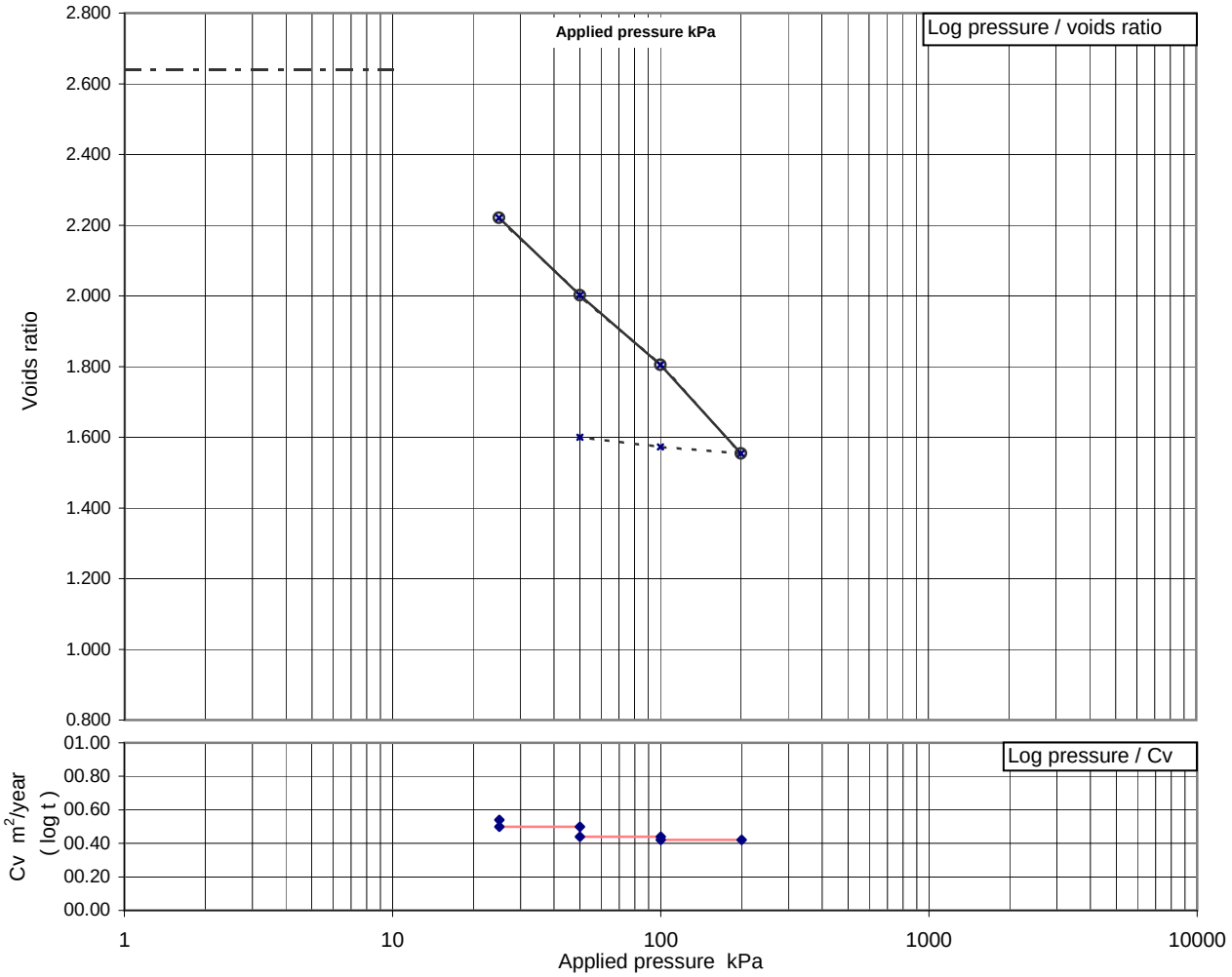
Notes :

Specimen taken 10 mm from base of sample

Applied Pressure kPa	Voids ratio	M_v m²/MN	C_v ($t_{50, log}$) m²/year	C_v ($t_{90, root}$) m²/year	
0	1.0191				
50	0.9642	0.544	0.35	0.37	
100	0.9224	0.425	0.37	0.4	
200	0.8586	0.332	0.39	0.42	
400	0.7833	0.203	0.5	0.54	
200	0.7937	0.029	-	-	
100	0.8122	0.103	-	-	

ONE DIMENSIONAL CONSOLIDATION TEST
BS 1377 : Part 5 : 1990 : clause 3

Project No	F4036-14	Sample Details:	Hole No	BH14		
Project Name	Frodsham Wind Farm		Depth (m BGL)	4.00		
			Samp No	11	Type	U
			ID	ESGF4036-14201409170000001072		
			Spec Ref			



Soil description	Very soft black and brown organic CLAY.
Preparation	Undisturbed
Index properties (if available)	Liquid limit % [ ] Plastic limit % [ ]

Specimen details	Initial	Final	
Particle density	2.65	assumed	Mg/m^3
Diameter	74.93		mm
Height	18.88	13.48	mm
Voids ratio	2.640	1.600	
Moisture content	98	61	%
Bulk density	1.44	1.64	Mg/m^3
Dry density	0.73	1.02	Mg/m^3
Saturation	98	101	%
Average temperature for test	20		°C

Swelling pressure: not measured kPa

Notes :

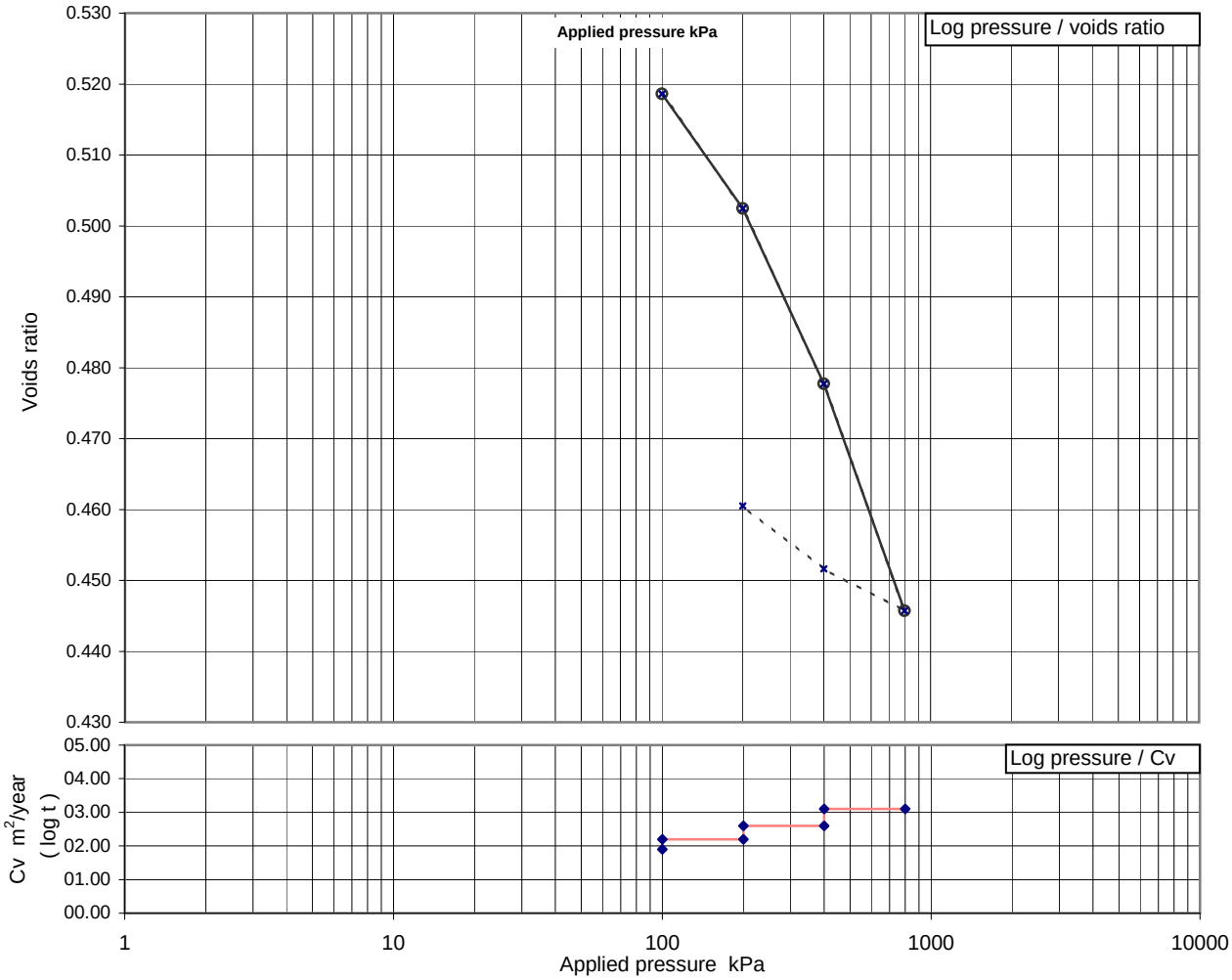
Specimen taken 10 mm from base of sample

Applied Pressure kPa	Voids ratio	M_v m^2/MN	C_v ($t_{50, log}$) m^2/year	C_v ($t_{90, root}$) m^2/year	
0	2.6403				
25	2.2204	4.614	0.54	0.57	
50	2.0017	2.716	0.5	0.52	
100	1.8046	1.313	0.44	0.47	
200	1.5545	0.892	0.42	0.45	
100	1.5726	0.071	-	-	
50	1.6004	0.216	-	-	

QA Ref			Figure
SLR 5.3 Rev 140 Mar 12	ESG Environmental Scientifics Group	UKAS TESTING 1157	Printed:11/12/2014 10:36	OED 7

ONE DIMENSIONAL CONSOLIDATION TEST
BS 1377 : Part 5 : 1990 : clause 3

Project No	F4036-14	Sample Details:	Hole No	BH19		
Project Name	Frodsham Wind Farm		Depth (m BGL)	19.00		
			Samp No	41	Type	U
			ID	ESGF4036-14201409240000001617		
			Spec Ref			



Soil description: Stiff brown slightly sandy CLAY.

Preparation: Undisturbed

Index properties (if available): Liquid limit % | Plastic limit %

Specimen details	Initial	Final	
Particle density	2.65	assumed	Mg/m³
Diameter	74.95		mm
Height	18.99	18.00	mm
Voids ratio	0.541	0.461	
Moisture content	20	18	%
Bulk density	2.07	2.15	Mg/m³
Dry density	1.72	1.81	Mg/m³
Saturation	99	105	%
Average temperature for test	21		°C

Swelling pressure: not measured kPa

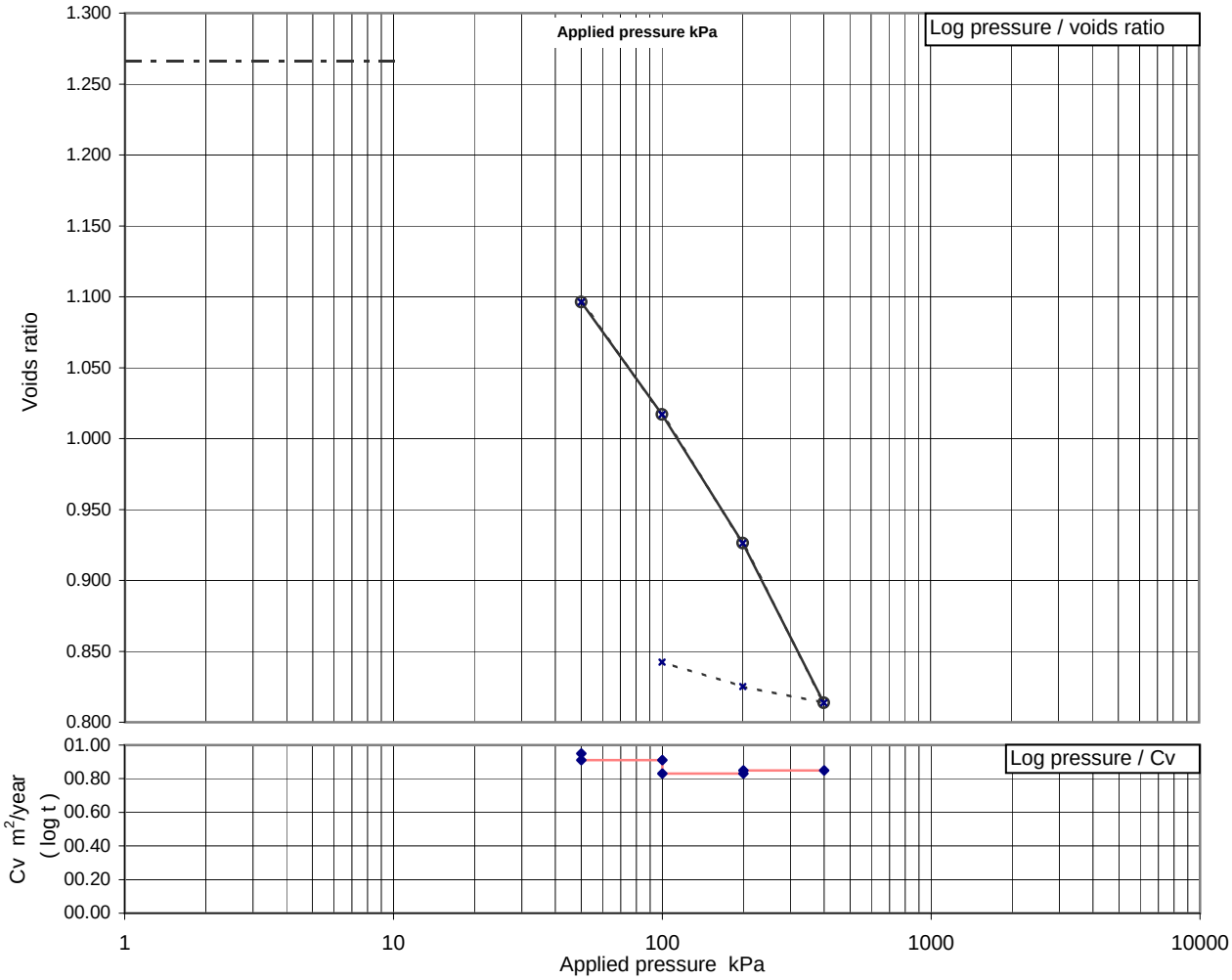
Notes :

Specimen taken 10 mm from base of sample

Applied Pressure kPa	Voids ratio	M_v m²/MN	C_v ($t_{50, log}$) m²/year	C_v ($t_{90, root}$) m²/year	
0	0.5410				
100	0.5186	0.145	1.9	2	
200	0.5025	0.106	2.2	2.3	
400	0.4777	0.082	2.6	2.8	
800	0.4457	0.054	3.1	3.4	
400	0.4517	0.010	-	-	
200	0.4605	0.030	-	-	

ONE DIMENSIONAL CONSOLIDATION TEST
BS 1377 : Part 5 : 1990 : clause 3

Project No	F4036-14	Sample Details:	Hole No	BH20		
Project Name	Frodsham Wind Farm		Depth (m BGL)	9.00		
			Samp No	21	Type	U
			ID	ESGF4036-14201409170000001164		
			Spec Ref			



Soil description	Soft to firm grey laminated CLAY with plant remains.
Preparation	Undisturbed
Index properties (if available)	Liquid limit % ; Plastic limit %

Specimen details	Initial	Final	
Particle density	2.65	measured	Mg/m³
Diameter	74.94		mm
Height	18.96	15.41	mm
Voids ratio	1.266	0.842	
Moisture content	49	33	%
Bulk density	1.74	1.92	Mg/m³
Dry density	1.17	1.44	Mg/m³
Saturation	103	105	%
Average temperature for test	20		°C

Swelling pressure: not measured kPa

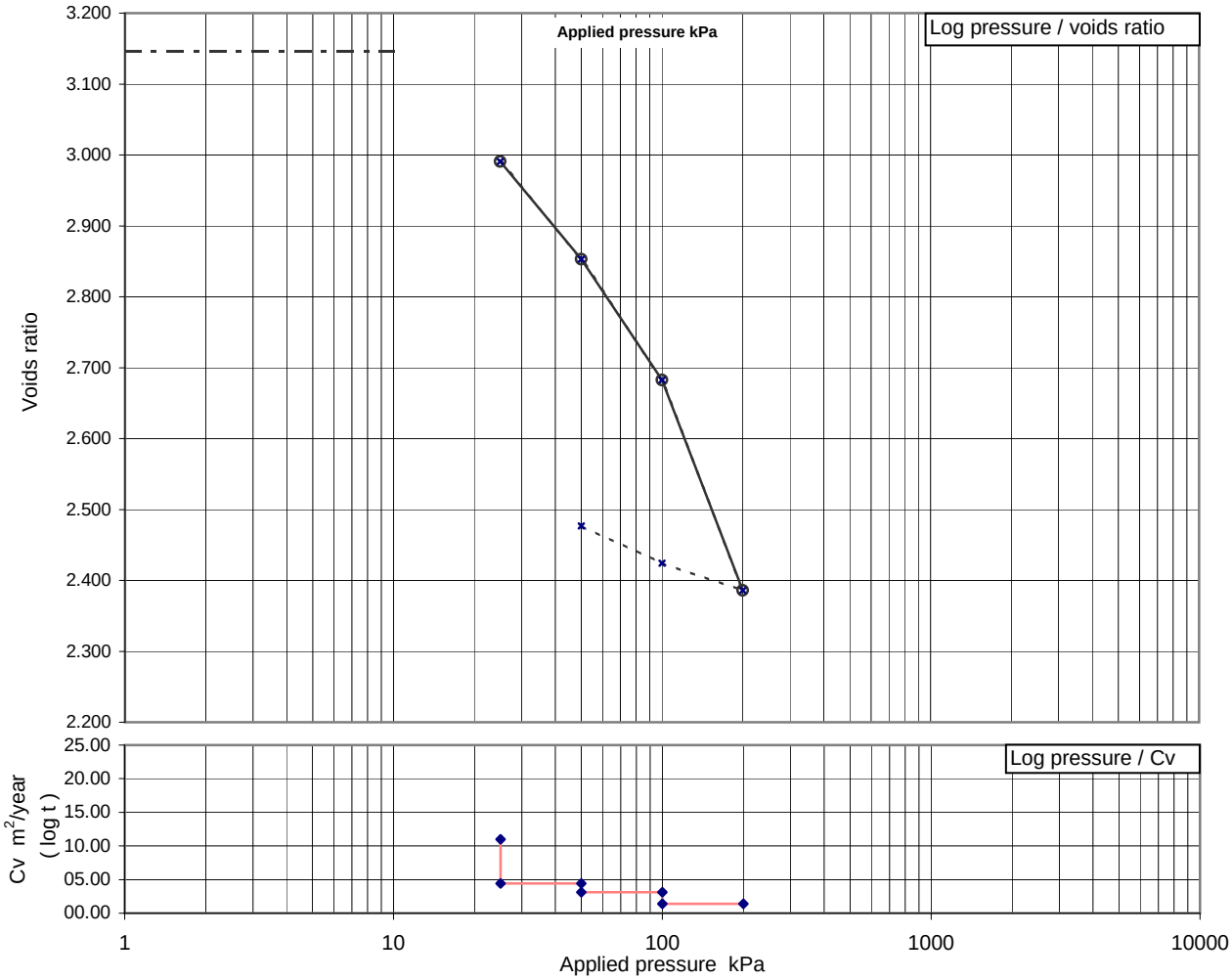
Notes :

Specimen taken 10 mm from base of sample

Applied Pressure kPa	Voids ratio	M_v m²/MN	C_v ($t_{50, log}$) m²/year	C_v ($t_{90, root}$) m²/year	
0	1.2663				
50	1.0962	1.501	0.95	0.96	
100	1.0169	0.756	0.91	0.99	
200	0.9263	0.449	0.83	0.9	
400	0.8138	0.292	0.85	0.91	
200	0.8252	0.031	-	-	
100	0.8424	0.094	-	-	

ONE DIMENSIONAL CONSOLIDATION TEST
BS 1377 : Part 5 : 1990 : clause 3

Project No	F4036-14	Sample Details:	Hole No	BH21		
Project Name	Frodsham Wind Farm		Depth (m BGL)	3.50		
			Samp No	10	Type	U
			ID	ESGF4036-14201409170000001186		
			Spec Ref			



Soil description: Firm dark brown organic CLAY with localised softening and frequent rootlets.

Preparation: Undisturbed

Index properties (if available): Liquid limit % | Plastic limit %

Specimen details	Initial	Final	
Particle density	2.65	assumed	Mg/m³
Diameter	74.98		mm
Height	18.83	15.79	mm
Voids ratio	3.146	2.477	
Moisture content	105	86	%
Bulk density	1.31	1.42	Mg/m³
Dry density	0.64	0.76	Mg/m³
Saturation	89	92	%
Average temperature for test	20		°C

Swelling pressure: not measured kPa

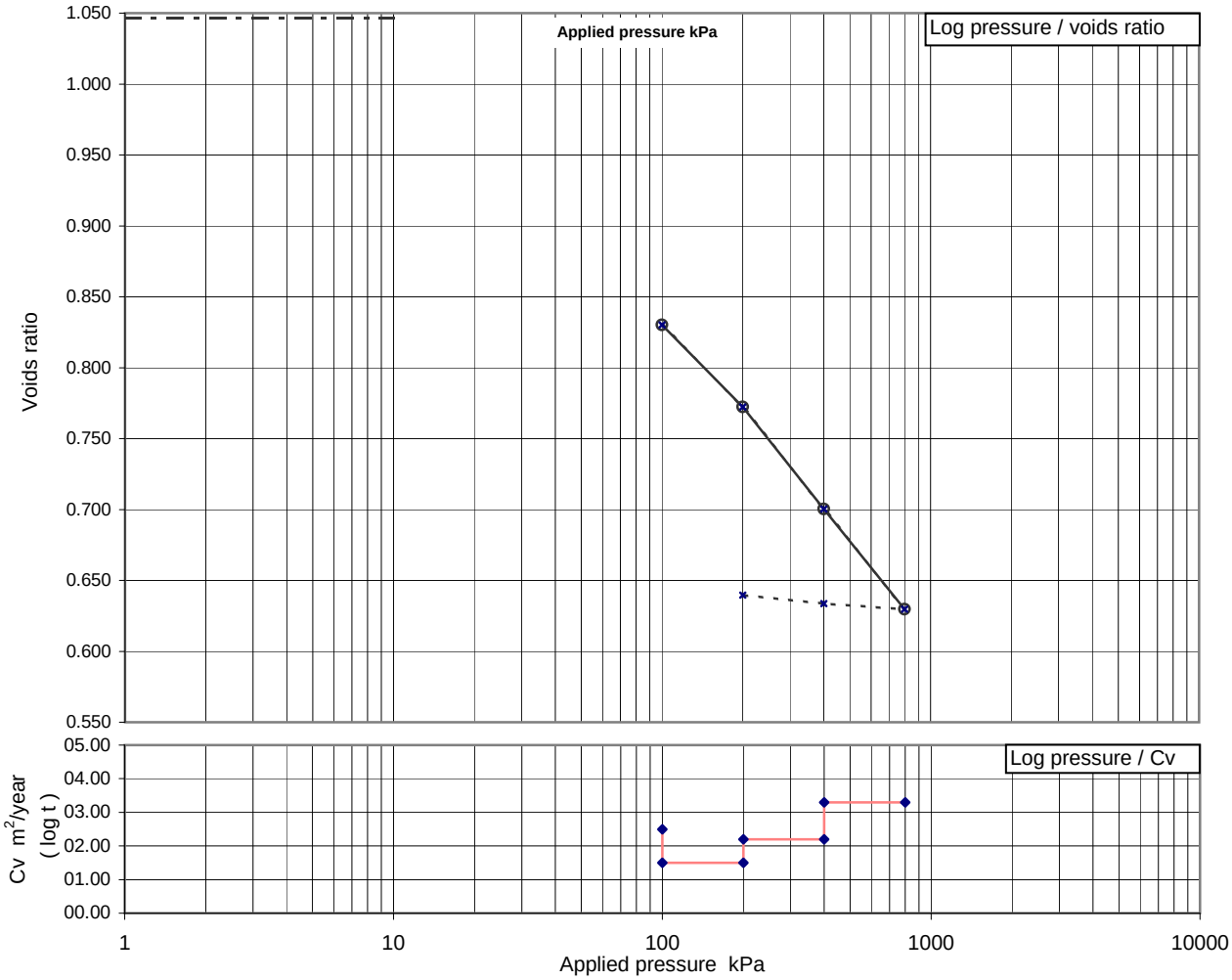
Notes :

Specimen taken 60 mm from base of sample

Applied Pressure kPa	Voids ratio	M_v m²/MN	C_v ($t_{50, log}$) m²/year	C_v ($t_{90, root}$) m²/year	
0	3.1465				
25	2.9908	1.502	11	12	
50	2.8529	1.382	4.4	4.7	
100	2.6827	0.884	3.1	3.3	
200	2.3858	0.806	1.4	1.4	
100	2.4243	0.114	-	-	
50	2.4767	0.306	-	-	

ONE DIMENSIONAL CONSOLIDATION TEST
BS 1377 : Part 5 : 1990 : clause 3

Project No	F4036-14	Sample Details:	Hole No	BH22		
Project Name	Frodsham Wind Farm		Depth (m BGL)	8.50		
			Samp No	22	Type	U
			ID	ESGF4036-14201409220000001473		
			Spec Ref			



Soil description: Soft grey slightly sandy silty CLAY.

Preparation: Undisturbed

Index properties (if available): Liquid limit % | Plastic limit %

Specimen details	Initial	Final	
Particle density	2.65	assumed	Mg/m³
Diameter	74.94		mm
Height	18.90	15.15	mm
Voids ratio	1.046	0.640	
Moisture content	40	25	%
Bulk density	1.81	2.03	Mg/m³
Dry density	1.30	1.62	Mg/m³
Saturation	102	105	%
Average temperature for test	21		°C

Swelling pressure: not measured kPa

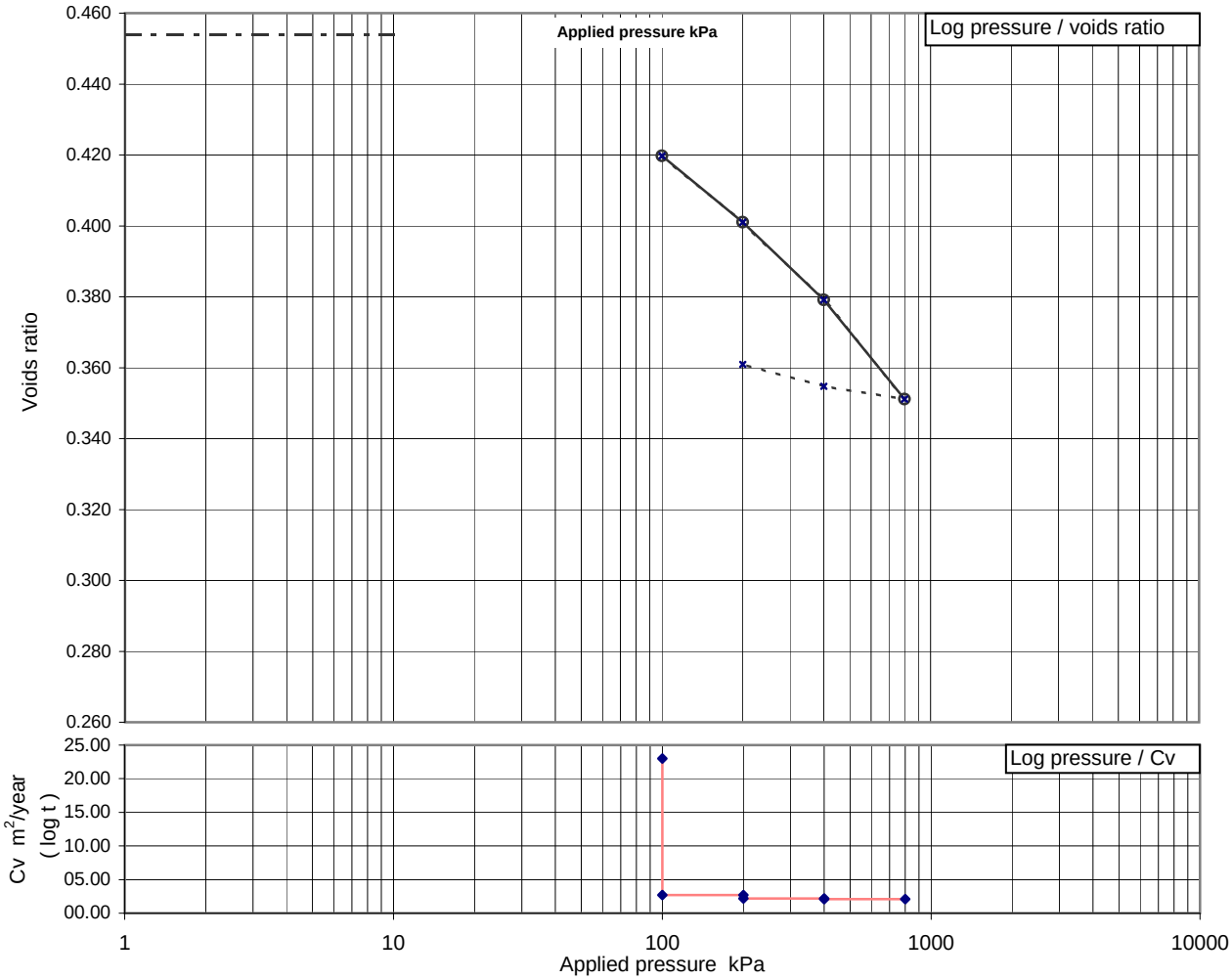
Notes :

Specimen taken 10 mm from base of sample

Applied Pressure kPa	Voids ratio	M_v m²/MN	C_v ($t_{50, log}$) m²/year	C_v ($t_{90, root}$) m²/year	
0	1.0462				
100	0.8302	1.056	2.5	2.7	
200	0.7724	0.316	1.5	1.6	
400	0.7004	0.203	2.2	2.4	
800	0.6296	0.104	3.3	3.6	
400	0.6336	0.006	-	-	
200	0.6397	0.019	-	-	

ONE DIMENSIONAL CONSOLIDATION TEST
BS 1377 : Part 5 : 1990 : clause 3

Project No	F4036-14	Sample Details:	Hole No	BH24		
Project Name	Frodsham Wind Farm		Depth (m BGL)	15.00		
			Samp No	25	Type	U
			ID	ESGF4036-14201409170000001235		
			Spec Ref			



Soil description: Stiff brown slightly gravelly CLAY.

Preparation: Undisturbed

Index properties (if available): Liquid limit % | Plastic limit %

Specimen details	Initial	Final	
Particle density	2.65	assumed	Mg/m³
Diameter	74.85		mm
Height	18.98	17.77	mm
Voids ratio	0.454	0.361	
Moisture content	16	14	%
Bulk density	2.12	2.23	Mg/m³
Dry density	1.82	1.95	Mg/m³
Saturation	96	105	%
Average temperature for test	20		°C

Swelling pressure: not measured kPa

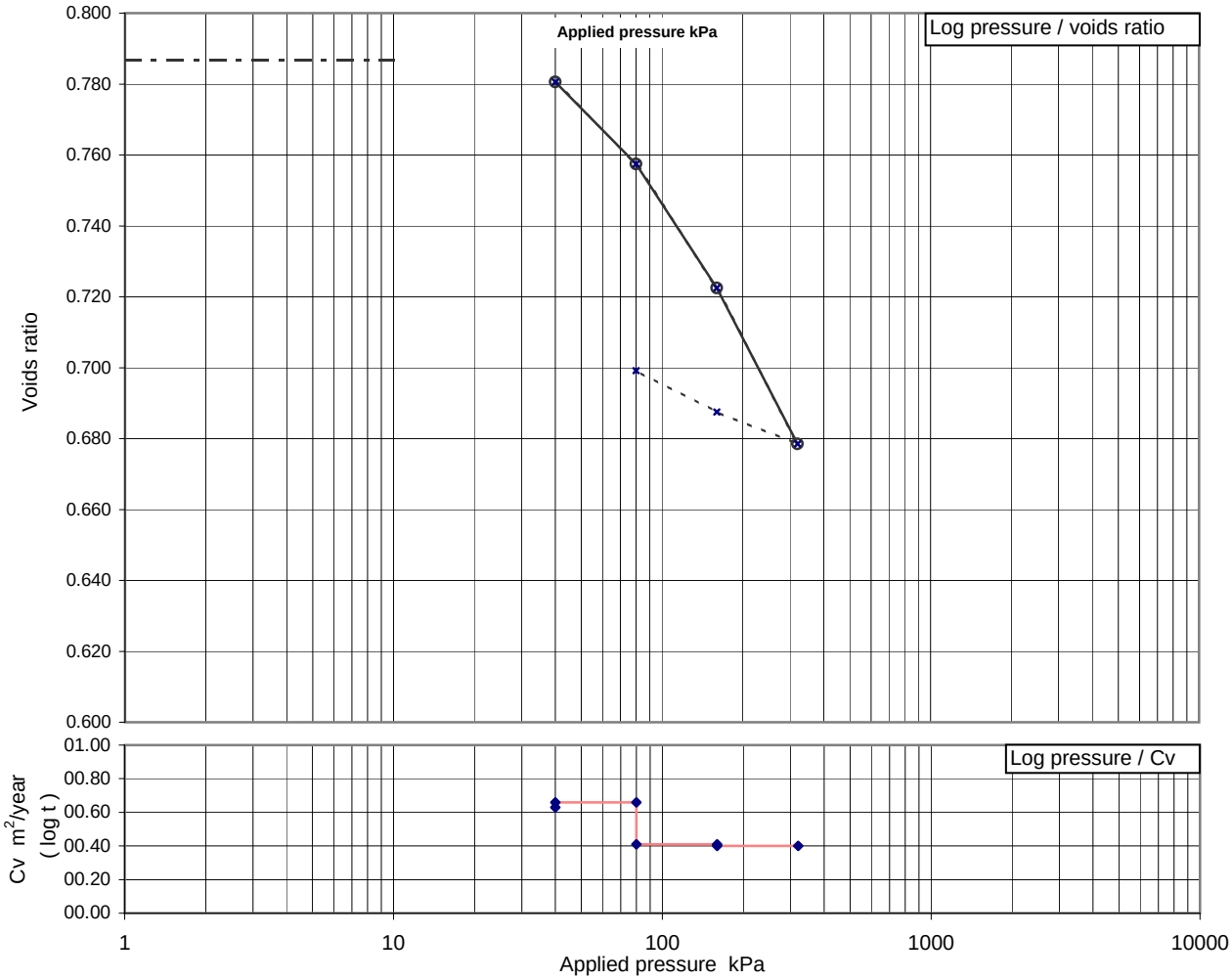
Notes :

Specimen taken 10 mm from base of sample

Applied Pressure kPa	Voids ratio	M_v m²/MN	C_v ($t_{50, log}$) m²/year	C_v ($t_{90, root}$) m²/year	
0	0.4538				
100	0.4198	0.234	23	26	
200	0.4010	0.132	2.7	2.8	
400	0.3792	0.078	2.2	2.4	
800	0.3511	0.051	2.1	2.2	
400	0.3547	0.007	-	-	
200	0.3609	0.023	-	-	

ONE DIMENSIONAL CONSOLIDATION TEST
BS 1377 : Part 5 : 1990 : clause 3

Project No	F4036-14	Sample Details:	Hole No	BH26		
Project Name	Frodsham Wind Farm		Depth (m BGL)	1.20		
			Samp No	2	Type	U
			ID	ESGF4036-14201409160000001039		
			Spec Ref			



Soil description: Firm brown mottled grey CLAY.

Preparation: Undisturbed

Index properties (if available): Liquid limit % | Plastic limit %

Specimen details	Initial	Final	
Particle density	2.65	assumed	Mg/m^3
Diameter	74.97		mm
Height	18.96	18.03	mm
Voids ratio	0.787	0.699	
Moisture content	27	26	%
Bulk density	1.89	1.97	Mg/m^3
Dry density	1.48	1.56	Mg/m^3
Saturation	91	100	%
Average temperature for test	21		°C

Swelling pressure: >20 kPa

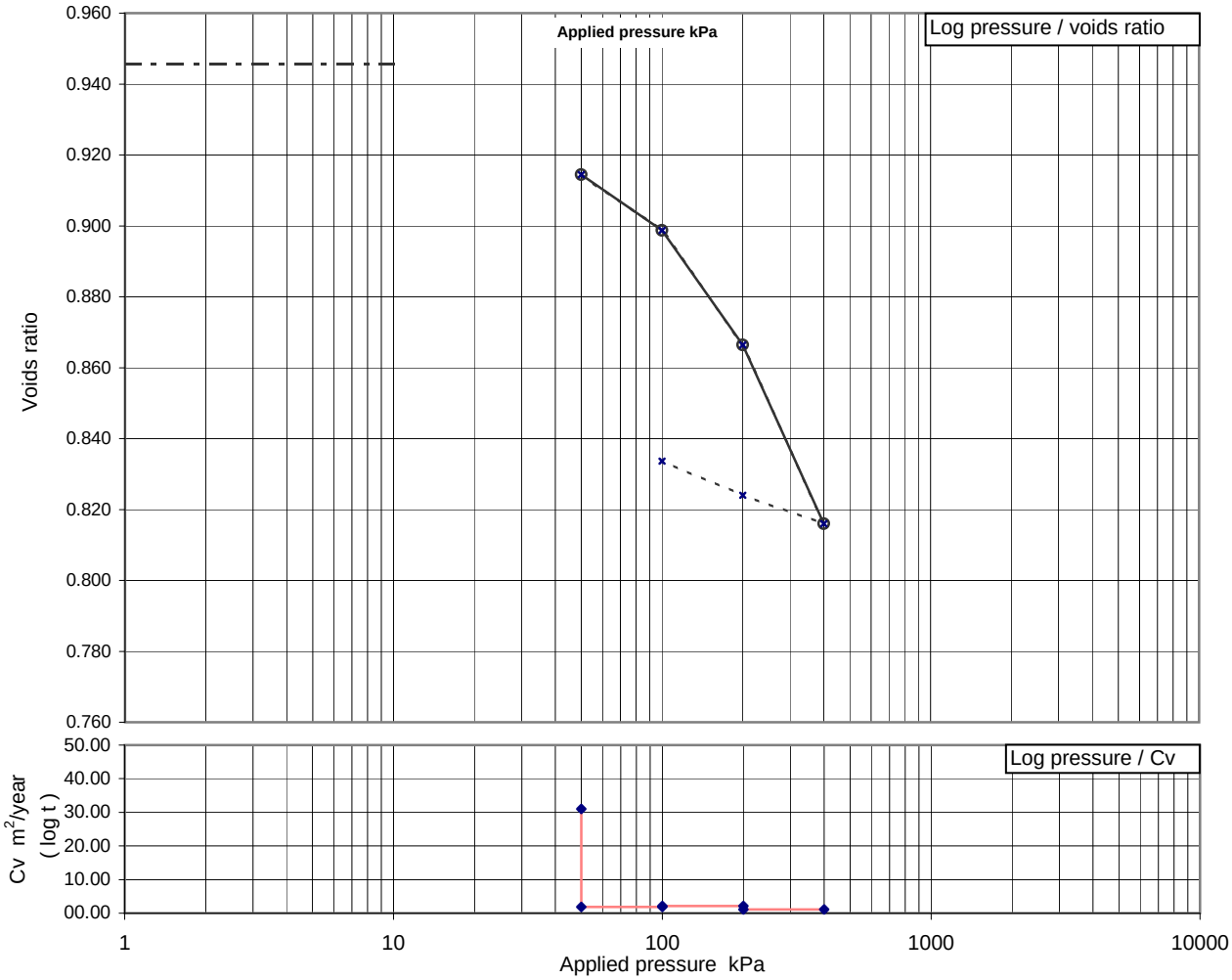
Notes :

Specimen taken 100 mm from base of sample

Applied Pressure kPa	Voids ratio	M_v m^2/MN	C_v ($t_{50, log}$) m^2/year	C_v ($t_{90, root}$) m^2/year	
20	0.7868				
40	0.7806	0.174	0.63	0.61	
80	0.7574	0.326	0.66	0.57	
160	0.7225	0.249	0.41	0.45	
320	0.6785	0.159	0.4	0.44	
160	0.6875	0.033	-	-	
80	0.6992	0.087	-	-	

ONE DIMENSIONAL CONSOLIDATION TEST
BS 1377 : Part 5 : 1990 : clause 3

Project No	F4036-14	Sample Details:	Hole No	BH27		
Project Name	Frodsham Wind Farm		Depth (m BGL)	7.00		
			Samp No	20	Type	U
			ID	ESGF4036-14201409170000001263		
			Spec Ref			



Soil description: Firm grey slightly sandy CLAY.

Preparation: Undisturbed

Index properties (if available): Liquid limit % | Plastic limit %

Specimen details	Initial	Final	
Particle density	2.65	assumed	Mg/m³
Diameter	74.91		mm
Height	18.98	17.88	mm
Voids ratio	0.946	0.834	
Moisture content	33	31	%
Bulk density	1.81	1.90	Mg/m³
Dry density	1.36	1.45	Mg/m³
Saturation	92	99	%
Average temperature for test	20		°C

Swelling pressure: not measured kPa

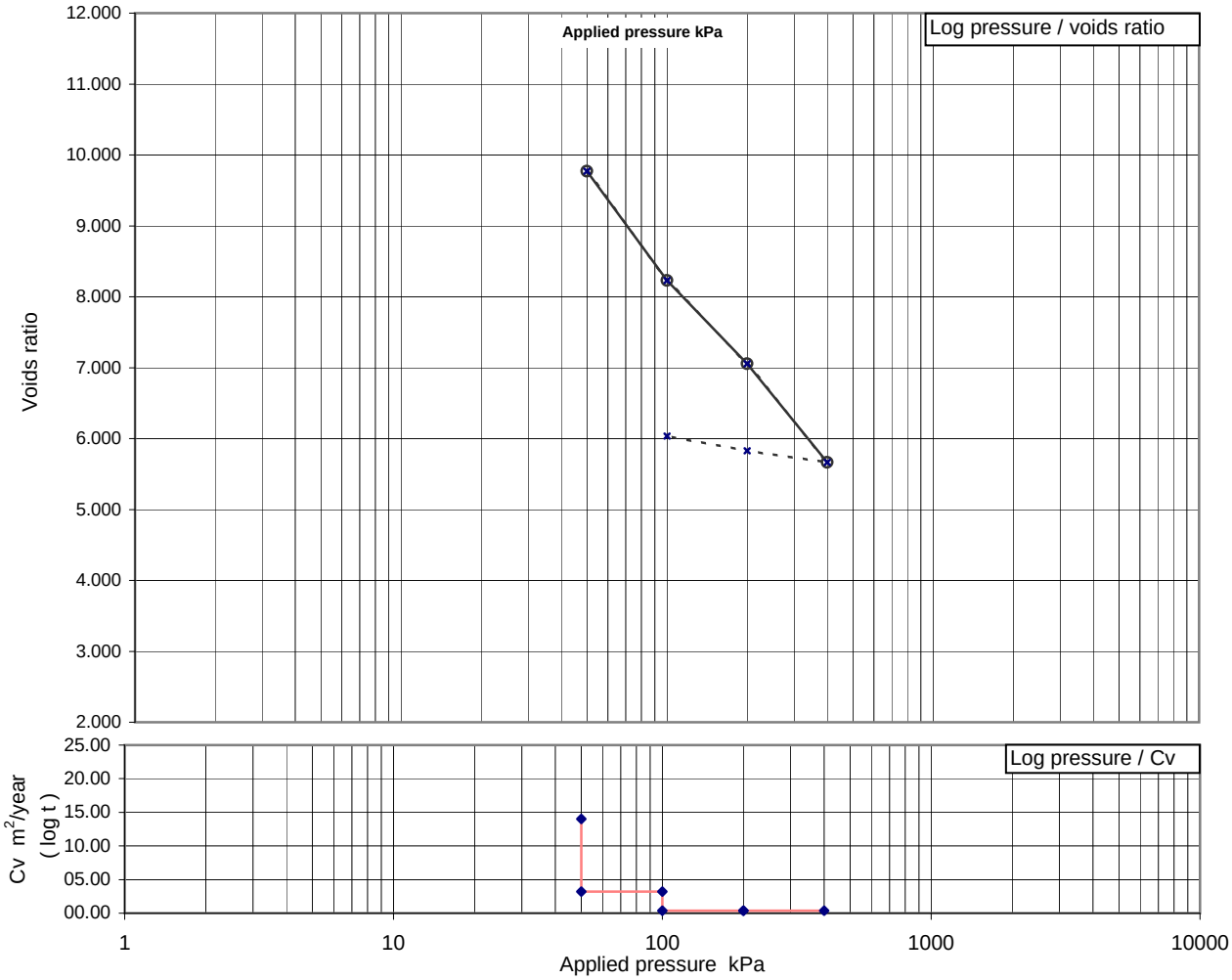
Notes :

Specimen taken 10 mm from base of sample

Applied Pressure kPa	Voids ratio	M_v m²/MN	C_v ($t_{50, log}$) m²/year	C_v ($t_{90, root}$) m²/year	
0	0.9456				
50	0.9144	0.320	31	33	
100	0.8987	0.164	1.9	2	
200	0.8664	0.170	2.1	2.3	
400	0.8160	0.135	1.1	1.1	
200	0.8240	0.022	-	-	
100	0.8336	0.053	-	-	

ONE DIMENSIONAL CONSOLIDATION TEST
BS 1377 : Part 5 : 1990 : clause 3

Project No	F4036-14	Sample Details:	Hole No	BH28		
Project Name	Frodsham Wind Farm		Depth (m BGL)	7.80		
			Samp No	9	Type	U
			ID	ESGF4036-14201409250000001733		
			Spec Ref			



Soil description	Brownish black psuedo fibrous PEAT.
Preparation	Undisturbed
Index properties (if available)	Liquid limit % [ ] Plastic limit % [ ]

Specimen details	Initial	Final	
Particle density	2.65	assumed	Mg/m^3
Diameter	74.93		mm
Height	18.99	9.65	mm
Voids ratio	12.840	6.035	
Moisture content	441	128	%
Bulk density	1.04	0.86	Mg/m^3
Dry density	0.19	0.38	Mg/m^3
Saturation	91	56	%
Average temperature for test	20		°C

Swelling pressure: not measured kPa

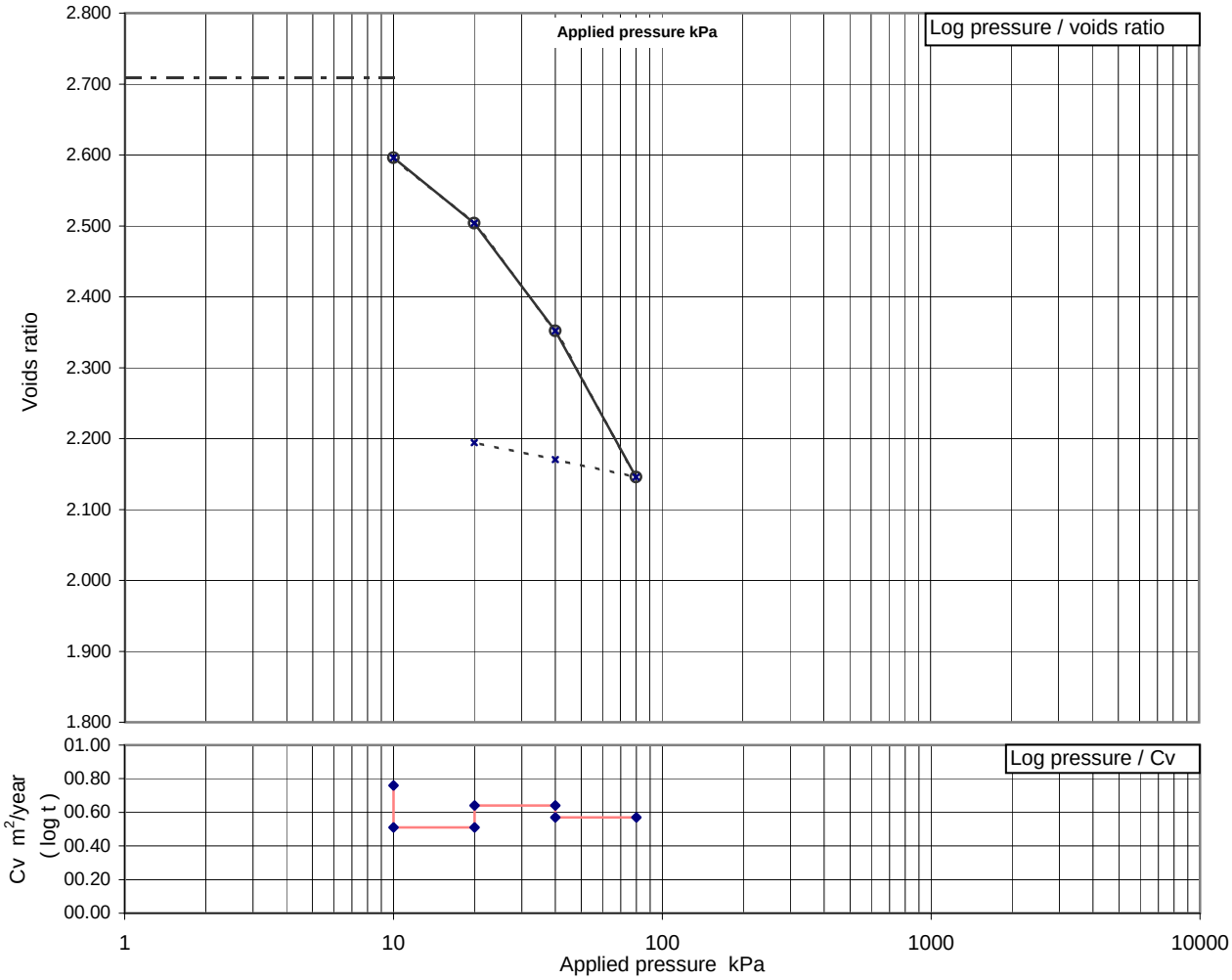
Notes :

Specimen taken 70 mm from base of sample

Applied Pressure kPa	Voids ratio	M_v m^2/MN	C_v ($t_{50, log}$) m^2/year	C_v ($t_{90, root}$) m^2/year	
0	12.8396				
50	9.7721	4.433	14	15	
100	8.2274	2.868	3.2	3.4	
200	7.0567	1.269	0.36	0.38	
400	5.6665	0.863	0.37	0.39	
200	5.8298	0.122	-	-	
100	6.0346	0.300	-	-	

ONE DIMENSIONAL CONSOLIDATION TEST
BS 1377 : Part 5 : 1990 : clause 3

Project No	F4036-14	Sample Details:	Hole No	BH29		
Project Name	Frodsham Wind Farm		Depth (m BGL)	1.20		
			Samp No	3	Type	U
			ID	ESGF4036-14201409250000001772		
			Spec Ref			



Soil description: Soft black silty CLAY.

Preparation: Undisturbed

Index properties (if available): Liquid limit % | Plastic limit %

Specimen details	Initial	Final	
Particle density	2.65	assumed	Mg/m³
Diameter	74.93		mm
Height	18.93	16.30	mm
Voids ratio	2.709	2.194	
Moisture content	88	79	%
Bulk density	1.34	1.49	Mg/m³
Dry density	0.71	0.83	Mg/m³
Saturation	86	96	%
Average temperature for test	20		°C

Swelling pressure: not measured kPa

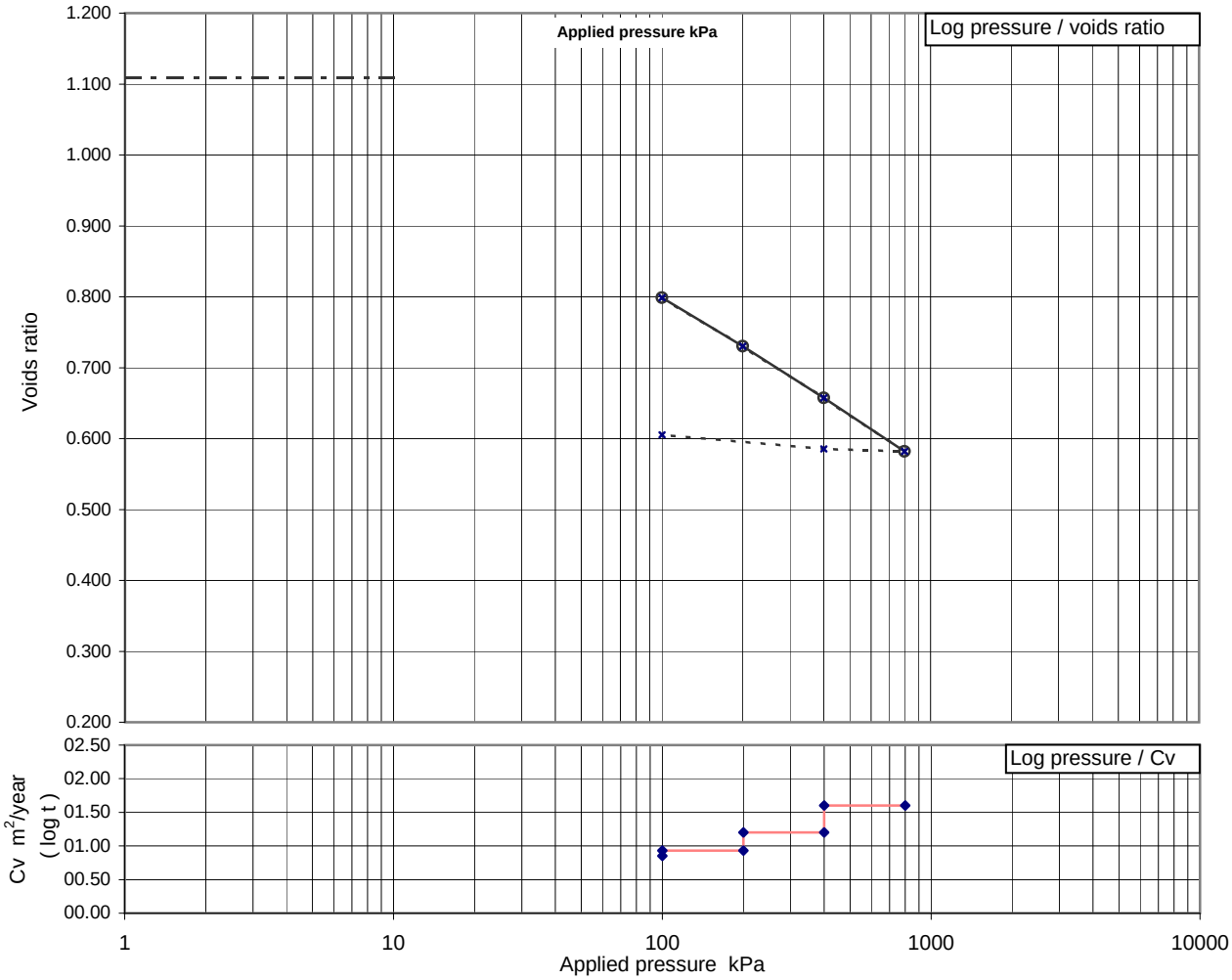
Notes :

Specimen taken 40 mm from base of sample

Applied Pressure kPa	Voids ratio	M_v m²/MN	C_v ($t_{50, log}$) m²/year	C_v ($t_{90, root}$) m²/year	
0	2.7087				
10	2.5962	3.033	0.76	0.81	
20	2.5037	2.572	0.51	0.55	
40	2.3518	2.167	0.64	0.68	
80	2.1459	1.536	0.57	0.61	
40	2.1704	0.195	-	-	
20	2.1943	0.377	-	-	

ONE DIMENSIONAL CONSOLIDATION TEST
BS 1377 : Part 5 : 1990 : clause 3

Project No	F4036-14	Sample Details:	Hole No	BH29		
Project Name	Frodsham Wind Farm		Depth (m BGL)	16.50		
			Samp No	28	Type	U
			ID	ESGF4036-14201409250000001798		
			Spec Ref			



Soil description: Soft grey slightly sandy slightly gravelly CLAY.

Preparation: Undisturbed

Index properties (if available): Liquid limit % | Plastic limit %

Specimen details	Initial	Final	
Particle density	2.65	assumed	Mg/m³
Diameter	75.09		mm
Height	20.12	15.32	mm
Voids ratio	1.109	0.605	
Moisture content	41	24	%
Bulk density	1.77	2.04	Mg/m³
Dry density	1.26	1.65	Mg/m³
Saturation	97	103	%
Average temperature for test	21		°C

Swelling pressure: not measured kPa

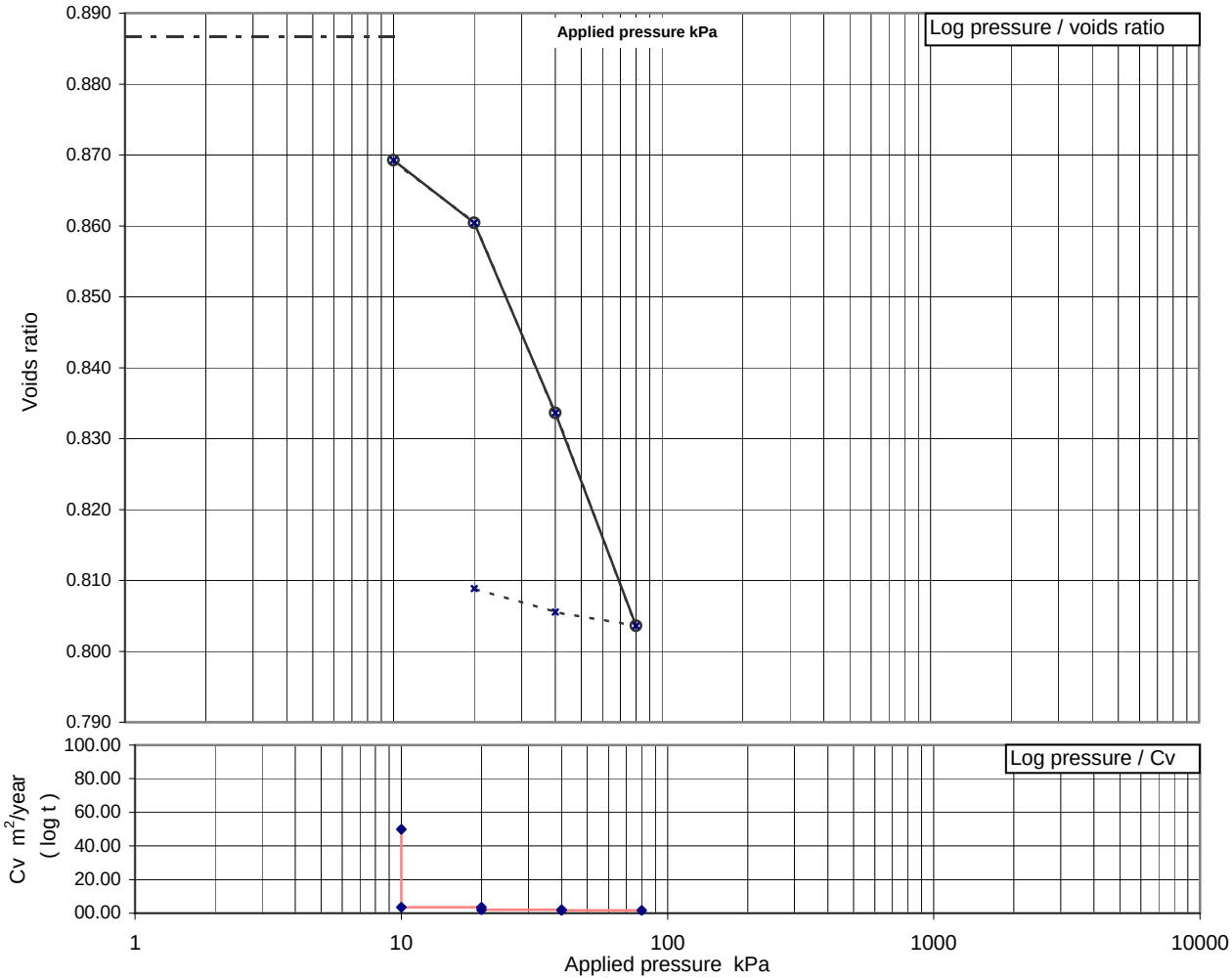
Notes : Loading error on stage 6. Unloaded to 100kPa instead of 200kPa.

Specimen taken 400 mm from base of sample

Applied Pressure kPa	Voids ratio	M_v m²/MN	C_v ($t_{50, log}$) m²/year	C_v ($t_{90, root}$) m²/year	
0	1.1087				
100	0.7988	1.470	0.85	0.91	
200	0.7304	0.380	0.93	1	
400	0.6573	0.211	1.2	1.3	
800	0.5818	0.114	1.6	2.3	
400	0.5856	0.006	-	-	
100	0.6054	0.042	-	-	

ONE DIMENSIONAL CONSOLIDATION TEST
BS 1377 : Part 5 : 1990 : clause 3

Project No	F4036-14	Sample Details:	Hole No	BH31		
Project Name	Frodsham Wind Farm		Depth (m BGL)	1.20		
			Samp No	2	Type	U
			ID	ESGF4036-14201409260000001885		
			Spec Ref			



Soil description: Firm grey slightly gravelly CLAY.

Preparation: Undisturbed

Index properties (if available): Liquid limit % | Plastic limit %

Specimen details	Initial	Final	
Particle density	2.65	assumed	Mg/m³
Diameter	75.04		mm
Height	20.02	19.20	mm
Voids ratio	0.887	0.809	
Moisture content	30	29	%
Bulk density	1.82	1.90	Mg/m³
Dry density	1.40	1.47	Mg/m³
Saturation	89	96	%
Average temperature for test	21		°C

Swelling pressure: not measured kPa

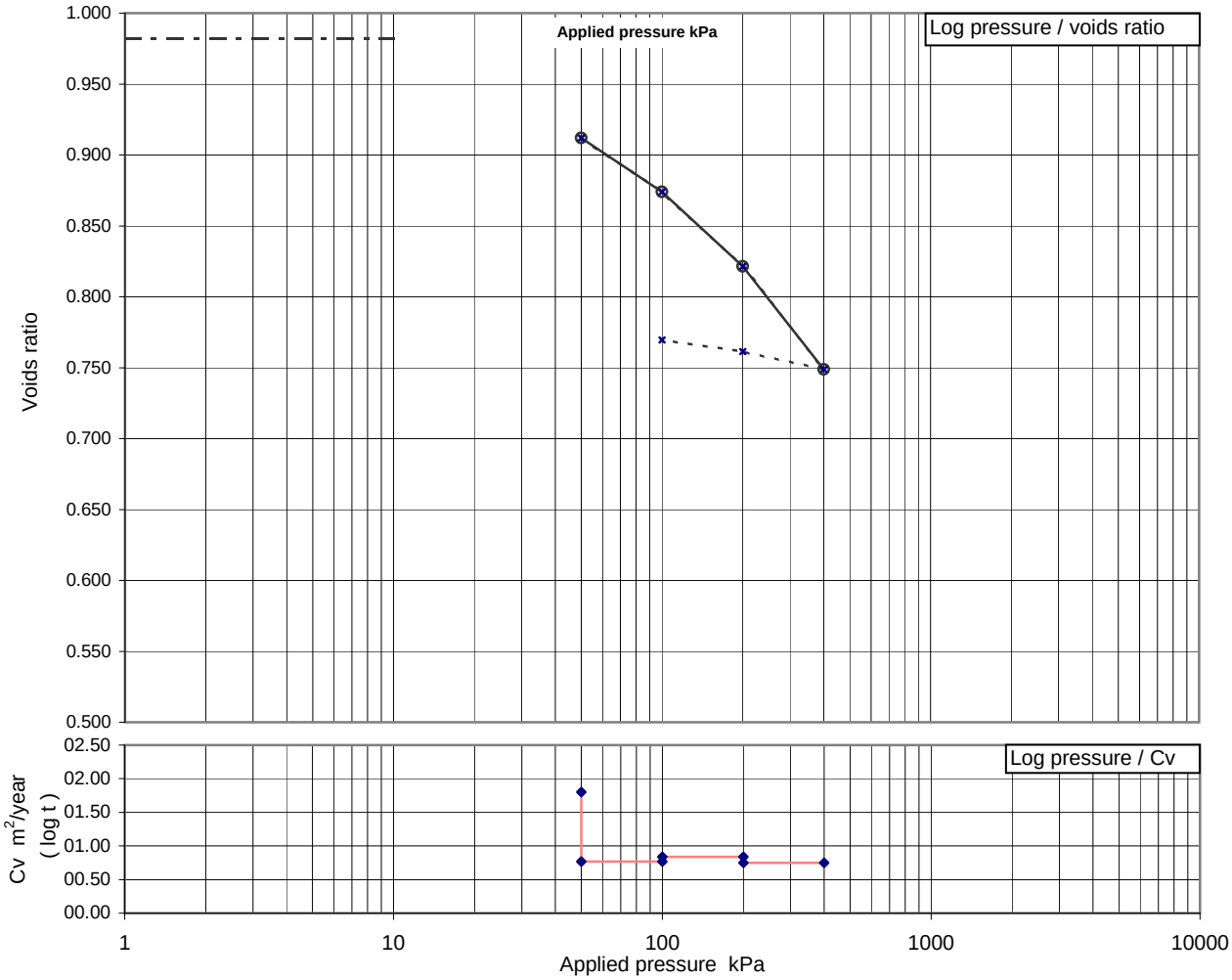
Notes :

Specimen taken 10 mm from base of sample

Applied Pressure kPa	Voids ratio	M_v m²/MN	C_v ($t_{50, log}$) m²/year	C_v ($t_{90, root}$) m²/year	
0	0.8867				
10	0.8693	0.924	50	54	
20	0.8604	0.474	3.5	3.8	
40	0.8336	0.719	2.1	2.3	
80	0.8036	0.410	1.7	1.9	
40	0.8056	0.027	-	-	
20	0.8089	0.091	-	-	

ONE DIMENSIONAL CONSOLIDATION TEST
BS 1377 : Part 5 : 1990 : clause 3

Project No	F4036-14	Sample Details:	Hole No	BH31		
Project Name	Frodsham Wind Farm		Depth (m BGL)	7.50		
			Samp No	14	Type	U
			ID	ESGF4036-14201409260000001897		
			Spec Ref			



Soil description: Firm grey mottled brown CLAY.

Preparation: Undisturbed

Index properties (if available): Liquid limit % | Plastic limit %

Specimen details	Initial	Final	
Particle density	2.65	assumed	Mg/m³
Diameter	75.03		mm
Height	20.21	18.04	mm
Voids ratio	0.982	0.769	
Moisture content	36	30	%
Bulk density	1.82	1.95	Mg/m³
Dry density	1.34	1.50	Mg/m³
Saturation	98	105	%
Average temperature for test	21		°C

Swelling pressure: not measured kPa

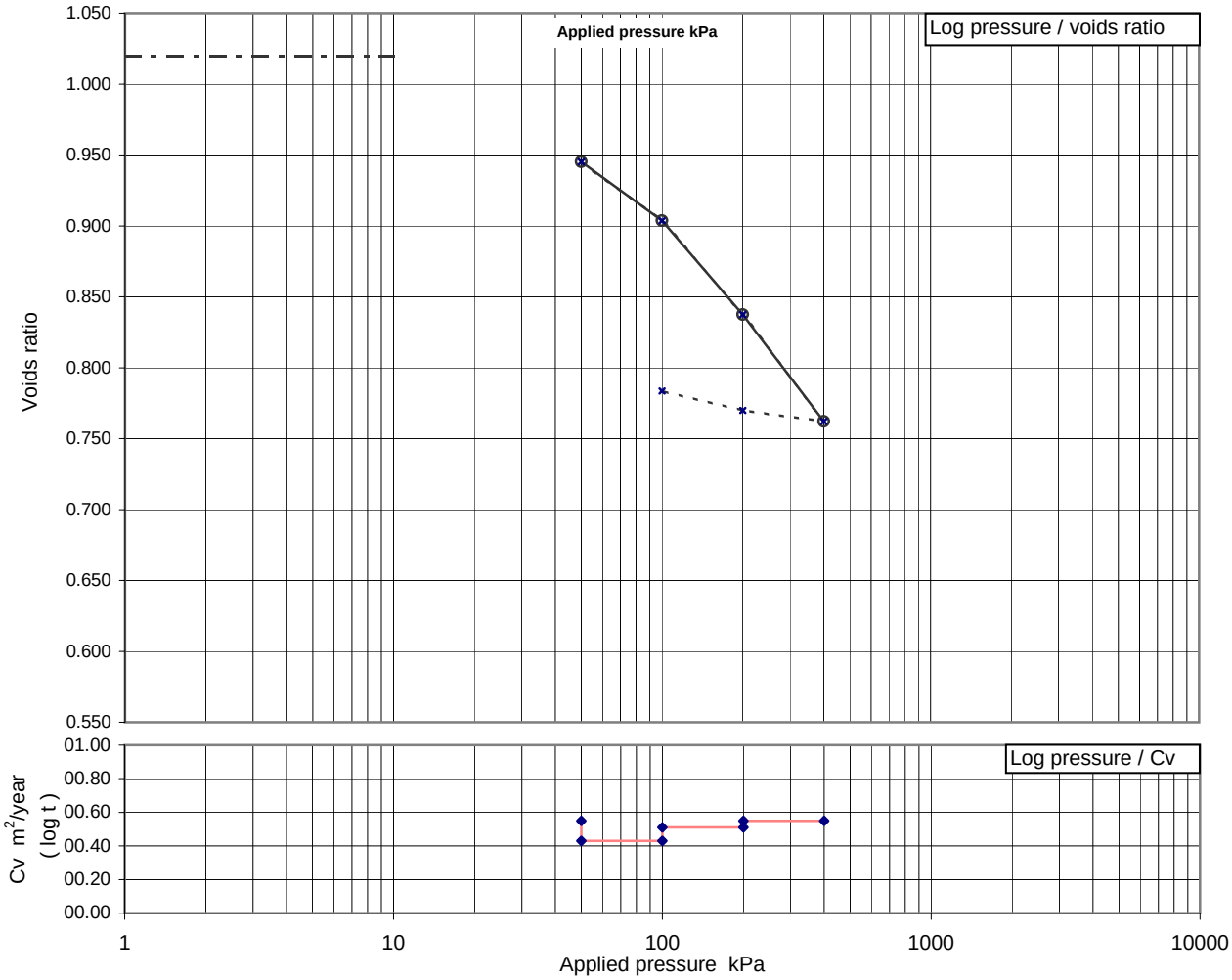
Notes :

Specimen taken 10 mm from base of sample

Applied Pressure kPa	Voids ratio	M_v m²/MN	C_v ($t_{50, log}$) m²/year	C_v ($t_{90, root}$) m²/year	
0	0.9819				
50	0.9118	0.707	1.8	2.1	
100	0.8740	0.396	0.77	0.82	
200	0.8215	0.280	0.84	0.9	
400	0.7487	0.200	0.75	0.79	
200	0.7613	0.036	-	-	
100	0.7694	0.046	-	-	

ONE DIMENSIONAL CONSOLIDATION TEST
BS 1377 : Part 5 : 1990 : clause 3

Project No	F4036-14	Sample Details:	Hole No	BH32		
Project Name	Frodsham Wind Farm		Depth (m BGL)	7.50		
			Samp No	16	Type	U
			ID	ESGF4036-14201409180000001322		
			Spec Ref			



Soil description	Soft grey CLAY with medium gravel sized pockets of fine sand.
Preparation	Undisturbed
Index properties (if available)	Liquid limit % [ ] Plastic limit % [ ]

Specimen details	Initial	Final	
Particle density	2.65	assumed	Mg/m^3
Diameter	74.94		mm
Height	18.95	16.73	mm
Voids ratio	1.020	0.783	
Moisture content	37	30	%
Bulk density	1.80	1.93	Mg/m^3
Dry density	1.31	1.49	Mg/m^3
Saturation	96	100	%
Average temperature for test	21		°C

Swelling pressure: not measured kPa

Notes :

Specimen taken 0 mm from base of sample

Applied Pressure kPa	Voids ratio	M_v m^2/MN	C_v ($t_{50, log}$) m^2/year	C_v ($t_{90, root}$) m^2/year	
0	1.0198				
50	0.9451	0.740	0.55	0.61	
100	0.9036	0.426	0.43	0.43	
200	0.8373	0.348	0.51	0.55	
400	0.7622	0.204	0.55	0.59	
200	0.7700	0.022	-	-	
100	0.7835	0.076	-	-	

TEST REPORT

1252

Report No. EFS/145807 (Ver. 1)

ESG Deeside
Unit 18
Geotechnical House
Deeside Industrial Estate
Deeside
Clwyd
CH5 2LR

Site: Frodsham Wind Farm

The 3 samples described in this report were registered for analysis by ESG on 18-Sep-2014. This report supersedes any versions previously issued by the laboratory.
The analysis was completed by: 30-Sep-2014

Tests where the accreditation is set to N or No, and any individual data items marked with a * are not UKAS accredited
Any opinions or interpretations expressed herein are outside the scope of any UKAS accreditation held by ESG.

The following tables are contained in this report:

Table 1 Main Analysis Results (Page 2)
Analytical and Deviating Sample Overview (Page 3)
Table of Method Descriptions (Page 4)
Table of Report Notes (Page 5)
Table of Sample Descriptions (Appendix A Page 1 of 1)

On behalf of
ESG :
Declan Burns Operations Director
Laboratory and Analytical Business

Date of Issue: 30-Sep-2014

Tests marked '^' have been subcontracted to another laboratory.
Where samples have been flagged as deviant on the Analytical and Deviating Sample Overview, for any reason, the data may not be representative of the sample at the point of sampling and the validity of the data may be affected.
ESG accepts no responsibility for any sampling not carried out by our personnel.

Where individual results are flagged see report notes for status.

Units :			mg/kg	mg/l	pH Units	%												
Method Codes :			ICPACIDS	ICPWSS	PHSOIL	TSBRE1												
Method Reporting Limits :			20	10		0.005												
UKAS Accredited :			Yes	Yes	Yes	No												
LAB ID Number CL/	**Client Sample Description**	**Sample Date**	**SO4-- (acid sol)**	**SO4-- (H2O sol) mg/l**	**pH units (AR)**	**Total Sulphur.**												
1425244	BH07 B 6 3.00	**22-Aug-14**	4260	936	8.0	0.657												
1425245	BH08 B 7 3.00	**19-Aug-14**	4360	930	7.9	0.643												
1425246	BH09 B 1 0.50	**19-Aug-14**	1670	321	7.9	0.155												

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Client Name ESG Deeside

Contact Mr A Bird

Frodsham Wind Farm

Sample Analysis

Date Printed	**30-Sep-2014**
Report Number	**EFS/145807**
Table Number	**1**

Analytical and Deviating Sample Overview

Customer ESG Deeside
Site Frodsham Wind Farm
Report No S145807

Consignment No S43665
Date Logged 18-Sep-2014

Report Due 01-Oct-2014

ID Number	Description	MethodID	CustServ	Dep.Opt			ICPACIDS	ICPBRE	ICPWSS	KONECL	KoneNO3	PHSOIL	TSBRE1
		Sampled	Report B	DO Cl if pH<5.5	DO Mg if SO4(W)>3000	DO NO3 if pH<5.5	SO4-- (acid sol)	Magnesium (BRE)	SO4-- (H2O sol) mg/l	Chloride:(2:1)	Nitrate (BRE 2:1): mg/l	pH units (AR)	Total Sulphur.
							✓		✓			✓	
CL/1425244	BH07 3.0-3.45	22/08/14							E			E	
CL/1425245	BH08 3.0-3.45	19/08/14							E			E	
CL/1425246	BH09 0.5-1.0	19/08/14							E			E	

Note: For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.

Deviating Sample Key	
A	The sample was received in an inappropriate container for this analysis
B	The sample was received without the correct preservation for this analysis
C	Headspace present in the sample container
D	The sampling date was not supplied so holding time may be compromised - applicable to all analysis
E	Sample processing did not commence within the appropriate holding time
F	Sample processing did not commence within the appropriate handling time

Requested Analysis Key	
	Analysis Required
	Analysis dependant upon trigger result - **Note: due date may be affected if triggered**
	No analysis scheduled
^	Analysis Subcontracted - **Note: due date may vary**

The integrity of data for samples/analysis that have been categorised as Deviating may be compromised. Data may not be representative of the sample at the time of sampling.

Where individual results are flagged see report notes for status.

Method Descriptions

Matrix	MethodID	Analysis Basis	Method Description
Soil	ICPACIDS	Oven Dried @ < 35℃	Determination of Total Sulphate in soil samples by Hydrochloric Acid extraction followed by ICPOES detection
Soil	ICPWSS	Oven Dried @ < 35℃	Determination of Water Soluble Sulphate in soil samples by water extraction followed by ICPOES detection
Soil	PHSOIL	As Received	Determination of pH of 2.5:1 deionised water to soil extracts using pH probe.
Soil	TSBRE1	Oven Dried @ < 35℃	Determination of Total Carbon and/or Total Sulphur in solid samples by high temperature combustion/infrared detection

Report Notes

Generic Notes

Soil/Solid Analysis

Unless stated otherwise,
- Results expressed as mg/kg have been calculated on the basis indicated in the Method Description table.
  All results on MCERTS reports are reported on a 105ºC dry weight basis with the exception of pH and conductivity.
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

Waters Analysis

Unless stated otherwise results are expressed as mg/l

Nil: Where "Nil" has been entered against Total Alkalinity or Total Acidity this indicates that a measurement was not required due to the inherent pH of the sample.

Oil analysis specific

Unless stated otherwise,
- Results are expressed as mg/kg
- SG is expressed as g/cm^3@ 15^{o}C

Gas (Tedlar bag) Analysis

Unless stated otherwise, results are expressed as ug/l

Asbestos Analysis

CH Denotes Chrysotile **TR** Denotes Tremolite
CR Denotes Crocidolite **AC** Denotes Actinolite
AM Denotes Amosite **AN** Denotes Anthophylite
NAIIS No Asbestos Identified in Sample
NADIS No Asbestos Detected In Sample

Symbol Reference

^ Sub-contracted analysis.
$$ Unable to analyse due to the nature of the sample
¶ Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols. This may have resulted in deterioration of the sample(s) during transit to the laboratory. Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling
¥ Results for guidance only due to possible interference
& Blank corrected result
I.S Insufficient sample to complete requested analysis
I.S(g) Insufficient sample to re-analyse, results for guidance only
Intf Unable to analyse due to interferences
N.D Not determined **N.Det** Not detected
N.F No Flow
NS Information Not Supplied
Req Analysis requested, see attached sheets for results
Þ Raised detection limit due to nature of the sample
***** All accreditation has been removed by the laboratory for this result
‡ MCERTS accreditation has been removed for this result
§ accreditation has been removed for this result as it is a non-accredited matrix

Note: The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

Sample Descriptions

Client : ESG Deeside

Site : Frodsham Wind Farm

Report Number : S14_5807

Note: major constituent in upper case

Lab ID Number	Client ID	Description
CL/1425244	BH07 B 6 3.00	CLAY
CL/1425245	BH08 B 7 3.00	CLAY
CL/1425246	BH09 B 1 0.50	SILT

TEST REPORT

1252

Report No. EFS/146100 (Ver. 3)

ESG Deeside
Unit 18
Geotechnical House
Deeside Industrial Estate
Deeside
Clwyd
CH5 2LR

Site: Frodsham Wind Farm

The 3 samples described in this report were registered for analysis by ESG on 03-Oct-2014. This report supersedes any versions previously issued by the laboratory.
The analysis was completed by: 24-Oct-2014

Tests where the accreditation is set to N or No, and any individual data items marked with a * are not UKAS accredited
Any opinions or interpretations expressed herein are outside the scope of any UKAS accreditation held by ESG.

The following tables are contained in this report:

Table 1 Main Analysis Results (Page 2)
Analytical and Deviating Sample Overview (Page 3)
Table of Method Descriptions (Page 4)
Table of Report Notes (Page 5)
Table of Sample Descriptions (Appendix A Page 1 of 1)

On behalf of
ESG :
Declan Burns

[redacted]

Operations Director
Laboratory and Analytical Business

Date of Issue: 24-Oct-2014

Tests marked '^' have been subcontracted to another laboratory.
Where samples have been flagged as deviant on the Analytical and Deviating Sample Overview, for any reason, the data may not be representative of the sample at the point of sampling and the validity of the data may be affected. ESG accepts no responsibility for any sampling not carried out by our personnel.

Where individual results are flagged see report notes for status.

Units :			mg/kg	mg/l	pH Units	%												
Method Codes :			ICPACIDS	ICPWSS	PHSOIL	TSBRE1												
Method Reporting Limits :			20	10		0.005												
UKAS Accredited :			Yes	Yes	Yes	No												
LAB ID Number CL/	**Client Sample Description**	**Sample Date**	**SO4-- (acid sol)**	**SO4-- (H2O sol) mg/l**	**pH units (AR)**	**Total Sulphur.**												
1426488	BH05 B 29 12.00	04-Sep-14	2680	1040	7.7	2.21												
1426489	BH11 B 6 2.00	04-Sep-14	1080	373	8.4	1.07												
1426490	BH32 B 6 2.00	11-Sep-14	1040	410	8.3	0.162												

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Fax +44 (0) 1283 554422

Client Name ESG Deeside

Contact Mr A Bird

Frodsham Wind Farm

Sample Analysis

Date Printed	**24-Oct-2014**
Report Number	**EFS/146100**
Table Number	**1**

Analytical and Deviating Sample Overview

Customer ESG Deeside
Site Frodsham Wind Farm
Report No S146100

Consignment No S43928
Date Logged 03-Oct-2014

Report Due 14-Oct-2014

ID Number	Description	Sampled	MethodID	CustServ	Dep.Opt			ICPAQIDS	ICPBRE	ICPWSS	KONECL	KoneNO3	PHSOIL	TSBRE1
				Report B	DO Cl if pH<5.5	DO Mg if SO4(W)>3000	DO NO3 if pH<5.5	SO4-- (acid sol)	Magnesium (BRE)	SO4-- (H2O sol) mg/l	Chloride:(2:1)	Nitrate (BRE 2:1): mg/l	pH units (AR)	Total Sulphur.
								✓		✓			✓	
CL/1426488	BH05	04/09/14								E			E	
CL/1426489	BH11	04/09/14								E			E	
CL/1426490	BH32	11/09/14											E	

Note: For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.

Deviating Sample Key	
A	The sample was received in an inappropriate container for this analysis
B	The sample was received without the correct preservation for this analysis
C	Headspace present in the sample container
D	The sampling date was not supplied so holding time may be compromised - applicable to all analysis
E	Sample processing did not commence within the appropriate holding time

Requested Analysis Key	
	Analysis Required
	Analysis dependant upon trigger result - **Note: due date may be affected if triggered**
	No analysis scheduled
^	Analysis Subcontracted - **Note: due date may vary**

The integrity of data for samples/analysis that have been categorised as Deviating may be compromised. Data may not be representative of the sample at the time of sampling.
Where individual results are flagged see report notes for status

Method Descriptions

Matrix	MethodID	Analysis Basis	Method Description
Soil	ICPACIDS	Oven Dried @ < 35℃	Determination of Total Sulphate in soil samples by Hydrochloric Acid extraction followed by ICPOES detection
Soil	ICPWSS	Oven Dried @ < 35℃	Determination of Water Soluble Sulphate in soil samples by water extraction followed by ICPOES detection
Soil	PHSOIL	As Received	Determination of pH of 2.5:1 deionised water to soil extracts using pH probe.
Soil	TSBRE1	Oven Dried @ < 35℃	Determination of Total Carbon and/or Total Sulphur in solid samples by high temperature combustion/infrared detection

Report Notes

Generic Notes

Soil/Solid Analysis

Unless stated otherwise,
- Results expressed as mg/kg have been calculated on the basis indicated in the Method Description table.
  All results on MCERTS reports are reported on a 105ºC dry weight basis with the exception of pH and conductivity.
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

Waters Analysis

Unless stated otherwise results are expressed as mg/l

Nil: Where "Nil" has been entered against Total Alkalinity or Total Acidity this indicates that a measurement was not required due to the inherent pH of the sample.

Oil analysis specific

Unless stated otherwise,
- Results are expressed as mg/kg
- SG is expressed as g/cm^3@ 15^{o}C

Gas (Tedlar bag) Analysis

Unless stated otherwise, results are expressed as ug/l

Asbestos Analysis

CH Denotes Chrysotile **TR** Denotes Tremolite
CR Denotes Crocidolite **AC** Denotes Actinolite
AM Denotes Amosite **AN** Denotes Anthophylite
NAIIS No Asbestos Identified in Sample
NADIS No Asbestos Detected In Sample

Symbol Reference

^ Sub-contracted analysis.
$$ Unable to analyse due to the nature of the sample
¶ Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols. This may have resulted in deterioration of the sample(s) during transit to the laboratory. Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling
¥ Results for guidance only due to possible interference
& Blank corrected result
I.S Insufficient sample to complete requested analysis
I.S(g) Insufficient sample to re-analyse, results for guidance only
Intf Unable to analyse due to interferences
N.D Not determined **N.Det** Not detected
N.F No Flow
NS Information Not Supplied
Req Analysis requested, see attached sheets for results
Þ Raised detection limit due to nature of the sample
***** All accreditation has been removed by the laboratory for this result
‡ MCERTS accreditation has been removed for this result
§ accreditation has been removed for this result as it is a non-accredited matrix

Note: The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

Sample Descriptions

Client : ESG Deeside

Site : Frodsham Wind Farm

Report Number : S14_6100

Note: major constituent in upper case

Lab ID Number	Client ID	Description
CL/1426488	BH05 B 29 12.00	CLAY
CL/1426489	BH11 B 6 2.00	CLAY
CL/1426490	BH32 B 6 2.00	CLAY

TEST REPORT

1252

Report No. EFS/146516 (Ver. 1)

ESG Deeside
Unit 18
Geotechnical House
Deeside Industrial Estate
Deeside
Clwyd
CH5 2LR

Site: Frodsham Wind Farm

The 18 samples described in this report were registered for analysis by ESG on 20-Oct-2014. This report supersedes any versions previously issued by the laboratory.
The analysis was completed by: 31-Oct-2014

Tests where the accreditation is set to N or No, and any individual data items marked with a * are not UKAS accredited
Any opinions or interpretations expressed herein are outside the scope of any UKAS accreditation held by ESG.

The following tables are contained in this report:

Table 1 Main Analysis Results (Page 2)
Analytical and Deviating Sample Overview (Pages 3 to 4)
Table of Method Descriptions (Page 5)
Table of Report Notes (Page 6)
Table of Sample Descriptions (Appendix A Page 1 of 1)

On behalf of ESG :
Declan Burns Operations Director
Laboratory and Analytical Business

Date of Issue: 31-Oct-2014

Tests marked '^' have been subcontracted to another laboratory.
Where samples have been flagged as deviant on the Analytical and Deviating Sample Overview, for any reason, the data may not be representative of the sample at the point of sampling and the validity of the data may be affected.
ESG accepts no responsibility for any sampling not carried out by our personnel.

Where individual results are flagged see report notes for status.

		Units :	mg/kg	mg/l	pH Units	%												
		Method Codes :	ICPACIDS	ICPWSS	PHSOIL	TSBRE1												
		Method Reporting Limits :	20	10		0.005												
		UKAS Accredited :	Yes	Yes	Yes	No												
LAB ID Number CL/	**Client Sample Description**	**Sample Date**	**SO4-- (acid sol)**	**SO4-- (H2O sol) mg/l**	**pH units (AR)**	**Total Sulphur.**												
1428286	BH01 B 4 2.00	**28-Aug-14**	5380	1850	7.6	0.658												
1428287	BH01 B 28 16.50	**28-Aug-14**	465	197	8.4	0.057												
1428288	BH01A B 10 24.50	**02-Sep-14**	183	45	8.7	0.044												
1428289	BH02 B 10 3.00	**28-Aug-14**	6060	1940	7.3	0.613												
1428290	BH02 B 26 10.00	**29-Aug-14**	2360	757	7.2	0.762												
1428291	BH03 B 8 3.00	**29-Aug-14**	3370	979	7.5	0.353												
1428292	BH03 B 31 14.50	**01-Sep-14**	604	244	8.1	0.335												
1428293	BH04 B 8 3.45	**03-Sep-14**	1410	445	7.8	0.240												
1428294	BH06 B 20 12.00	**20-Aug-14**	881	286	8.1	0.410												
1428295	BH14 B 9 3.00	**12-Sep-14**	3140	841	7.9	0.541												
1428296	BH15 B 5 2.00	**12-Sep-14**	1660	438	7.8	0.267												
1428297	BH15 B 37 18.00	**15-Sep-14**	1080	286	8.2	0.726												
1428298	BH10 D 2 1.20	**19-Aug-14**	4250	1330	7.7	0.329												
1428299	BH17 B 9 3.00	**23-Sep-14**	2900	646	8.0	0.478												
1428300	BH18 B 5 2.00	**22-Sep-14**	3170	534	7.8	0.536												
1428301	BH18 B 26 10.50	**23-Sep-14**	2800	1260	7.4	2.26												
1428302	BH20A B 2 16.50	**29-Sep-14**	306	100	8.7	0.060												
1428303	BH28 B 4 3.00	**15-Sep-14**	3080	694	7.8	0.570												

ESG Environmental Scientifics Group

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Client Name **ESG Deeside**

Contact Mr A Bird

Frodsham Wind Farm

Sample Analysis

Date Printed	**31-Oct-2014**
Report Number	**EFS/146516**
Table Number	**1**

Where individual results are flagged see report notes for status.

Analytical and Deviating Sample Overview

Customer ESG Deeside
Site Frodsham Wind Farm
Report No S146516

Consignment No S44330
Date Logged 20-Oct-2014
Report Due 31-Oct-2014

ID Number	Description	Sampled	MethodID	CustServ	Dep.Opt			ICPACIDS	ICPBRE	ICPWSS	KONECL	KoneNO3	PHSOIL	TSBRE1
				Report B	DO Cl if pH<5.5	DO Mg if SO4(W)>3000	DO NO3 if pH<5.5	SO4-- (acid sol)	Magnesium (BRE)	SO4-- (H2O sol) mg/l	Chloride:(2:1)	Nitrate (BRE 2:1): mg/l	pH units (AR)	Total Sulphur.
								✓		✓			✓	
CL/1428286	BH01 2.00	28/08/14								E			E	
CL/1428287	BH01 16.50	28/08/14								E			E	
CL/1428288	BH01A 24.50	02/09/14								E			E	
CL/1428289	BH02 3.00	28/08/14								E			E	
CL/1428290	BH02 10.00	29/08/14								E			E	
CL/1428291	BH03 3.00	29/08/14								E			E	
CL/1428292	BH03 14.50	01/09/14								E			E	
CL/1428293	BH04 3.45	03/09/14								E			E	
CL/1428294	BH06 12.00	20/08/14								E			E	
CL/1428295	BH14 3.00	12/09/14								E			E	
CL/1428296	BH15 2.00	12/09/14								E			E	
CL/1428297	BH15 18.00	15/09/14								E			E	
CL/1428298	BH10 1.20	19/08/14								E			E	
CL/1428299	BH17 3.00	23/09/14								E			E	
CL/1428300	BH18 2.00	22/09/14								E			E	

Note: For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.

Deviating Sample Key

A	The sample was received in an inappropriate container for this analysis
B	The sample was received without the correct preservation for this analysis
C	Headspace present in the sample container
D	The sampling date was not supplied so holding time may be compromised - applicable to all analysis
E	Sample processing did not commence within the appropriate holding time
F	Sample processing did not commence within the appropriate handling time

Requested Analysis Key

	Analysis Required
	Analysis dependant upon trigger result - **Note: due date may be affected if triggered**
	No analysis scheduled
^	Analysis Subcontracted - **Note: due date may vary**

Where individual results are flagged see report notes for status.

Analytical and Deviating Sample Overview

Customer ESG Deeside
Site Frodsham Wind Farm
Report No S146516

Consignment No S44330
Date Logged 20-Oct-2014
Report Due 31-Oct-2014

ID Number	Description	Sampled	MethodID	CustServ	Dep.Opt			ICPACIDS	ICPBRE	ICPWSS	KONECL	KoneNO3	PHSOIL	TSBRE1
				Report B	DO Cl if pH<5.5	DO Mg if SO4(W)>3000	DO NO3 if pH<5.5	SO4-- (acid sol)	Magnesium (BRE)	SO4-- (H2O sol) mg/l	Chloride:(2:1)	Nitrate (BRE 2:1): mg/l	pH units (AR)	Total Sulphur.
								✓		✓			✓	
CL/1428301	BH18 10.50	23/09/14								E			E	
CL/1428302	BH20A 16.50	29/09/14								E			E	
CL/1428303	BH28 3.00	15/09/14								E			E	

Note: For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.

Deviating Sample Key

A	The sample was received in an inappropriate container for this analysis
B	The sample was received without the correct preservation for this analysis
C	Headspace present in the sample container
D	The sampling date was not supplied so holding time may be compromised - applicable to all analysis
E	Sample processing did not commence within the appropriate holding time
F	Sample processing did not commence within the appropriate handling time

Requested Analysis Key

	Analysis Required
	Analysis dependant upon trigger result - **Note: due date may be affected if triggered**
	No analysis scheduled
^	Analysis Subcontracted - **Note: due date may vary**

Where individual results are flagged see report notes for status.

Method Descriptions

Matrix	MethodID	Analysis Basis	Method Description
Soil	ICPACIDS	Oven Dried @ < 35℃	Determination of Total Sulphate in soil samples by Hydrochloric Acid extraction followed by ICPOES detection
Soil	ICPWSS	Oven Dried @ < 35℃	Determination of Water Soluble Sulphate in soil samples by water extraction followed by ICPOES detection
Soil	PHSOIL	As Received	Determination of pH of 2.5:1 deionised water to soil extracts using pH probe.
Soil	TSBRE1	Oven Dried @ < 35℃	Determination of Total Carbon and/or Total Sulphur in solid samples by high temperature combustion/infrared detection

Report Notes

Generic Notes

Soil/Solid Analysis

Unless stated otherwise,
- Results expressed as mg/kg have been calculated on the basis indicated in the Method Description table.
  All results on MCERTS reports are reported on a 105ºC dry weight basis with the exception of pH and conductivity.
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

Waters Analysis

Unless stated otherwise results are expressed as mg/l

Nil: Where "Nil" has been entered against Total Alkalinity or Total Acidity this indicates that a measurement was not required due to the inherent pH of the sample.

Oil analysis specific

Unless stated otherwise,
- Results are expressed as mg/kg
- SG is expressed as g/cm^3@ 15^{o}C

Gas (Tedlar bag) Analysis

Unless stated otherwise, results are expressed as ug/l

Asbestos Analysis

CH Denotes Chrysotile **TR** Denotes Tremolite
CR Denotes Crocidolite **AC** Denotes Actinolite
AM Denotes Amosite **AN** Denotes Anthophylite
NAIIS No Asbestos Identified in Sample
NADIS No Asbestos Detected In Sample

Symbol Reference

^ Sub-contracted analysis.
$$ Unable to analyse due to the nature of the sample
¶ Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols. This may have resulted in deterioration of the sample(s) during transit to the laboratory. Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling
¥ Results for guidance only due to possible interference
& Blank corrected result
I.S Insufficient sample to complete requested analysis
I.S(g) Insufficient sample to re-analyse, results for guidance only
Intf Unable to analyse due to interferences
N.D Not determined **N.Det** Not detected
N.F No Flow
NS Information Not Supplied
Req Analysis requested, see attached sheets for results
Þ Raised detection limit due to nature of the sample
***** All accreditation has been removed by the laboratory for this result
‡ MCERTS accreditation has been removed for this result
§ accreditation has been removed for this result as it is a non-accredited matrix

Note: The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

Sample Descriptions

Client : ESG Deeside

Site : Frodsham Wind Farm

Report Number : S14_6516

Note: major constituent in upper case

Lab ID Number	Client ID	Description
CL/1428286	BH01 B 4 2.00	SILT
CL/1428287	BH01 B 28 16.50	SAND
CL/1428288	BH01A B 10 24.50	SAND
CL/1428289	BH02 B 10 3.00	SILT
CL/1428290	BH02 B 26 10.00	CLAY
CL/1428291	BH03 B 8 3.00	CLAY
CL/1428292	BH03 B 31 14.50	SAND
CL/1428293	BH04 B 8 3.45	SAND
CL/1428294	BH06 B 20 12.00	SAND
CL/1428295	BH14 B 9 3.00	CLAY
CL/1428296	BH15 B 5 2.00	SILT
CL/1428297	BH15 B 37 18.00	SAND
CL/1428298	BH10 D 2 1.20	SILT
CL/1428299	BH17 B 9 3.00	CLAY
CL/1428300	BH18 B 5 2.00	CLAY
CL/1428301	BH18 B 26 10.50	CLAY
CL/1428302	BH20A B 2 16.50	SAND
CL/1428303	BH28 B 4 3.00	CLAY

TEST REPORT

1252

Report No. EFS/146517 (Ver. 2)

ESG Deeside
Unit 18
Geotechnical House
Deeside Industrial Estate
Deeside
Clwyd
CH5 2LR

Site: Frodsham Wind Farm

The 5 samples described in this report were registered for analysis by ESG on 20-Oct-2014. This report supersedes any versions previously issued by the laboratory.
The analysis was completed by: 07-Nov-2014

Tests where the accreditation is set to N or No, and any individual data items marked with a * are not UKAS accredited
Any opinions or interpretations expressed herein are outside the scope of any UKAS accreditation held by ESG.

The following tables are contained in this report:

Table 1 Main Analysis Results (Page 2)
Analytical and Deviating Sample Overview (Page 3)
Table of Method Descriptions (Page 4)
Table of Report Notes (Page 5)
Table of Sample Descriptions (Appendix A Page 1 of 1)

On behalf of ESG : [redacted]
Declan Burns Operations Director
Laboratory and Analytical Business

Date of Issue: 07-Nov-2014

Tests marked '^' have been subcontracted to another laboratory.
Where samples have been flagged as deviant on the Analytical and Deviating Sample Overview, for any reason, the data may not be representative of the sample at the point of sampling and the validity of the data may be affected.
ESG accepts no responsibility for any sampling not carried out by our personnel.

Where individual results are flagged see report notes for status.

Units :			mg/kg	mg/l	pH Units	mg/l	mg/l	%										
Method Codes :			ICPACIDS	ICPWSS	PHSOIL	KONECL	KoneNO3	TSBRE1										
Method Reporting Limits :			20	10		1	0.2	0.005										
UKAS Accredited :			Yes	Yes	Yes	No	No	No										
LAB ID Number CL/	**Client Sample Description**	**Sample Date**	**SO4-- (acid sol)**	**SO4-- (H2O sol) mg/l**	**pH units (AR)**	**Chloride:(2:1)**	**Nitrate (BRE 2:1): mg/l**	**Total Sulphur.**										
1428304	BH21 5 BH 1.50	11-Sep-14	140	20	8.6			0.029										
1428305	BH24 16 BH 8.50	12-Sep-14	623	168	8.2			0.262										
1428306	BH25 2 BH 1.20	03-Sep-14	770	165	7.8			0.074										
1428307	BH26 5 BH 2.00	04-Sep-14	2100	758	5.0	146	0.4	0.307										
1428308	BHMM 6 BH 2.00	08-Sep-14	3550	1090	7.6			0.419										

ESG Environmental Scientifics Group
Bretby Business Park, Ashby Road
Burton-on-Trent, Staffordshire, DE15 0YZ
Tel +44 (0) 1283 554400
Fax +44 (0) 1283 554422

Client Name ESG Deeside

Contact Mr A Bird

Frodsham Wind Farm

Sample Analysis

Date Printed	**07-Nov-2014**
Report Number	**EFS/146517**
Table Number	**1**

Analytical and Deviating Sample Overview

Customer ESG Deeside
Site Frodsham Wind Farm
Report No S146517

Consignment No S44330
Date Logged 20-Oct-2014

Report Due 07-Nov-2014

ID Number	Description	MethodID	CustServ	Dep.Opt			ICPACIDS	ICPBRE	ICPWSS	KONECL	KoneNO3	PHSOIL	TSBRE1
		Sampled	Report B	DO Cl if pH<5.5	DO Mg if SO4(W)>3000	DO NO3 if pH<5.5	SO4-- (acid sol)	Magnesium (BRE)	SO4-- (H2O sol) mg/l	Chloride:(2:1)	Nitrate (BRE 2:1): mg/l	pH units (AR)	Total Sulphur.
Test Method Accredited to ISO17025							✓		✓			✓	
CL/1428304	BH21 1.50	11/09/14							E			E	
CL/1428305	BH24 8.50	12/09/14							E			E	
CL/1428306	BH25 1.20	03/09/14							E			E	
CL/1428307	BH26 2.00	04/09/14							E			E	
CL/1428308	BHMM 2.00	08/09/14							E			E	

Note: For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.

Deviating Sample Key

A	The sample was received in an inappropriate container for this analysis
B	The sample was received without the correct preservation for this analysis
C	Headspace present in the sample container
D	The sampling date was not supplied so holding time may be compromised - applicable to all analysis
E	Sample processing did not commence within the appropriate holding time
F	Sample processing did not commence within the appropriate handling time

Requested Analysis Key

	Analysis Required
	Analysis dependant upon trigger result - **Note: due date may be affected if triggered**
	No analysis scheduled
^	Analysis Subcontracted - **Note: due date may vary**

Where individual results are flagged see report notes for status.

Method Descriptions

Matrix	MethodID	Analysis Basis	Method Description
Soil	ICPACIDS	Oven Dried @ < 35℃	Determination of Total Sulphate in soil samples by Hydrochloric Acid extraction followed by ICPOES detection
Soil	ICPWSS	Oven Dried @ < 35℃	Determination of Water Soluble Sulphate in soil samples by water extraction followed by ICPOES detection
Soil	KONECL	Oven Dried @ < 35℃	Determination of Chloride in Soil using water extraction at the stated water:soil ratio, discrete colorimetric detection
Soil	KoneNO3	Oven Dried @ < 35℃	Determination of Nitrate in soil samples by water extraction followed by colorimetric detection
Soil	PHSOIL	As Received	Determination of pH of 2.5:1 deionised water to soil extracts using pH probe.
Soil	TSBRE1	Oven Dried @ < 35℃	Determination of Total Carbon and/or Total Sulphur in solid samples by high temperature combustion/infrared detection

Report Notes

Generic Notes

Soil/Solid Analysis

Unless stated otherwise,
- Results expressed as mg/kg have been calculated on the basis indicated in the Method Description table.
  All results on MCERTS reports are reported on a 105ºC dry weight basis with the exception of pH and conductivity.
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

Waters Analysis

Unless stated otherwise results are expressed as mg/l

Nil: Where "Nil" has been entered against Total Alkalinity or Total Acidity this indicates that a measurement was not required due to the inherent pH of the sample.

Oil analysis specific

Unless stated otherwise,
- Results are expressed as mg/kg
- SG is expressed as g/cm^3@ 15^{o}C

Gas (Tedlar bag) Analysis

Unless stated otherwise, results are expressed as ug/l

Asbestos Analysis

CH Denotes Chrysotile **TR** Denotes Tremolite
CR Denotes Crocidolite **AC** Denotes Actinolite
AM Denotes Amosite **AN** Denotes Anthophylite
NAIIS No Asbestos Identified in Sample
NADIS No Asbestos Detected In Sample

Symbol Reference

^ Sub-contracted analysis.
$$ Unable to analyse due to the nature of the sample
¶ Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols. This may have resulted in deterioration of the sample(s) during transit to the laboratory. Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling
¥ Results for guidance only due to possible interference
& Blank corrected result
I.S Insufficient sample to complete requested analysis
I.S(g) Insufficient sample to re-analyse, results for guidance only
Intf Unable to analyse due to interferences
N.D Not determined **N.Det** Not detected
N.F No Flow
NS Information Not Supplied
Req Analysis requested, see attached sheets for results
Þ Raised detection limit due to nature of the sample
***** All accreditation has been removed by the laboratory for this result
‡ MCERTS accreditation has been removed for this result
§ accreditation has been removed for this result as it is a non-accredited matrix

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Sample Descriptions

Client : ESG Deeside

Site : Frodsham Wind Farm

Report Number : S14_6517

Note: major constituent in upper case

Lab ID Number	Client ID	Description
CL/1428304	BH21 5 BH 1.50	SAND
CL/1428305	BH24 16 BH 8.50	SAND
CL/1428306	BH25 2 BH 1.20	SILT
CL/1428307	BH26 5 BH 2.00	CLAY
CL/1428308	BHMM 6 BH 2.00	CLAY

TEST REPORT

1252

Report No. EFS/146832 (Ver. 1)

ESG Deeside
Unit 18
Geotechnical House
Deeside Industrial Estate
Deeside
Clwyd
CH5 2LR

Site: Frodsham Wind Farm

The 8 samples described in this report were registered for analysis by ESG on 01-Nov-2014. This report supersedes any versions previously issued by the laboratory.
The analysis was completed by: 12-Nov-2014

Tests where the accreditation is set to N or No, and any individual data items marked with a * are not UKAS accredited
Any opinions or interpretations expressed herein are outside the scope of any UKAS accreditation held by ESG.

The following tables are contained in this report:

Table 1 Main Analysis Results (Page 2)
Analytical and Deviating Sample Overview (Page 3)
Table of Method Descriptions (Page 4)
Table of Report Notes (Page 5)
Table of Sample Descriptions (Appendix A Page 1 of 1)

On behalf of
ESG :
Declan Burns

Operations Director
Laboratory and Analytical Business

Date of Issue: 12-Nov-2014

Tests marked '^' have been subcontracted to another laboratory.
Where samples have been flagged as deviant on the Analytical and Deviating Sample Overview, for any reason, the data may not be representative of the sample at the point of sampling and the validity of the data may be affected.
ESG accepts no responsibility for any sampling not carried out by our personnel.

Where individual results are flagged see report notes for status.

Units :			mg/kg	mg/l	pH Units	%												
Method Codes :			ICPACIDS	ICPWSS	PHSOIL	TSBRE1												
Method Reporting Limits :			20	10		0.005												
UKAS Accredited :			Yes	Yes	Yes	No												
LAB ID Number CL/	**Client Sample Description**	**Sample Date**	**SO4-- (acid sol)**	**SO4-- (H2O sol) mg/l**	**pH units (AR)**	**Total Sulphur.**												
1429825	BH12 B 4 1.20	19-Sep-14	303	49	7.9	0.052												
1429826	BH12 B 39 24.00	22-Sep-14	312	40	8.7	0.050												
1429827	BH22 B 11 3.50	17-Sep-14	1950	649	7.7	1.05												
1429828	BH23 B 3 1.20	24-Sep-14	4550	1570	6.4	1.69												
1429829	BH23 B 26 15.00	24-Sep-14	390	80	8.8	0.074												
1429830	BH30 B 15 7.00	17-Sep-14	3450	741	7.4	0.517												
1429831	BH30 B 21 10.00	18-Sep-14	9640	3590	6.0	5.38												
1429832	BH31 B 5 2.00	15-Sep-14	392	161	7.2	0.061												

ESG Environmental Scientifics Group
Bretby Business Park, Ashby Road
Burton-on-Trent, Staffordshire, DE15 0YZ
Tel +44 (0) 1283 554400
Fax +44 (0) 1283 554422

Client Name **ESG Deeside**

Contact Mr A Bird

Frodsham Wind Farm

Sample Analysis

Date Printed	**12-Nov-2014**
Report Number	**EFS/146832**
Table Number	**1**

Where individual results are flagged see report notes for status.

Analytical and Deviating Sample Overview

Customer ESG Deeside
Site Frodsham Wind Farm
Report No S146832

Consignment No S44553
Date Logged 01-Nov-2014
Report Due 12-Nov-2014

ID Number	Description	MethodID	CustServ	Dep.Opt			ICPACIDS	ICPBRE	ICPWSS	KONECL	KoneNO3	PHSOIL	TSBRE1
		Sampled	Report B	DO Cl if pH<5.5	DO Mg if SO4(W)>3000	DO NO3 if pH<5.5	SO4-- (acid sol)	Magnesium (BRE)	SO4-- (H2O sol) mg/l	Chloride:(2:1)	Nitrate (BRE 2:1): mg/l	pH units (AR)	Total Sulphur.
							✓		✓			✓	
CL/1429825	BH12 1.20	19/09/14							E			E	
CL/1429826	BH12 24.00	22/09/14							E			E	
CL/1429827	BH22 3.50	17/09/14							E			E	
CL/1429828	BH23 1.20	24/09/14							E			E	
CL/1429829	BH23 15.00	24/09/14							E			E	
CL/1429830	BH30 7.00	17/09/14							E			E	
CL/1429831	BH30 10.00	18/09/14							E			E	
CL/1429832	BH31 2.00	15/09/14							E			E	

Note: For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.

Deviating Sample Key

A	The sample was received in an inappropriate container for this analysis
B	The sample was received without the correct preservation for this analysis
C	Headspace present in the sample container
D	The sampling date was not supplied so holding time may be compromised - applicable to all analysis
E	Sample processing did not commence within the appropriate holding time
F	Sample processing did not commence within the appropriate handling time

Requested Analysis Key

	Analysis Required
	Analysis dependant upon trigger result - **Note: due date may be affected if triggered**
	No analysis scheduled
^	Analysis Subcontracted - **Note: due date may vary**

Where individual results are flagged see report notes for status.

Method Descriptions

Matrix	MethodID	Analysis Basis	Method Description
Soil	ICPACIDS	Oven Dried @ < 35℃	Determination of Total Sulphate in soil samples by Hydrochloric Acid extraction followed by ICPOES detection
Soil	ICPWSS	Oven Dried @ < 35℃	Determination of Water Soluble Sulphate in soil samples by water extraction followed by ICPOES detection
Soil	PHSOIL	As Received	Determination of pH of 2.5:1 deionised water to soil extracts using pH probe.
Soil	TSBRE1	Oven Dried @ < 35℃	Determination of Total Carbon and/or Total Sulphur in solid samples by high temperature combustion/infrared detection

Report Notes

Generic Notes

Soil/Solid Analysis

Unless stated otherwise,
- Results expressed as mg/kg have been calculated on the basis indicated in the Method Description table.
  All results on MCERTS reports are reported on a 105ºC dry weight basis with the exception of pH and conductivity.
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

Waters Analysis

Unless stated otherwise results are expressed as mg/l

Nil: Where "Nil" has been entered against Total Alkalinity or Total Acidity this indicates that a measurement was not required due to the inherent pH of the sample.

Oil analysis specific

Unless stated otherwise,
- Results are expressed as mg/kg
- SG is expressed as g/cm^3@ 15^{o}C

Gas (Tedlar bag) Analysis

Unless stated otherwise, results are expressed as ug/l

Asbestos Analysis

CH Denotes Chrysotile **TR** Denotes Tremolite
CR Denotes Crocidolite **AC** Denotes Actinolite
AM Denotes Amosite **AN** Denotes Anthophylite
NAIIS No Asbestos Identified in Sample
NADIS No Asbestos Detected In Sample

Symbol Reference

^ Sub-contracted analysis.
$$ Unable to analyse due to the nature of the sample
¶ Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols. This may have resulted in deterioration of the sample(s) during transit to the laboratory. Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling
¥ Results for guidance only due to possible interference
& Blank corrected result
I.S Insufficient sample to complete requested analysis
I.S(g) Insufficient sample to re-analyse, results for guidance only
Intf Unable to analyse due to interferences
N.D Not determined **N.Det** Not detected
N.F No Flow
NS Information Not Supplied
Req Analysis requested, see attached sheets for results
Þ Raised detection limit due to nature of the sample
***** All accreditation has been removed by the laboratory for this result
‡ MCERTS accreditation has been removed for this result
§ accreditation has been removed for this result as it is a non-accredited matrix

Note: The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

Sample Descriptions

Client : ESG Deeside

Site : Frodsham Wind Farm

Report Number : S14_6832

Note: major constituent in upper case

Lab ID Number	Client ID	Description
CL/1429825	BH12 B 4 1.20	CLAY
CL/1429826	BH12 B 39 24.00	CLAY
CL/1429827	BH22 B 11 3.50	SILT
CL/1429828	BH23 B 3 1.20	SILT
CL/1429829	BH23 B 26 15.00	CLAY
CL/1429830	BH30 B 15 7.00	CLAY
CL/1429831	BH30 B 21 10.00	SILT
CL/1429832	BH31 B 5 2.00	CLAY

TEST REPORT

1252

Report No. EFS/147184 (Ver. 1)

ESG Deeside
Unit 18
Geotechnical House
Deeside Industrial Estate
Deeside
Clwyd
CH5 2LR

Site: F4036-14

The 1 sample described in this report were registered for analysis by ESG on 14-Nov-2014. This report supersedes any versions previously issued by the laboratory.
The analysis was completed by: 26-Nov-2014

Tests where the accreditation is set to N or No, and any individual data items marked with a * are not UKAS accredited
Any opinions or interpretations expressed herein are outside the scope of any UKAS accreditation held by ESG.

The following tables are contained in this report:

Table 1 Main Analysis Results (Page 2)
Analytical and Deviating Sample Overview (Page 3)
Table of Method Descriptions (Page 4)
Table of Report Notes (Page 5)
Table of Sample Descriptions (Appendix A Page 1 of 1)

On behalf of
ESG :
Declan Burns

[redacted]

Operations Director
Laboratory and Analytical Business

Date of Issue: 26-Nov-2014

Tests marked '^' have been subcontracted to another laboratory.
Where samples have been flagged as deviant on the Analytical and Deviating Sample Overview, for any reason, the data may not be representative of the sample at the point of sampling and the validity of the data may be affected.
ESG accepts no responsibility for any sampling not carried out by our personnel.

Where individual results are flagged see report notes for status.

Units :		mg/kg	mg/l	pH Units	%												
Method Codes :		ICPACIDS	ICPWSS	PHSOIL	TSBRE1												
Method Reporting Limits :		20	10		0.005												
UKAS Accredited :		Yes	Yes	Yes	No												
LAB ID Number CL/	**Client Sample Description**	**SO4-- (acid sol)**	**SO4-- (H2O sol) mg/l**	**pH units (AR)**	**Total Sulphur.**												
1431877	BH19 D 5.0	3690	631	7.9	0.455												

ESG Environmental Scientifics Group
Bretby Business Park, Ashby Road
Burton-on-Trent, Staffordshire, DE15 0YZ
Tel +44 (0) 1283 554400
Fax +44 (0) 1283 554422

Client Name	**ESG Deeside**
Contact	Mr A Bird

F4036-14

Sample Analysis

Date Printed	**26-Nov-2014**
Report Number	**EFS/147184**
Table Number	**1**

Where individual results are flagged see report notes for status.

Sample Analysis

ESG Environmental Chemistry
Analytical and Deviating Sample Overview

S147184

Customer **ESG Deeside**
Site **F4036-14**
Report No **S147184**

Consignment No S44859
Date Logged 14-Nov-2014

Report Due 26-Nov-2014

ID Number	Description	MethodID	CustServ	Dep.Opt			ICPACIDS	ICPBRE	ICPWSS	KONECL	KoneNO3	PHSOIL	TSBRE1
		Sampled	Report B	DO Cl if pH<5.5	DO Mg if SO4(W)>3000	DO NO3 if pH<5.5	SO4-- (acid sol)	Magnesium (BRE)	SO4-- (H2O sol) mg/l	Chloride:(2:1)	Nitrate (BRE 2:1): mg/l	pH units (AR)	Total Sulphur.
							✓		✓			✓	
CL/1431877	BH19 5.0-5.45	D											

Note: For analysis where the scheduled turnaround is greater than the holding time we will do our utmost to prioritise these samples. However, it is possible that samples could become deviant whilst being processed in the laboratory.

In this instance please contact the laboratory immediately should you wish to discuss how you would like us to proceed. If you do not respond within 24 hours, we will proceed as originally requested.

Deviating Sample Key

A	The sample was received in an inappropriate container for this analysis
B	The sample was received without the correct preservation for this analysis
C	Headspace present in the sample container
D	The sampling date was not supplied so holding time may be compromised - applicable to all analysis
E	Sample processing did not commence within the appropriate holding time
F	Sample processing did not commence within the appropriate handling time

Requested Analysis Key

	Analysis Required
	Analysis dependant upon trigger result - **Note: due date may be affected if triggered**
	No analysis scheduled
^	Analysis Subcontracted - **Note: due date may vary**

Where individual results are flagged see report notes for status.

Method Descriptions

Matrix	MethodID	Analysis Basis	Method Description
Soil	ICPACIDS	Oven Dried @ < 35℃	Determination of Total Sulphate in soil samples by Hydrochloric Acid extraction followed by ICPOES detection
Soil	ICPWSS	Oven Dried @ < 35℃	Determination of Water Soluble Sulphate in soil samples by water extraction followed by ICPOES detection
Soil	PHSOIL	As Received	Determination of pH of 2.5:1 deionised water to soil extracts using pH probe.
Soil	TSBRE1	Oven Dried @ < 35℃	Determination of Total Carbon and/or Total Sulphur in solid samples by high temperature combustion/infrared detection

Report Notes

Generic Notes

Soil/Solid Analysis

Unless stated otherwise,
- Results expressed as mg/kg have been calculated on the basis indicated in the Method Description table.
  All results on MCERTS reports are reported on a 105ºC dry weight basis with the exception of pH and conductivity.
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

Waters Analysis

Unless stated otherwise results are expressed as mg/l

Nil: Where "Nil" has been entered against Total Alkalinity or Total Acidity this indicates that a measurement was not required due to the inherent pH of the sample.

Oil analysis specific

Unless stated otherwise,
- Results are expressed as mg/kg
- SG is expressed as g/cm^3@ 15^{o}C

Gas (Tedlar bag) Analysis

Unless stated otherwise, results are expressed as ug/l

Asbestos Analysis

CH Denotes Chrysotile **TR** Denotes Tremolite
CR Denotes Crocidolite **AC** Denotes Actinolite
AM Denotes Amosite **AN** Denotes Anthophylite
NAIIS No Asbestos Identified in Sample
NADIS No Asbestos Detected In Sample

Symbol Reference

^ Sub-contracted analysis.
$$ Unable to analyse due to the nature of the sample
¶ Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols. This may have resulted in deterioration of the sample(s) during transit to the laboratory. Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling
¥ Results for guidance only due to possible interference
& Blank corrected result
I.S Insufficient sample to complete requested analysis
I.S(g) Insufficient sample to re-analyse, results for guidance only
Intf Unable to analyse due to interferences
N.D Not determined **N.Det** Not detected
N.F No Flow
NS Information Not Supplied
Req Analysis requested, see attached sheets for results
Þ Raised detection limit due to nature of the sample
***** All accreditation has been removed by the laboratory for this result
‡ MCERTS accreditation has been removed for this result
§ accreditation has been removed for this result as it is a non-accredited matrix

Note: The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

Sample Descriptions

Client : ESG Deeside
Site : F4036-14
Report Number : S14_7184

Note: major constituent in upper case

Lab ID Number	Client ID	Description
CL/1431877	BH19 D 5.0	CLAY

Trial Pit Log

Trialpit No **TP01**

Sheet 1 of 1

Project Name: Frodsham Wind Farm	Project No. ST13418	Co-ords: 347440.00 - 377284.00 Level:	Date 03/09/2014
Location: Frodsham, Cheshire		Dimensions (m): Depth 2.50 — 4 × 1.5	Scale 1:25
Client: Peel Wind Farms (Frodsham) Ltd			Logged MH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND: Soft, brown to grey CLAY. Abundant roots.
				0.30			MADE GROUND: Very soft, mottled black, brown and grey CLAY. Orange staining around roots. Clay is laminated. Water coming out of cracks in clay.
			HVP=27 HVP=29 HVP=24				*0.50m. Hand Shear Vane Test - Average result: 27KPa.*
			HVP=12 HVP=14 HVP=14				*1.00m. Hand Shear Vane Test - Average Result: 13KPa*
▼							*Water encountered at 2.1m.*
				2.50			End of pit at 2.50 m

Remarks: Perched water encountered at 2.1m.

Stability: Side collapsed at 2.5m depth. Failed by toppling in.

Trial Pit Log

Trialpit No **TP02**

Sheet 1 of 1

Project Name: Frodsham Wind Farm	Project No. ST13418	Co-ords: 347593.00 - 377510.00 Level:	Date 02/09/2014
Location: Frodsham, Cheshire		Dimensions (m): Depth 4.00 — 4 × 1.5	Scale 1:25
Client: Peel Wind Farms (Frodsham) Ltd			Logged MH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
			HVP=32 HVP=32 HVP=31				MADE GROUND: Soft, orange brown slightly sandy CLAY. Abundant Roots. *0.20m. Hand Shear Vane Test - Average Result: 32 KPa.*
				0.60			MADE GROUND: Very soft, mottled black and brown CLAY. Hydrocarbon odour.
			HVP=20 HVP=22 HVP=17				*0.80m. Hand Shear Vane Test - Average Result: 20KPa.*
▼							*Water encountered at 2m.*
				4.00			End of pit at 4.00 m

1 2 3 4 5

Remarks: Perched water encountered at 2m.

Stability: Sides collapsing at 4m.

AGS

Trial Pit Log

Trialpit No **TP03**

Sheet 1 of 1

Project Name: Frodsham Wind Farm	Project No. ST13418	Co-ords: 347847.00 - 377652.00 Level:	Date 03/09/2014
Location: Frodsham, Cheshire		Dimensions (m): 4 × 1.5 Depth 3.70	Scale 1:25
Client: Peel Wind Farms (Frodsham) Ltd			Logged MH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
			HVP=32 HVP=25 HVP=17				MADE GROUND: Soft, dark brown clayey SILT interlaminated with fine sand layers 0.1m thick. *0.20m. Hand Shear Vane Test - Average Result: 25KPa.*
				0.90			MADE GROUND: Very soft, black CLAY. Hydrocarbon odour. Occasional thin sandy layers. *1.10m. Hand Shear Vane Test - Average Result: 13 KPa.*
			HVP=12 HVP=13 HVP=13				
				3.70			End of pit at 3.70 m

Remarks: Water not encountered.

Stability: Sides remained vertical, ground wobbling.

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Trial Pit Log

Trialpit No **TP04**

Sheet 1 of 1

Project Name: Frodsham Wind Farm	Project No. ST13418	Co-ords: 348086.00 - 377810.00 Level:	Date 02/09/2014
Location: Frodsham, Cheshire		Dimensions (m): Depth 4.00 — 4 × 1.5	Scale 1:25
Client: Peel Wind Farms (Frodsham) Ltd			Logged MH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
			HVP=28 HVP=19 HVP=21 HVP=18 HVP=12 HVP=13 HVP=16 HVP=22 HVP=21	0.40			MADE GROUND: Loose, light orangey brown fine SAND. Frequent roots. *0.30m. Hand Shear Vane Test - Average Result: 23 KPa.*
				0.60			MADE GROUND: Very soft, black, slightly sandy CLAY. Sand is fine. *0.50m. Hand Shear Vane Test - Average Result: 14KPa.*
							MADE GROUND: Grey, slightly clayey fine SAND. *0.70m. Hand Shear Vane Test - Average Result: 20Kpa.*
				1.70			MADE GROUND: Grey to black, clayey fine SAND. Wet. When squeezed water come out. Frequent plant remains. Becoming clayeyer with depth.
				2.50			MADE GROUND: Very soft, black slightly sandy CLAY.
				4.00			End of pit at 4.00 m

1 2 3 4 5

Remarks: Water not encountered.

Stability: Side remained vertical throughout excavation. Collapsed upon backfilling.

AGS

Trial Pit Log

Trialpit No **TP05**

Sheet 1 of 1

Project Name: Frodsham Wind Farm	Project No. ST13418	Co-ords: 348319.00 - 377970.00 Level:	Date 02/09/2014
Location: Frodsham, Cheshire		Dimensions (m): Depth 4.00 — 4 × 1.5	Scale 1:25
Client: Peel Wind Farms (Frodsham) Ltd			Logged MH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
			HVP=30 HVP=32 HVP=27				MADE GROUND: Loose, orange brown fine SAND. Frequent roots and vegetation. *0.20m. Hand Shear Vane Test - Average Result: 30KPa.*
			HVP=10 HVP=11 HVP=8	0.60			MADE GROUND: Grey, slightly clayey, fine SAND. Occasional roots and rare plastic. *0.70m. Hand Shear Vane Test - Average Result: 10KPa.*
▼							*Water encountered at 1.5m.*
				4.00			End of pit at 4.00 m

1 2 3 4 5

Remarks: Water encountered at 1.50m.

Stability: Very unstable. Sides collapsing at 1.5m depth.

Trial Pit Log

Trialpit No **TP06**

Sheet 1 of 1

Project Name: Frodsham Wind Farm	Project No. ST13418	Co-ords: 347606.00 - 376942.00 Level:	Date 02/09/2014
Location: Frodsham, Cheshire		Dimensions (m): 4 × 1.5, Depth 2.50	Scale 1:25
Client: Peel Wind Farms (Frodsham) Ltd			Logged MH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND: Soft, brown, slightly silty CLAY. Abundant roots.
				0.20			MADE GROUND: Very soft, mottled brown and grey CLAY. Stratified with occasional roots.
			HVP=14 HVP=13 HVP=15				*0.50m. Hand Shear Vane Test - Average Result: 14KPa.* *Becoming black.*
			HVP=8 HVP=8 HVP=8				*1.00m. Hand Shear Vane Test - Average Result: 8KPa.*
▼				2.50			End of pit at 2.50 m

1 2 3 4 5

Remarks: Water encountered at 2.5m.

Stability: Very unstable at 2.5m depth. Sides collapsed. Pit wobbling when excavator moves.

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Trial Pit Log

Trialpit No **TP07**

Sheet 1 of 1

Project Name: Frodsham Wind Farm	Project No. ST13418	Co-ords: 347872.00 - 377105.00 Level:	Date 02/09/2014
Location: Frodsham, Cheshire		Dimensions (m): 4 × 1.5 Depth 3.00	Scale 1:25
Client: Peel Wind Farms (Frodsham) Ltd			Logged MH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
			HVP=35 HVP=25 HVP=29				MADE GROUND: Soft, dark brown silghtly silty CLAY. Abundant roots. *0.50m. Hand Shear Vane Test - Average Result: 30KPa.*
			HVP=11 HVP=12 HVP=9	0.90			MADE GROUND: Very soft, black CLAY. Hydrocarbon odour. *0.90m. Hand Shear Vane Test - Average Result: 11 KPa.*
▼							*Water encountered at 2.00m.*
				3.00			End of pit at 3.00 m

Remarks: Water encountered at 2.00m.

Stability: Sides collapsed. Vegetation holding surface together.

Trial Pit Log

Trialpit No **TP08**

Sheet 1 of 1

Project Name: Frodsham Wind Farm	Project No. ST13418	Co-ords: 348108.00 - 377293.00 Level:	Date 02/09/2014
Location: Frodsham, Cheshire		Dimensions (m): 4 × 1.5, Depth 3.00	Scale 1:25
Client: Peel Wind Farms (Frodsham) Ltd			Logged MH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
			HVP=28 HVP=25 HVP=33				MADE GROUND: Soft, brown CLAY with abundant roots. *0.20m. Hand Shear Vane Test - Average Result: 29KPa.*
			HVP=9 HVP=10 HVP=9	0.50			MADE GROUND: Very soft, mottled black and brown CLAY. Hydrocarbon odour. *0.50m. Hand Shear Vane Test - Average Result: 9 KPa.*
▼							*Water encountered at 2.00m.*
				3.00			End of pit at 3.00 m

Remarks: Water encountered at 2.00m.

Stability: Unstable. Sides collapsing in. Vegetation holding top crust together.

Trial Pit Log

Trialpit No **TP09** Sheet 1 of 1

Project Name: Frodsham Wind Farm	Project No. ST13418	Co-ords: 348371.00 - 377495.00 Level:	Date 02/09/2014
Location: Frodsham, Cheshire		Dimensions (m): Depth 3.50, 4, 1.5	Scale 1:25
Client: Peel Wind Farms (Frodsham) Ltd			Logged MH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
			HVP=23 HVP=16 HVP=28				MADE GROUND: Soft, brown silty CLAY with abundant roots. *0.30m. Hand Shear Vane Test - Average Result: 22KPa.*
			HVP=11 HVP=15 HVP=11	0.80			MADE GROUND: Very soft, mottled black and brown CLAY. Hydrocarbon odour. *0.80m. Hand Shear Vane Test - Average Result: 12KPa.*
▼				2.20			MADE GROUND: Very soft, grey CLAY. Stratified with frequent roots and occasional slightly sandy laminations. *Water encountered at 2.2m. Perched water within clay.*
				2.70			MADE GROUND: Very soft, mottled black and brown CLAY.
				3.50			End of pit at 3.50 m

Remarks: Water encountered at 2.20m.

Stability: Sides collapsing at final depth.

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Trial Pit Log

Trialpit No **TP10**

Sheet 1 of 1

Project Name: Frodsham Wind Farm	Project No. ST13418	Co-ords: 348658.00 - 377649.00 Level:	Date 02/09/2014
Location: Frodsham, Cheshire		Dimensions (m): 4 × 1.5, Depth 3.50	Scale 1:25
Client: Peel Wind Farms (Frodsham) Ltd			Logged MH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND: Soft, Brown silty CLAY with abundant roots.
			HVP=31 HVP=28 HVP=23	0.30			MADE GROUND: Light brown, slightly silty, fine SAND. *0.30m. Hand Shear Vane Test - Average Result 27KPa.*
			HVP=8 HVP=12 HVP=9	0.80			MADE GROUND: Very soft, black mottled brown and grey, slightly sandy and silty CLAY. Hydrocarbon odour. *0.80m. Hand Shear Vane Test - Average Result: 10KPa.*
▼							*Water encountered at 2.4m.*
				3.50			End of pit at 3.50 m

Remarks: Water encountered at 2.40m.

Stability: Pit remained stable for 5 mins, then the sides collapsed in.

Trial Pit Log

Trialpit No **TP13** Sheet 1 of 1

Project Name: Frodsham Wind Farm	Project No. ST13418	Co-ords: 348860.00 - 377149.00 Level:	Date 03/09/2014
Location: Frodsham, Cheshire		Dimensions (m): 4 × 1.5 Depth 4.30	Scale 1:25
Client: Peel Wind Farms (Frodsham) Ltd			Logged MH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
			HVP=80 HVP=160 HVP=181				Firm to stiff, brown clayey SILT. Abundant roots. *0.20m. Hand Shear Vane Test - Average Result: 140KPa.*
			HVP=47 HVP=54 HVP=35	0.70			Soft, grey CLAY. Frequent roots with orange staining. *0.80m. Hand Shear Vane Test - Average Result: 45KPa.*
				1.70			Spongy, brown, fibrous PEAT. Strong sulphurous odour.
			HVP=7 HVP=7 HVP=13	3.50			Very soft, blueish grey CLAY. *3.50m. Hand Shear Vane Test - Average Result: 9KPa.*
				4.30			End of pit at 4.30 m

1 2 3 4 5

Remarks: Water not encountered.

Stability: Pit remained stable, sides intact and vertical.

AGS

Trial Pit Log

Trialpit No **TP14**

Sheet 1 of 1

Project Name: Frodsham Wind Farm	Project No. ST13418	Co-ords: 350472.00 - 379273.00 Level:	Date 04/09/2014
Location: Frodsham, Cheshire		Dimensions (m): Depth 3.50 — 4 × 1.5	Scale 1:25
Client: Peel Wind Farms (Frodsham) Ltd			Logged MH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
			HVP=101 HVP=80 HVP=67				MADE GROUND: Firm to stiff, brown silty CLAY. Occasional thin sandy lenses. *0.20m. Hand Shear Vane Test - Average Result: 83KPa.*
			HVP=52 HVP=58 HVP=62	0.50			MADE GROUND: Soft, brown CLAY. Desiccated. *0.60m. Hand Shear Vane Test - Average Result: 57KPa.*
			HVP=27 HVP=33 HVP=16	1.00			MADE GROUND: Very soft, mottled black and brown CLAY. Desiccation cracks. *1.20m. Hand Shear Vane Test - Average Result: 25KPa.*
				3.50			End of pit at 3.50 m

1 2 3 4 5

Remarks: Water not encountered.

Stability: Side collapsed at 3.5m depth.

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Trial Pit Log

Trialpit No **TP15** Sheet 1 of 1

Project Name: Frodsham Wind Farm	Project No. ST13418	Co-ords: 350237.00 - 379065.00 Level:	Date 04/09/2014
Location: Frodsham, Cheshire		Dimensions (m): Depth 4.30 — 4 × 1.5	Scale 1:25
Client: Peel Wind Farms (Frodsham) Ltd			Logged MH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
			HVP=152 HVP=141 HVP=87	0.35			MADE GROUND: Firm to stiff, brown, slightly silty CLAY. Abundant roots. *0.20m. Hand Shear Vane Test - Average Result: 127KPa.*
			HVP=54 HVP=51 HVP=47	0.70			MADE GROUND: Medium dense, orange brown, slighty clayey SAND. Sand is fine. *0.50m. Hand Shear Vane Test - Average Result: 51KPa.*
			HVP=24 HVP=34 HVP=30				MADE GROUND: Soft, mottled brown and grey CLAY. Desiccation cracks. *0.90m. Hand Shear Vane Test - Average Result: 29KPa.*
			HVP=16 HVP=15 HVP=15				*1.20m. Hand Shear Vane Test - Average Result: 15KPa.*
				4.30			End of pit at 4.30 m

1 2 3 4 5

Remarks: Water not encountered.

Stability: Pit remained stable for 2 mins, then sides collapsed in.

AGS

Trial Pit Log

Trialpit No **TP16** Sheet 1 of 1

Project Name: Frodsham Wind Farm	Project No. ST13418	Co-ords: 350429.00 - 378527.00 Level:	Date 04/09/2014
Location: Frodsham, Cheshire		Dimensions (m): 4 × 1.5, Depth 2.00	Scale 1:25
Client: Peel Wind Farms (Frodsham) Ltd			Logged MH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
			HVP=137 HVP=94 HVP=123				MADE GROUND: Firm, brown silty CLAY with frequent roots. *0.10m. Hand Shear Vane Test - Average Result: 118KPa.*
				0.40			MADE GROUND: Very soft, grey brown CLAY. Occasional bands of fine sand. Desiccation cracks.
			HVP=32 HVP=38 HVP=21				*0.60m. Hand Shear Vane Test - Average Result: 30KPa.*
			HVP=13 HVP=8 HVP=11				*1.00m Hand Shear Vane Test - Average Result: 11KPa.*
				2.00			End of pit at 2.00 m

Remarks: Water not encountered.

Stability: Very unstable. Bottom of pit squeezing in before sides slumped in.

Trial Pit Log

Trialpit No **TP17**

Sheet 1 of 1

Project Name: Frodsham Wind Farm	Project No. ST13418	Co-ords: 350707.00 - 378679.00 Level:	Date 04/09/2014
Location: Frodsham, Cheshire		Dimensions (m): 4 × 1.5 Depth 2.00	Scale 1:25
Client: Peel Wind Farms (Frodsham) Ltd			Logged MH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND: Firm, brown CLAY with abundant roots.
				0.30			MADE GROUND: Very soft, mottled black and brown CLAY. Hydrocarbon odour. Desiccation cracks.
			HVP=17 HVP=16 HVP=18				*0.70m. Hand Shear Vane Test - Average Result: 17KPa.*
			HVP=10 HVP=10 HVP=10				*1.00m. Hand Shear Vane Test - Average Result: 10KPa.*
				2.00			End of pit at 2.00 m

Remarks: Water not encountered

Stability: Very unstable, sides slumped in at 2m depth.

AGS

Trial Pit Log

Trialpit No **TP18**

Sheet 1 of 1

Project Name: Frodsham Wind Farm	Project No. ST13418	Co-ords: 350393.00 - 378230.00 Level:	Date 04/09/2014
Location: Frodsham, Cheshire		Dimensions (m): 4 × 1.5 Depth 2.60	Scale 1:25
Client: Peel Wind Farms (Frodsham) Ltd			Logged MH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
			HVP=106 HVP=106 HVP=113				MADE GROUND: Firm, brown CLAY. *0.20m. Hand Shear Vane Test - Average Result: 108KPa.*
			HVP=38 HVP=35 HVP=40	0.60			MADE GROUND: Soft, brown CLAY. Desiccated. *0.70m. Hand Shear Vane Test - Average Result: 38KPa.*
			HVP=15 HVP=15 HVP=15	0.80			MADE GROUND: Very soft, mottled black and brown CLAY. *1.00m. Hand Shear Vane Test - Average Result: 15KPa.*
			HVP=6 HVP=7 HVP=7	2.60			End of pit at 2.60 m

Remarks: Water not encountered.

Stability: Sides collapsed and slumped in after 1 minute.

Trial Pit Log

Trialpit No **TP19**

Sheet 1 of 1

Project Name: Frodsham Wind Farm	Project No. ST13418	Co-ords: 350826.00 - 378307.00 Level:	Date 04/09/2014
Location: Frodsham, Cheshire		Dimensions (m): Depth 2.00, 4 × 1.5	Scale 1:25
Client: Peel Wind Farms (Frodsham) Ltd			Logged MH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
			HVP=169 HVP=176 HVP=182	0.25			MADE GROUND: Firm, brown CLAY with abundant roots. *0.20m. Hand Shear Vane Test - Average Result: 176KPa.*
			HVP=14 HVP=24 HVP=27				MADE GROUND: Very soft mottled black and brown CLAY. Desiccation cracks. *0.50m. Hand Shear Vane Test - Average Result: 22KPa.*
			HVP=4 HVP=4 HVP=3	2.00			End of pit at 2.00 m

1 2 3 4 5

Remarks: Water not encountered.

Stability: Unstable. Pit collapsed at 2m depth. Sides slumped in.

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Trial Pit Log

Trialpit No **TPMM**

Sheet 1 of 1

Project Name: Frodsham Wind Farm	Project No. ST13418	Co-ords: 350208.00 - 379631.00 Level:	Date 04/09/2014
Location: Frodsham, Cheshire		Dimensions (m): 4 × 1.5 Depth 4.30	Scale 1:25
Client: Peel Wind Farms (Frodsham) Ltd			Logged MH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
			HVP=117 HVP=87 HVP=114				MADE GROUND: Firm to stiff, dark brown silty CLAY. Abundant roots. *0.20m. Hand Shear Vane Test - Average Result: 106KPa.*
			HVP=38 HVP=44 HVP=44	0.50			MADE GROUND: Soft, brown CLAY. Desiccated with fine roots and orange staining around roots. *0.70m. Hand Shear Vane Test - Average Result: 42KPa.*
			HVP=20 HVP=36 HVP=23	0.90			MADE GROUND: Very soft, mottled black grey and brown CLAY. Occasional thin sandy laminations. *1.00m. Hand Shear Vane Test - Average Result: 26KPa.* *1.30m. Hand Shear Vane Test - Average Result: 16KPa.*
			HVP=17 HVP=17 HVP=15	4.30			End of pit at 4.30 m

Remarks: Water not encountered.

Stability: Sides stable and vertical, held up for 5 mins. Sides bowing in slightly. Collapsed during backfilling.

Appendix C: Frodsham Wind Farm. Condition 38: Hydrocarbon Contamination within Cell 3, April 2015

wardell-armstrong.com

ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING, QUARRYING AND MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

FRODSHAM WIND FARM LIMITED

Frodsham Wind Farm

Condition 38: Hydrocarbon Contamination Within Cell 3

April 2015

your earth our world

wardell armstrong

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FRODSHAM WIND FARM LIMITED

Frodsham Wind Farm

Condition 38: Hydrocarbon Contamination Within Cell 3

April 2015

PREPARED BY:

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APPROVED BY:

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ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
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WASTE RESOURCE MANAGEMENT

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DRAWINGS

Drawing No.	Title	Scale
ST13418-009A	Site Location	1:10,000
ST13418-012	Cell 3 Water Body Locations	As shown

1 INTRODUCTION

1.1 The proposed Frodsham Wind Farm site consists of c.450 hectares of land adjacent to the south bank of the Mersey Estuary, at the Frodsham and Helsby marshes. The Manchester Ship Canal forms the northern site boundary. The location of the site is shown on Drawing ST13418-009A and its configuration in Appendix 1. The site primarily contains a series of raised bunded lagoons (Cells) used by the Manchester Ship Canal Company for the deposition of canal dredgings. Cell 6 is currently receiving dredgings; the infilling of all other cells is complete.

1.2 The proposed development involves the construction of 19 wind turbines, 16 of which will be located on the deposit cells. The remaining 3 turbines are located on farmland to the south of the deposit grounds. Ancillary infrastructure will consist of crane pads at each turbine location, various bridge crossings, electricity sub-stations and a meteorological mast. As part of the scheme, a designated ecological wetland area is being constructed in the north of the site, within the area labelled 'Cell 3' in Appendix 1. This consists of five man-made water bodies designed to provide ecological mitigation for the scheme and support wading bird species.

1.3 The site is being developed principally under planning approval reference 10/00597/DECC (Cheshire West & Chester Council ref. 12.04.09.109C). Condition 38 of this approval relates to the investigation and assessment of contamination that was 'not previously identified', but which has come to light during the course of the approved development.

1.4 The Cell 3 water bodies are labelled water bodies A-E, as shown on Drawing ST13418-012. A contamination 'watching brief' was undertaken during the initial excavation of the Cell 3 water bodies. During this process, material described generally as 'black clayey silt', with a notable hydrocarbon odour, was encountered. Pre-construction intrusive investigations did not include testing of materials of this nature within the Cell 3 area, and therefore this contamination falls under the remit of Condition 38 of the above planning consent (previously unidentified / unassessed contamination). Accordingly, an investigation and risk assessment is required, together with the determination of any remediation measures required to protect the receptor (Cell 3 ecosystem).

1.5 The purpose of this report is to document this investigation and risk assessment, in compliance with the requirements of Condition 38.

1.6 This report relates only to the wetland ecosystem receptor in Cell 3. Whilst other receptors are also present in Cell 3, these are present on a site-wide basis (unlike the wetland, which is unique to Cell 3). The potential effects from the dredgings on these site-wide receptors have previously been assessed on a site-wide basis under Condition 37.

2 INVESTIGATION AND RISK ASSESSMENT

2.1 The near surface soils in Cell 3 consist of canal dredgings, primarily comprising black silty clay / clayey silt (logs are provided in Appendix 2). During the contamination watching brief, this material was noted to display olfactory evidence of potential hydrocarbon contamination in some instances. Evidence of potential contamination was encountered in all five water body excavations. Whilst the potential contamination appeared to be relatively widespread, its degree appeared to be variable, with no clear spatial pattern.

2.2 Five samples of the black silty clay / clayey silt were obtained from locations displaying the greatest olfactory evidence of potential contamination and subjected to laboratory chemical analysis to provide an indication of its contamination status. One sample was obtained per pond location. Due to the size of the potentially affected area (all of Cell 3) and the absence of any relevant published generic screening criteria for the site-specific receptor (Cell 3 ecosystem; particularly wading birds), it was not deemed necessary to undertake a more comprehensive sampling exercise, as mitigation based on reactive monitoring at the receptor (discussed further below) is generally more effective in such circumstances. The purpose of the sampling exercise was purely to provide both confirmation as to the presence of contamination and an indication of the general scale of the contamination. The sampling exercise was undertaken in conjunction with the excavation of the ponds, with all excavated materials screened by the watching brief and only the most contaminated (based on visual and olfactory evidence) selected for analysis. The results of the testing are therefore considered to represent a worst case with respect

to the excavated materials. Laboratory results certificates are provided in Appendix 3.

2.3 Although soil samples were originally obtained from all five pond locations, it should be noted that water bodies C-E will be constructed as rainwater fed features that are isolated from groundwater by a geosynthetic clay liner (GCL). This is necessary to prevent these water bodies from drying out, as their bases are above the level of groundwater. Accordingly, potential risks from ground contamination to ecological receptors using these water bodies can be discounted and are not considered further.

2.4 Subsequent references to the Cell 3 ecosystem receptor within this report relate only to water bodies A and B. It has been possible to design these water bodies as unlined groundwater fed features (this is favoured for ecological reasons) and therefore a potentially viable source-pathway-receptor linkage exists in relation to the effects of soil / groundwater contamination on these two water bodies.

2.5 There are no published generic assessment criteria for readily assessing the risk from soil contaminant concentrations to the Cell 3 ecosystem receptor. Determination of theoretical maximum leachable concentrations based on chemical partitioning behaviour and comparison to Environmental Quality Standards (EQS) is not considered to be an appropriate approach, as this does not account for the specific ecosystem receptor at this site (wading birds etc.). However, in general, the recorded soil concentrations are considered to be relatively low (i.e. not indicative of gross / severe contamination) and within the range commonly found on many former industrial sites across the UK.

2.6 Assessing the effects of this contamination on the Cell 3 ecosystem receptor would require highly specialised ecotoxicological modelling. Any such assessment would need to consider the potentially synergistic toxicological effects of a mixture of organic contaminants on a complex ecosystem (to understand effects on aquatic invertebrates, wading birds etc.).

2.7 The ecological designer for the Cell 3 area (Atmos Consulting) has provided specialist advice on this issue. They have provided the following qualitative risk assessment comments.

- Many of the aquatic invertebrate species fed on by wading birds are colonising-type species (i.e. Chironomid larvae and worms) which are often highly tolerant of poor water quality conditions. Poor water quality conditions in water bodies A and B may affect invertebrate diversity but not necessarily invertebrate abundance as pollutant tolerant species can often thrive in the absence of other invertebrate predators that are more sensitive to water quality.
- The potential effects on birds are difficult to predict. Many aquatic invertebrates, which form the majority of prey items for birds, have short-lifecycles which does not allow time for pollutants to bio-accumulate. Therefore the contamination burden on the birds may be relatively low, particularly as they will only be using the water bodies seasonally. Atmos consider that the contamination is unlikely to cause acute toxic effects that may lead to direct bird mortalities, but that there may be the potential for sub-lethal effects that may subtly affect the general fitness of the birds.

2.8 Based on this professional judgement of Atmos, and that the recorded soil concentrations are considered to be relatively low, it is considered that the potential risk to the Cell 3 ecosystem receptor (water bodies A and B) is low. Therefore, the highly detailed ecotoxicological modelling that would be required to quantitatively assess the risks to the ecological receptor is not warranted. Rather, a more pragmatic and effective means of addressing the risk is considered appropriate. This has been developed in consultation with Atmos and comprises the following:

- A 12 month monitoring period, during which water quality within water bodies A and B will be monitored at a quarterly frequency for the following: (i) chemical parameters (field measurements of pH, dissolved oxygen and electrical conductivity, together with laboratory testing for speciated PAH and TPH-CWG); (ii) invertebrate abundance testing, which will comprise a bespoke methodology designed for ephemeral water features that may include water testing for species that colonise rapidly after inundation and substrate monitoring for invertebrate abundance. The monitoring will also include chemical and biological testing from the water bodies that will be lined and rainwater fed

(water bodies C-E) and substrate testing (invertebrate abundance) from natural soils remote from the water bodies, to provide 'control' data.

- Should this monitoring indicate significant evidence of adverse effects on the ecological receptor (i.e. poor water quality, low invertebrate abundance), then mitigation measures will be implemented. These would be likely to comprise the installation of a low permeability liner in water bodies A and B, similar to that which will be used in water bodies C-E.

2.9 No specified target levels are proposed for either chemical water quality or ecological water effects (water or substrate). This is because the significance of effects will be a combination of both factors, and is subject to professional judgment. However, to ensure that the determination of whether remediation is required has some quantitative basis, the following general guidelines are proposed. Remediation should be considered in circumstances where:

- Water chemistry data indicates the presence of dissolved phase contaminants at concentrations above Environmental Quality Standards (EQS), or dissolved oxygen levels below 5 mg/l; **and**
- Invertebrate abundance testing indicates a low abundance or a significant decrease in abundance relative to previous testing. Control testing within surface water fed water bodies (i.e. water bodies C-E) and invertebrate abundance testing in near surface natural soils remote from the water bodies will be used to inform this assessment.

2.10 It should be emphasized that this is considered as a 'rule of thumb' only and it may be that remediation is considered when only one of these criteria is met, should this be considered to represent a potentially significant adverse impact. The determination of whether remediation is required should also consider any significant changes in pH or electrical conductivity.

Currently Available Water Quality Data

2.11 A programme of baseline water monitoring has recently (February 2015) been completed at the site. This comprised groundwater and surface water monitoring required to establish baseline conditions in advance of piling, rather than testing directly designed to assess the effects of ground contamination on water quality within the Cell 3 water bodies. Nevertheless, this testing includes chemical data from

the Cell 3 water bodies. The monitoring comprised three rounds of sampling and laboratory analysis, which chemical testing of samples from water bodies A-D on all three occasions. Water body E was found to be dry during this monitoring round. The data is included in Appendix 4 (the samples from surface water bodies A-D are labelled 'SW-A' to 'SW-D'; other samples are from groundwater and are not relevant to this report). It should be noted that this data was obtained shortly after construction of the water bodies and may not be reflective an 'equilibrated' situation (i.e. recent ground disturbance may have temporarily increased contaminant concentrations). Additionally, water bodies C-E were not lined at the time of the sampling and therefore the current water quality within these does not reflect likely water quality upon completion (whereupon it is understood that the ponds will have been lined). However, the following general interpretive comments are provided:

- Water bodies C and D recorded slightly elevated TPH concentrations (up to a maximum of 326 µg/l, composed entirely of >C12 compounds). TPH concentrations in water bodies A-C were below laboratory detection limits (10 µg/l).
- All four water bodies recorded slightly elevated PAH concentrations, with the maximum concentrations being recorded in water body D (e.g. 0.158 µg/l benzo(a)pyrene). PAH concentrations in all water bodies exceed EQS, although in absolute terms the concentrations are low (sub parts per billion for individual PAH compounds). It is also emphasized that comparison to EQS is not necessarily strictly relevant to the site-specific receptor (transient use by wading birds) and that the chemical data should be considered in conjunction with biological (invertebrate abundance) data to inform a suitable risk assessment.

2.12 This data forms a useful basis for the required monitoring and risk assessment in relation to the Cell 3 ecosystem receptor (water bodies A and B) discussed above. Given the source of the contamination (silty material) and presence of PAH in 'aqueous' samples, it would be advisable for the monitoring to include laboratory analysis on both filtered and 'aqueous' samples. Together with the collection of invertebrate abundance data (including control data from natural soils remote from the water bodies), this will allow any remediation requirements to be determined based on a robust data set.

3 CONCLUSIONS

3.1 Soils affected by hydrocarbon contamination were encountered during the contamination watching brief undertaken during the excavation of the Cell 3 water bodies. Samples were obtained and analysed from these materials on a 'worst case' basis i.e. from soils displaying the greatest potential evidence of potential contamination based on field observations. An appraisal of the potential risk from ground contamination on the Cell 3 water bodies (ecosystem receptor) has been undertaken, based on qualitative consideration of the nature of the contamination and the professional judgment of contaminated land and ecological specialists. This relates to water bodies A and B only, as water bodies C-E will be lined and isolated from groundwater inputs. This initial appraisal indicates that the risk to the ecosystem receptor (water bodies A and B) is low.

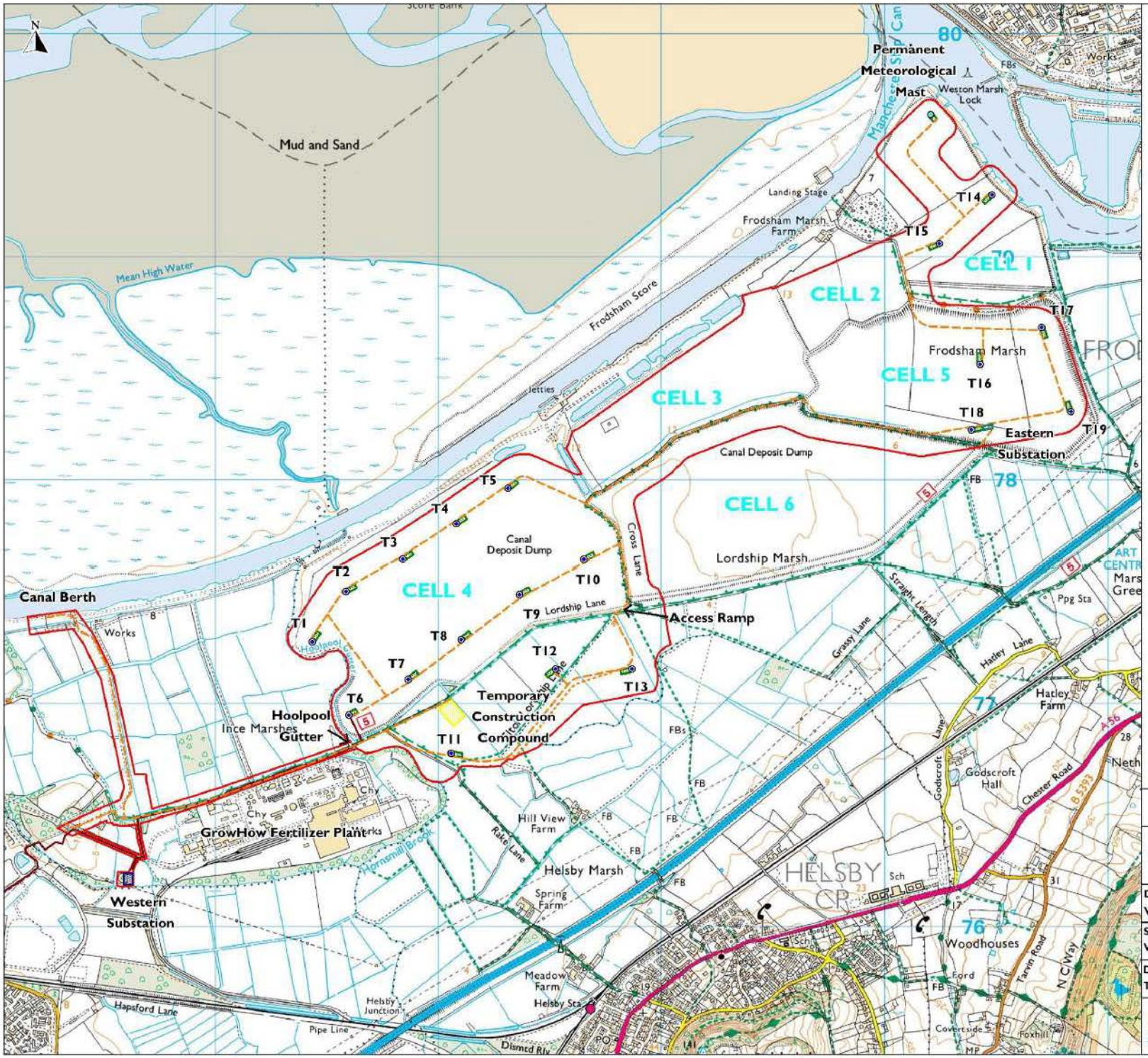
3.2 Detailed toxicological modelling would be required to quantitatively predict potential effects on the ecosystem receptor. It is considered that this is not warranted given the findings of the initial appraisal. Rather, a pragmatic reactive approach to further risk assessment and the determination of mitigation requirements is considered appropriate. This will comprise a quarterly chemical and ecological monitoring programme in Cell 3 over a 12 month period. Upon completion of this, the situation will either be (i) 12 months of monitoring data indicating that the soil contamination is not having a significant effect on the water bodies, or (ii) water bodies A and B have been lined due to the monitoring indicating potentially significant effects from contamination, with supporting post-lining data to indicate the success of this remediation. In either instance, the result will be that the potential for significant risks to the Cell 3 aquatic ecosystem can be assessed as negligible.

3.3 This approach to assessing and mitigating any risks associated with contamination ingress into the Cell 3 water bodies A and B constitutes a risk assessment, remediation strategy and verification plan (as required by Condition 38). The results of the monitoring will be compiled into a verification report, which will also document any remediation measures implemented.

APPENDICES

Appendix 1

Preliminary Site Layout Plan (Parsons Brinckerhoff) and Location of Proposed Scrape Features (Atmos Consulting) – Annotated by Wardell Armstrong



LEGEND

- Site Boundary - the "Site"
- Turbine Location
- Access Track
- Crane Hardstanding
- Temporary Construction Compound
- Eastern Substation (18MW)
- Western Substation (39MW)
- Permanent Meteorological Mast Location
- Cable Route
- Approximate requested diversion route of access track by landowner

SCALE

Kilometres 0 0.5 1.0

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FRODSHAM WIND FARM

Preliminary Site Layout Plan

DOCUMENT REFERENCE	LAST REVISION DATE
V1	3rd October 2014
SITE DESIGN VERSION	**SCALE**
V1	1:17k when printed at A3

DRAWN	CHECKED	APPROVED
TR	LT	AL

PARSONS BRINCKERHOFF

APPENDIX 1

Appendix 2

Trial Pit Logs

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Trial Pit Log

Trialpit No
TP-A
Sheet 1 of 1

Project Name: Frodsham Wind Farm	Project No. ST13418	Co-ords: 348723.00 - 378026.00 Level:	Date 01/10/2014
Location: Frodsham, Cheshire		Dimensions (m): Depth 2.00 — 1 — 2	Scale 1:25
Client: Peel Wind Farms (Frodsham) Ltd			Logged MH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			MADE GROUND: Soft, brown silty CLAY. Desiccated.
	1.00	ES					MADE GROUND: Very soft, black, grey, blue CLAY. Desiccated with a hydrocarbon like odour.
				2.00			End of pit at 2.00 m

Remarks: Water not encountered.

Stability: Remained Stable and Vertical

AGS

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Trial Pit Log

Trialpit No
TP-B
Sheet 1 of 1

Project Name: Frodsham Wind Farm	Project No. ST13418	Co-ords: 349506.00 - 378457.00 Level:	Date 01/10/2014
Location: Frodsham, Cheshire		Dimensions (m): 2 × 1, Depth 2.00	Scale 1:25
Client: Peel Wind Farms (Frodsham) Ltd			Logged MH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			MADE GROUND: Soft to firm, brown CLAY. Roots.
	1.50	ES					MADE GROUND: Very soft, black grey, blue mottled CLAY. Laminated, sandy in part, desiccated.
				2.00			End of pit at 2.00 m

Remarks: Water not encountered.

Stability: Remained stable and vertical.

AGS

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Trial Pit Log

Trialpit No
TP-C
Sheet 1 of 1

Project Name: Frodsham Wind Farm	Project No. ST13418	Co-ords: 348808.00 - 378284.00 Level:	Date 01/10/2014
Location: Frodsham, Cheshire		Dimensions (m): Depth 2.00 — 2 — 1	Scale 1:25
Client: Peel Wind Farms (Frodsham) Ltd			Logged MH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.60			MADE GROUND: Soft to firm brown clayey SILT. Rootlets, desiccated.
	2.00	ES		2.00			MADE GROUND: Very soft, black grey blue mottled CLAY. Desiccated with a hydrocarbon like odour.
							End of pit at 2.00 m

1 2 3 4 5

Remarks: Water not encountered.

Stability: Remained stable and vertical.

AGS

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Trial Pit Log

Trialpit No
TP-D
Sheet 1 of 1

Project Name: Frodsham Wind Farm	Project No. ST13418	Co-ords: 349154.00 - 378449.00 Level:	Date 01/10/2014
Location: Frodsham, Cheshire		Dimensions (m): Depth 2.00 — 1 × 2	Scale 1:25
Client: Peel Wind Farms (Frodsham) Ltd			Logged MH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10			Turf over TOPSOIL.
							MADE GROUND: Soft to firm, brown clayey SILT. Rootlets.
				0.60			MADE GROUND: Very soft, black CLAY. Desiccated and laminated with a hydrocarbon like odour.
	1.50	ES					
				2.00			End of pit at 2.00 m

Remarks: Water not encountered.

Stability: Remained stable and vertical.

AGS

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Trial Pit Log

Trialpit No
TP-E
Sheet 1 of 1

Project Name: Frodsham Wind Farm	Project No. ST13418	Co-ords: 349420.00 - 378642.00 Level:	Date 01/10/2014
Location: Frodsham, Cheshire		Dimensions (m): Depth 2.00 — 1 — 2	Scale 1:25
Client: Peel Wind Farms (Frodsham) Ltd			Logged MH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10			Turf over TOPSOIL.
							MADE GROUND: Firm to stiff, brown clayey SILT. Rootlets and iron staining on some surfaces.
				0.80			MADE GROUND: Very soft, black CLAY. Laminated with occasional thin sandy laminations. Desiccated with a hydrocarbon like odour.
	2.00	ES		2.00			End of pit at 2.00 m

Remarks: Water not encountered.

Stability: Remained stable and vertical.

AGS

Appendix 3

Soil Contamination Laboratory Testing Data

ALcontrol Laboratories

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: mkt@alcontrol.com
Website: www.alcontrol.com

Wardell Armstrong LLP
Sir Henry Doulton House
Forge Lane
Etruria
Stoke on Trent
Staffordshire
ST1 5BD

Attention: Tim Cawood

CERTIFICATE OF ANALYSIS

Date:	14 October 2014
Customer:	H_WARDELL_SKT
Sample Delivery Group (SDG):	141002-98
Your Reference:	ST13418
Location:	Frodsham
Report No:	287762

We received 5 samples on Thursday October 02, 2014 and 5 of these samples were scheduled for analysis which was completed on Tuesday October 14, 2014. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

[redacted]

Operations Manager

CERTIFICATE OF ANALYSIS

SDG:	141002-98	**Location:**	Frodsham	**Order Number:**	ST14392
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	287762
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
10104583	TP-A		1.00 - 1.00	01/10/2014
10104591	TP-B		1.50 - 1.50	01/10/2014
10104601	TP-C		2.00 - 2.00	01/10/2014
10104611	TP-D		1.50 - 1.50	01/10/2014
10104618	TP-E		2.00 - 2.00	01/10/2014

Only received samples which have had analysis scheduled will be shown on the following pages.

CERTIFICATE OF ANALYSIS

SDG:	141002-98	**Location:**	Frodsham	**Order Number:**	ST14392
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	287762
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

SOLID

Results Legend

X Test

N No Determination Possible

			Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container
			10104583	TP-A		1.00 - 1.00	250g Amber Jar (AL
			10104583	TP-A		1.00 - 1.00	60g VOC (ALE215)
			10104591	TP-B		1.50 - 1.50	250g Amber Jar (AL
			10104591	TP-B		1.50 - 1.50	60g VOC (ALE215)
			10104601	TP-C		2.00 - 2.00	250g Amber Jar (AL
			10104601	TP-C		2.00 - 2.00	60g VOC (ALE215)
			10104611	TP-D		1.50 - 1.50	250g Amber Jar (AL
			10104611	TP-D		1.50 - 1.50	60g VOC (ALE215)
			10104618	TP-E		2.00 - 2.00	250g Amber Jar (AL
			10104618	TP-E		2.00 - 2.00	60g VOC (ALE215)
EPH CWG (Aliphatic) GC (S)	All	NDPs: 0 Tests: 5	X		X		X		X		X	
EPH CWG (Aromatic) GC (S)	All	NDPs: 0 Tests: 5	X		X		X		X		X	
GRO by GC-FID (S)	All	NDPs: 0 Tests: 5		X		X		X		X		X
PAH by GCMS	All	NDPs: 0 Tests: 5	X		X		X		X		X	
Sample description	All	NDPs: 0 Tests: 5	X		X		X		X		X	
Total Organic Carbon	All	NDPs: 0 Tests: 5	X		X		X		X		X	
TPH CWG GC (S)	All	NDPs: 0 Tests: 5	X		X		X		X		X	

CERTIFICATE OF ANALYSIS

SDG:	141002-98	**Location:**	Frodsham	**Order Number:**	ST14392
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	287762
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions	Inclusions 2
10104583	TP-A	1.00 - 1.00	Black	Silt Loam	0.063 - 0.1 mm	None	None
10104591	TP-B	1.50 - 1.50	Black	Sandy Silt Loam	0.063 - 0.1 mm	Stones	Vegetation
10104601	TP-C	2.00 - 2.00	Black	Silt Loam	0.063 - 0.1 mm	Oil/Petroleum	None
10104611	TP-D	1.50 - 1.50	Black	Silt Loam	0.063 - 0.1 mm	Oil/Petroleum	None
10104618	TP-E	2.00 - 2.00	Black	Silt Loam	0.063 - 0.1 mm	None	None

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

CERTIFICATE OF ANALYSIS

SDG:	141002-98	**Location:**	Frodsham	**Order Number:**	ST14392
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	287762
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+$@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	TP-A	TP-B	TP-C	TP-D	TP-E
			Depth (m)	1.00 - 1.00	1.50 - 1.50	2.00 - 2.00	1.50 - 1.50	2.00 - 2.00
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	01/10/2014	01/10/2014	01/10/2014	01/10/2014	01/10/2014
			Sample Time					
			Date Received	02/10/2014	02/10/2014	02/10/2014	02/10/2014	02/10/2014
			SDG Ref	141002-98	141002-98	141002-98	141002-98	141002-98
			Lab Sample No.(s)	10104583	10104601	10104601	10104611	10104618
			AGS Reference					
Moisture Content Ratio (% of as received sample)	%	PM024		47	42	49	44	45
Organic Carbon, Total	<0.2 %	TM132		2.9 M	2.52 M	2.93 M	3 M	3.11 M

CERTIFICATE OF ANALYSIS

SDG:	141002-98	**Location:**	Frodsham	**Order Number:**	ST14392
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	287762
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

PAH by GCMS

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+5@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	TP-A	TP-B	TP-C	TP-D	TP-E
			Depth (m)	1.00 - 1.00	1.50 - 1.50	2.00 - 2.00	1.50 - 1.50	2.00 - 2.00
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	01/10/2014	01/10/2014	01/10/2014	01/10/2014	01/10/2014
			Sample Time					
			Date Received	02/10/2014	02/10/2014	02/10/2014	02/10/2014	02/10/2014
			SDG Ref	141002-98	141002-98	141002-98	141002-98	141002-98
			Lab Sample No.(s)	10104583	10104601	10104601	10104611	10104618
			AGS Reference					
Naphthalene-d8 % recovery**	%	TM218		105	111	111	81.9	108
Acenaphthene-d10 % recovery**	%	TM218		94.9	109	107	75.2	102
Phenanthrene-d10 % recovery**	%	TM218		88.1	106	104	69.4	98.4
Chrysene-d12 % recovery**	%	TM218		86.5	108	107	71.3	99.2
Perylene-d12 % recovery**	%	TM218		92.9	115	114	71	107
Naphthalene	<9 µg/kg	TM218		1330 M	907 M	3190 M	735 M	1990 M
Acenaphthylene	<12 µg/kg	TM218		240 M	168 M	278 M	162 M	241 M
Acenaphthene	<8 µg/kg	TM218		461 M	505 M	1380 M	922 M	1680 M
Fluorene	<10 µg/kg	TM218		759 M	644 M	1480 M	773 M	1610 M
Phenanthrene	<15 µg/kg	TM218		2570 M	2680 M	3760 M	1600 M	5170 M
Anthracene	<16 µg/kg	TM218		1350 M	1160 M	2730 M	1380 M	1960 M
Fluoranthene	<17 µg/kg	TM218		4870 M	4780 M	3930 M	1690 M	5650 M
Pyrene	<15 µg/kg	TM218		3360 M	3520 M	3360 M	1370 M	3730 M
Benz(a)anthracene	<14 µg/kg	TM218		2040 M	1960 M	1470 M	680 M	2000 M
Chrysene	<10 µg/kg	TM218		1670 M	1760 M	1270 M	550 M	1790 M
Benzo(b)fluoranthene	<15 µg/kg	TM218		2980 M	2760 M	2240 M	834 M	2590 M
Benzo(k)fluoranthene	<14 µg/kg	TM218		873 M	958 M	770 M	327 M	946 M
Benzo(a)pyrene	<15 µg/kg	TM218		2370 M	2120 M	1610 M	838 M	2070 M
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218		1170 M	1070 M	783 M	395 M	942 M
Dibenzo(a,h)anthracene	<23 µg/kg	TM218		340 M	310 M	235 M	127 M	285 M
Benzo(g,h,i)perylene	<24 µg/kg	TM218		1380 M	1250 M	953 M	465 M	1120 M
PAH, Total Detected USEPA 16	<118 µg/kg	TM218		27800	26600	29400	12600	33800

CERTIFICATE OF ANALYSIS

SDG:	141002-98	**Location:**	Frodsham	**Order Number:**	ST14392
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	287762
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

TPH CWG (S)

Results Legend		Customer Sample R	TP-A	TP-B	TP-C	TP-D	TP-E	
#	ISO17025 accredited.							
M	mCERTS accredited.							
aq	Aqueous / settled sample.							
diss.filt	Dissolved / filtered sample.	Depth (m)	1.00 - 1.00	1.50 - 1.50	2.00 - 2.00	1.50 - 1.50	2.00 - 2.00	
tot.unfilt	Total / unfiltered sample.	Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	
*	Subcontracted test.	Date Sampled	01/10/2014	01/10/2014	01/10/2014	01/10/2014	01/10/2014	
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery	Sample Time						
		Date Received	02/10/2014	02/10/2014	02/10/2014	02/10/2014	02/10/2014	
(F)	Trigger breach confirmed	SDG Ref	141002-98	141002-98	141002-98	141002-98	141002-98	
1-5&+5@	Sample deviation (see appendix)	Lab Sample No.(s)	10104583	10104601	10104601	10104611	10104618	
		AGS Reference						

Component	LOD/Units	Method						
GRO Surrogate % recovery**	%	TM089	70	86	44	70	65	
GRO TOT (Moisture Corrected)	<44 µg/kg	TM089	24500 M	27900 M	49900 M	24800 M	50400 M	
Methyl tertiary butyl ether (MTBE)	<5 µg/kg	TM089	<5 M	<5 M	<5 M	88.2 M	<5 M	
Benzene	<10 µg/kg	TM089	<10 M	<10 M	25.4 M	18 M	<10 M	
Toluene	<2 µg/kg	TM089	<2 M	<2 M	<2 M	<2 M	<2 M	
Ethylbenzene	<3 µg/kg	TM089	<3 M	<3 M	<3 M	158 M	<3 M	
m,p-Xylene	<6 µg/kg	TM089	105 M	<6 M	<6 M	<6 M	<6 M	
o-Xylene	<3 µg/kg	TM089	457 M	<3 M	<3 M	140 M	<3 M	
sum of detected mpo xylene by GC	<9 µg/kg	TM089	562	<9	<9	140	<9	
sum of detected BTEX by GC	<24 µg/kg	TM089	562	<24	25.4	316	<24	
Aliphatics >C5-C6	<10 µg/kg	TM089	39.5	23.9	513	135	56.7	
Aliphatics >C6-C8	<10 µg/kg	TM089	2580	1870	11000	2640	5330	
Aliphatics >C8-C10	<10 µg/kg	TM089	6080	6990	14200	5910	15500	
Aliphatics >C10-C12	<10 µg/kg	TM089	6650	8630	8800	7070	11500	
Aliphatics >C12-C16	<100 µg/kg	TM173	158000	41800	653000	674000	480000	
Aliphatics >C16-C21	<100 µg/kg	TM173	178000	48000	466000	588000	548000	
Aliphatics >C21-C35	<100 µg/kg	TM173	126000	74800	639000	502000	762000	
Aliphatics >C35-C44	<100 µg/kg	TM173	12100	9410	92900	59800	87700	
Total Aliphatics >C12-C44	<100 µg/kg	TM173	475000	174000	1850000	1820000	1880000	
Aromatics >EC5-EC7	<10 µg/kg	TM089	<10	<10	25.4	18	14.6	
Aromatics >EC7-EC8	<10 µg/kg	TM089	<10	<10	<10	<10	<10	
Aromatics >EC8-EC10	<10 µg/kg	TM089	4620	4660	9490	4240	10300	
Aromatics >EC10-EC12	<10 µg/kg	TM089	4430	5750	5860	4710	7690	
Aromatics >EC12-EC16	<100 µg/kg	TM173	42600	14700	134000	167000	88300	
Aromatics >EC16-EC21	<100 µg/kg	TM173	134000	56000	217000	300000	274000	
Aromatics >EC21-EC35	<100 µg/kg	TM173	118000	102000	390000	349000	448000	
Aromatics >EC35-EC44	<100 µg/kg	TM173	10500	18700	89700	72900	88300	
Aromatics >EC40-EC44	<100 µg/kg	TM173	2300	6920	28200	24100	28800	
Total Aromatics >EC12-EC44	<100 µg/kg	TM173	305000	192000	831000	889000	899000	
Total Aliphatics & Aromatics >C5-C44	<100 µg/kg	TM173	804000	394000	2730000	2740000	2830000	
Aromatics >EC16-EC35	<100 µg/kg	TM173	252000	158000	607000	649000	722000	

CERTIFICATE OF ANALYSIS

SDG:	141002-98	**Location:**	Frodsham	**Order Number:**	ST14392
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	287762
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Table of Results - Appendix

Method No	Reference	Description	Wet/Dry Sample [1]	Surrogate Corrected
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)		
TM132	In - house Method	ELTRA CS600 Operators Guide		
TM173	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GC-FID		
TM218	Microwave extraction – EPA method 3546	Microwave extraction - EPA method 3546		

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

CERTIFICATE OF ANALYSIS

SDG:	141002-98	**Location:**	Frodsham	**Order Number:**	ST14392
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	287762
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	10104583	10104591	10104601	10104611	10104618
Customer Sample Ref.	TP-A	TP-B	TP-C	TP-D	TP-E
AGS Ref.					
Depth	1.00 - 1.00	1.50 - 1.50	2.00 - 2.00	1.50 - 1.50	2.00 - 2.00
Type	SOLID	SOLID	SOLID	SOLID	SOLID
EPH CWG (Aliphatic) GC (S)	13-Oct-2014	13-Oct-2014	13-Oct-2014	13-Oct-2014	13-Oct-2014
EPH CWG (Aromatic) GC (S)	13-Oct-2014	13-Oct-2014	13-Oct-2014	13-Oct-2014	13-Oct-2014
GRO by GC-FID (S)	14-Oct-2014	13-Oct-2014	13-Oct-2014	14-Oct-2014	13-Oct-2014
PAH by GCMS	13-Oct-2014	10-Oct-2014	10-Oct-2014	12-Oct-2014	10-Oct-2014
Sample description	03-Oct-2014	03-Oct-2014	03-Oct-2014	03-Oct-2014	03-Oct-2014
Total Organic Carbon	07-Oct-2014	07-Oct-2014	06-Oct-2014	06-Oct-2014	06-Oct-2014
TPH CWG GC (S)	14-Oct-2014	13-Oct-2014	13-Oct-2014	14-Oct-2014	13-Oct-2014

SDG:	141002-98	**Location:**	Frodsham	**Order Number:**	ST14392
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	287762
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Appendix

General

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICS and SVOC TICS.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible. The quantity of asbestos present is not determined unless specifically requested.

7. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP -No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals -total metals must be requested separately.

11. Results relate only to the items tested.

12. LODs for wet tests reported on a dry weight basis are not corrected for moisture content.

13. **Surrogate recoveries** -Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 -130 %.

14. **Product analyses** -Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5 -C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

Sample Deviations

1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Holding time exceeded before sample received**
5	**Samples exceeded holding time before presevation was performed**
§	**Sampled on date not provided**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to sampled on date**
&	**Sample Holding Time exceeded - Late arrival of instructions.**

Asbestos

Identification of Asbestos in Bulk Materials & Soils:

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

Appendix 4

Water Contamination Laboratory Testing Data

ALcontrol Laboratories

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: mkt@alcontrol.com
Website: www.alcontrol.com

Wardell Armstrong LLP
Sir Henry Doulton House
Forge Lane
Etruria
Stoke on Trent
Staffordshire
ST1 5BD

Attention: Tim Cawood

CERTIFICATE OF ANALYSIS

Date:	12 February 2015
Customer:	H_WARDELL_SKT
Sample Delivery Group (SDG):	150202-38
Your Reference:	ST13418
Location:	Frodsham
Report No:	301600

We received 13 samples on Monday February 02, 2015 and 13 of these samples were scheduled for analysis which was completed on Thursday February 12, 2015. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

[redacted]

Operations Manager

CERTIFICATE OF ANALYSIS

SDG:	150202-38	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	301600
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
10760877	BH05		0.00 - 0.00	30/01/2015
10760863	BH24		0.00 - 0.00	30/01/2015
10760848	BH29		0.00 - 0.00	29/01/2015
10760830	BH32		0.00 - 0.00	29/01/2015
10760961	SA1		0.00 - 0.00	30/01/2015
10760974	SA3		0.00 - 0.00	30/01/2015
10760986	SA4		0.00 - 0.00	30/01/2015
10761005	SA5		0.00 - 0.00	29/01/2015
10760815	SW-A		0.00 - 0.00	29/01/2015
10760893	SW-B		0.00 - 0.00	29/01/2015
10760929	SW-C		0.00 - 0.00	29/01/2015
10760911	SW-D		0.00 - 0.00	29/01/2015
10760945	SW-HOOLPOOL		0.00 - 0.00	30/01/2015

Only received samples which have had analysis scheduled will be shown on the following pages.

CERTIFICATE OF ANALYSIS

SDG:	150202-38	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	301600
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

LIQUID

Results Legend

X Test

N No Determination Possible

Lab Sample No(s)			10750877	10750863	10750848	10750930	10750961
Customer Sample Reference			BH05	BH24	BH29	BH32	SA1
AGS Reference							
Depth (m)			0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Container			1l Glass bottle (ALE 500ml Plastic (ALE2 Dissolved Metals Pr DO KIT + DO 250 m H2SO4 (ALE244) NaOH (ALE245) Vial (ALE297) ZnAc (ALE248) 1l Glass bottle (ALE 500ml Plastic (ALE2 Dissolved Metals Pr DO KIT + DO 250 m NaOH (ALE245) Vial (ALE297) ZnAc (ALE248)	1l Glass bottle (ALE 500ml Plastic (ALE2 Dissolved Metals Pr DO KIT + DO 250 m H2SO4 (ALE244) NaOH (ALE245) Vial (ALE297) ZnAc (ALE248) 1l Glass bottle (ALE 500ml Plastic (ALE2 Dissolved Metals Pr DO KIT + DO 250 m H2SO4 (ALE244) NaOH (ALE245) Vial (ALE297) ZnAc (ALE248)	1l Glass bottle (ALE 500ml Plastic (ALE2 Dissolved Metals Pr DO KIT + DO 250 m H2SO4 (ALE244) NaOH (ALE245) Vial (ALE297) ZnAc (ALE248) 1l Glass bottle (ALE 500ml Plastic (ALE2 Dissolved Metals Pr DO KIT + DO 250 m H2SO4 (ALE244) NaOH (ALE245) Vial (ALE297) ZnAc (ALE248)	1l Glass bottle (ALE 500ml Plastic (ALE2 Dissolved Metals Pr DO KIT + DO 250 m H2SO4 (ALE244) NaOH (ALE245) Vial (ALE297) ZnAc (ALE248) 1l Glass bottle (ALE 500ml Plastic (ALE2 Dissolved Metals Pr DO KIT + DO 250 m H2SO4 (ALE244) NaOH (ALE245) Vial (ALE297) ZnAc (ALE248)	1l Glass bottle (ALE 500ml Plastic (ALE2 Dissolved Metals Pr DO KIT + DO 250 m H2SO4 (ALE244) NaOH (ALE245) Vial (ALE297) ZnAc (ALE248)
Ammoniacal Nitrogen	All	NDPs: 0 Tests: 13					
				X		X	
					X		X
						X	
							X
Anions by Kone (w)	All	NDPs: 0 Tests: 13					
			X		X		X
				X		X	
							X
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 13					
			X		X		X
				X		X	
Determination of Dissolved Gases	All	NDPs: 0 Tests: 13					
			X		X		X
				X		X	
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 13					
			X		X		X
				X		X	
							X
Dissolved Oxygen by Titration	All	NDPs: 0 Tests: 13					
			X		X		X
				X		X	
EPH CWG (Aliphatic) Aqueous GC (W)	All	NDPs: 0 Tests: 13					
			X		X		X
				X		X	
							X
EPH CWG (Aromatic) Aqueous GC (W)	All	NDPs: 0 Tests: 13					
			X		X		X
				X		X	
							X
GRO by GC-FID (W)	All	NDPs: 0 Tests: 13					
			X		X		X
				X		X	
Hexavalent Chromium (w)	All	NDPs: 0 Tests: 13					
			X		X		X
				X		X	
Mercury Dissolved	All	NDPs: 0 Tests: 13					
				X		X	
					X		X
Metals by iCap-OES Unfiltered (W)	All	NDPs: 0 Tests: 13					
			X		X		X
				X		X	
							X
PAH Spec MS - Aqueous (W)	All	NDPs: 0 Tests: 13					
			X		X		X
				X		X	
							X
PCB Congeners - Aqueous (W)	All	NDPs: 0 Tests: 13					
			X		X		X
				X		X	
							X
pH Value	All	NDPs: 0 Tests: 13					
			X		X		X
				X		X	

CERTIFICATE OF ANALYSIS

SDG:	150202-38	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	301600
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

LIQUID

Results Legend

X Test

N No Determination Possible

Lab Sample No(s)			10750877	10750863	10750848	10750930	10750961
Customer Sample Reference			BH05	BH24	BH29	BH32	SA1
AGS Reference							
Depth (m)			0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Container			1l Glass bottle (ALE	1l Glass bottle (ALE	1l Glass bottle (ALE	1l Glass bottle (ALE	1l Glass bottle (ALE
			500ml Plastic (ALE2	500ml Plastic (ALE2	500ml Plastic (ALE2	500ml Plastic (ALE2	500ml Plastic (ALE2
			Dissolved Metals Pr	Dissolved Metals Pr	Dissolved Metals Pr	Dissolved Metals Pr	Dissolved Metals Pr
			DO KIT + DO 250 m	DO KIT + DO 250 m	DO KIT + DO 250 m	DO KIT + DO 250 m	DO KIT + DO 250 m
			H2SO4 (ALE244)	H2SO4 (ALE244)	H2SO4 (ALE244)	H2SO4 (ALE244)	H2SO4 (ALE244)
			NaOH (ALE245)	NaOH (ALE245)	NaOH (ALE245)	NaOH (ALE245)	NaOH (ALE245)
			Vial (ALE297)	Vial (ALE297)	Vial (ALE297)	Vial (ALE297)	Vial (ALE297)
			ZnAc (ALE248)	ZnAc (ALE248)	ZnAc (ALE248)	ZnAc (ALE248)	ZnAc (ALE248)
Phenols by HPLC (W)	All	NDPs: 0 Tests: 13		X		X	
Sulphide	All	NDPs: 0 Tests: 13		X		X		X		X
TPH CWG (W)	All	NDPs: 0 Tests: 13	X		X		X		X	

CERTIFICATE OF ANALYSIS

SDG:	150202-38	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	301600
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

LIQUID

Results Legend

X Test

N No Determination Possible

Lab Sample No(s)	10750974	10750983	10751005	10750915	10750893	10750929
Customer Sample Reference	SA3	SA4	SA5	SW-A	SW-B	SW-C
AGS Reference						
Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00

| Container | 1l Glass bottle (ALE | 500ml Plastic (ALE2 | Dissolved Metals Pr | DO KIT + DO 250 m | H2SO4 (ALE244) | NaOH (ALE245) | Vial (ALE297) | ZnAc (ALE248)

CERTIFICATE OF ANALYSIS

SDG:	150202-38	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	301600
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

LIQUID

Results Legend

X Test

N No Determination Possible

Lab Sample No(s)		10730974	10730983	10731005	10730915	10730893	10730929
Customer Sample Reference		SA3	SA4	SA5	SW-A	SW-B	SW-C
AGS Reference							
Depth (m)		0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Container		1l Glass bottle (ALE	1l Glass bottle (ALE	1l Glass bottle (ALE	1l Glass bottle (ALE	1l Glass bottle (ALE	1l Glass bottle (ALE
Phenols by HPLC (W)	All	NDPs: 0 Tests: 13		X		X		X	
Sulphide	All	NDPs: 0 Tests: 13		X		X		X	
TPH CWG (W)	All	NDPs: 0 Tests: 13	X	X	X	X	X	X	X

CERTIFICATE OF ANALYSIS

SDG:	150202-38	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	301600
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

LIQUID

Results Legend

X Test

N No Determination Possible

Lab Sample No(s)			10750929	10750911	10750945
Customer Sample Reference			SW-C	SW-D	SW-HOOLPOOL
AGS Reference					
Depth (m)			0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Container			500ml Plastic (ALE2 Dissolved Metals Pr DO KIT + DO 250 m H2SO4 (ALE244) NaOH (ALE245) Vial (ALE297) ZnAc (ALE243)	1l Glass bottle (ALE 500ml Plastic (ALE2 Dissolved Metals Pr DO KIT + DO 250 m H2SO4 (ALE244) NaOH (ALE245) Vial (ALE297) ZnAc (ALE243)	1l Glass bottle (ALE 500ml Plastic (ALE2 Dissolved Metals Pr DO KIT + DO 250 m H2SO4 (ALE244) NaOH (ALE245) Vial (ALE297) ZnAc (ALE243)
Ammoniacal Nitrogen	All	NDPs: 0 Tests: 13			
Anions by Kone (w)	All	NDPs: 0 Tests: 13	X	X	X
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 13			
Determination of Dissolved Gases	All	NDPs: 0 Tests: 13			
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 13	X	X	X
Dissolved Oxygen by Titration	All	NDPs: 0 Tests: 13			
EPH CWG (Aliphatic) Aqueous GC (W)	All	NDPs: 0 Tests: 13		X	X
EPH CWG (Aromatic) Aqueous GC (W)	All	NDPs: 0 Tests: 13		X	X
GRO by GC-FID (W)	All	NDPs: 0 Tests: 13			
Hexavalent Chromium (w)	All	NDPs: 0 Tests: 13	X	X	X
Mercury Dissolved	All	NDPs: 0 Tests: 13			
Metals by iCap-OES Unfiltered (W)	All	NDPs: 0 Tests: 13	X	X	X
PAH Spec MS - Aqueous (W)	All	NDPs: 0 Tests: 13		X	X
PCB Congeners - Aqueous (W)	All	NDPs: 0 Tests: 13		X	X
pH Value	All	NDPs: 0 Tests: 13	X	X	X

CERTIFICATE OF ANALYSIS

SDG:	150202-38	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	301600
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

LIQUID

Results Legend

X Test

N No Determination Possible

Lab Sample No(s)			10750929	10750911	10750945
Customer Sample Reference			SW-C	SW-D	SW-HOOLPOOL
AGS Reference					
Depth (m)			0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Container			500ml Plastic (ALE2 Dissolved Metals Pr DO KIT + DO 250 m H2SO4 (ALE244) NaOH (ALE245) Vial (ALE297) ZnAc (ALE243) 1l Glass bottle (ALE 500ml Plastic (ALE2 Dissolved Metals Pr DO KIT + DO 250 m H2SO4 (ALE244) NaOH (ALE245) Vial (ALE297) ZnAc (ALE243) 1l Glass bottle (ALE 500ml Plastic (ALE2 Dissolved Metals Pr DO KIT + DO 250 m H2SO4 (ALE244) NaOH (ALE245) Vial (ALE297) ZnAc (ALE243)
Phenols by HPLC (W)	All	NDPs: 0 Tests: 13		X			X			X	
Sulphide	All	NDPs: 0 Tests: 13			X			X			X
TPH CWG (W)	All	NDPs: 0 Tests: 13				X			X		

CERTIFICATE OF ANALYSIS

SDG:	150202-38	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	301600
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+&@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	BH05	BH24	BH29	BH32	SA1	SA3
			Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
			Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
			Date Sampled	30/01/2015	30/01/2015	29/01/2015	29/01/2015	30/01/2015	30/01/2015
			Sample Time						
			Date Received	02/02/2015	02/02/2015	02/02/2015	02/02/2015	02/02/2015	02/02/2015
			SDG Ref	150202-38	150202-38	150202-38	150202-38	150202-38	150202-38
			Lab Sample No.(s)	10760877	10760863	10760848	10760830	10760961	10760974
			AGS Reference						
Ammoniacal Nitrogen as N	<0.2 mg/l	TM099		9.99 #	2.01 #	92 #	51.1 #	1.22 #	<0.2 #
Sulphide	<0.01 mg/l	TM101		<0.01 #	0.0151 #	<0.01 #	<0.01 #	0.0381 #	0.186 #
Arsenic (diss.filt)	<0.12 µg/l	TM152		5.24 #	10.2 #	73.4 #	26.5 #	4.56 #	5.28 #
Boron (diss.filt)	<9.4 µg/l	TM152		2750 #	840 #	1840 #	2120 #	765 #	42.5 #
Cadmium (diss.filt)	<0.1 µg/l	TM152		<0.1 #	<0.1 #	0.158 #	<0.1 #	0.404 #	<0.1 #
Chromium (diss.filt)	<0.22 µg/l	TM152		6.29 #	2.62 #	11.1 #	12.1 #	3.11 #	1.18 #
Copper (diss.filt)	<0.85 µg/l	TM152		1.02 #	5.91 #	2.39 #	0.975 #	17.1 #	<0.85 #
Lead (diss.filt)	<0.02 µg/l	TM152		0.223 #	0.068 #	0.271 #	0.088 #	0.117 #	<0.02 #
Nickel (diss.filt)	<0.15 µg/l	TM152		5.7 #	6.18 #	11.4 #	3.5 #	24.9 #	0.501 #
Selenium (diss.filt)	<0.39 µg/l	TM152		4.25 #	8.12 #	<0.39 #	15.9 #	5.4 #	2.28 #
Zinc (diss.filt)	<0.41 µg/l	TM152		7.92 #	6.27 #	9.59 #	2.75 #	54.5 #	<0.41 #
Mercury (diss.filt)	<0.01 µg/l	TM183		<0.01 #	<0.01 #	<0.01 #	0.0136 #	<0.01 #	<0.01 #
Sulphate	<2 mg/l	TM184		160 #	473 #	<2 #	<2 #	735 #	26.6 #
Chloride	<2 mg/l	TM184		365 #	301 #	6870 #	1410 #	744 #	52.1 #
Nitrate as NO3	<0.3 mg/l	TM184		<0.3 #	93.7 #	<0.3 #	<0.3 #	<0.3 #	0.633 #
Oxygen, dissolved	<0.3 mg/l	TM187		<0.3 #	1.84 #	<0.3 #	<0.3 #	3.5 #	3.09 #
PCB congener 118	<0.015 µg/l	TM197		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 77	<0.015 µg/l	TM197		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 81	<0.015 µg/l	TM197		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 105	<0.015 µg/l	TM197		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 114	<0.015 µg/l	TM197		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 123	<0.015 µg/l	TM197		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 126	<0.015 µg/l	TM197		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 156	<0.015 µg/l	TM197		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 157	<0.015 µg/l	TM197		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 167	<0.015 µg/l	TM197		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 169	<0.015 µg/l	TM197		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 189	<0.015 µg/l	TM197		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Methane, dissolved	<1 µg/l	TM223		4290	1.41	12800	6120	7360	<2.25
Cyanide, Total	<0.05 mg/l	TM227		<0.05 @#	<0.05 #	<0.05 @#	<0.05 #	<0.05 #	<0.05 @#
Cyanide, Free	<0.05 mg/l	TM227		<0.05 @#	<0.05 #	<0.05 @#	<0.05 #	<0.05 #	<0.05 @#
Hardness, Total as CaCO3 unfiltered	<0.35 mg/l	TM228		753	2380	3740	1250	1340	219

CERTIFICATE OF ANALYSIS

SDG:	150202-38	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	301600
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
^^	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	BH05	BH24	BH29	BH32	SA1	SA3
			Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
			Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
			Date Sampled	30/01/2015	30/01/2015	29/01/2015	29/01/2015	30/01/2015	30/01/2015
			Sample Time	-	-	-	-	-	-
			Date Received	02/02/2015	02/02/2015	02/02/2015	02/02/2015	02/02/2015	02/02/2015
			SDG Ref	150202-38	150202-38	150202-38	150202-38	150202-38	150202-38
			Lab Sample No.(s)	10760877	10760863	10760848	10760830	10760961	10760974
			AGS Reference						
Chromium, Hexavalent	<0.03 mg/l	TM241		<0.03 #	<0.03 #	<0.03 #	<0.03 #	<0.03 #	<0.03 #
pH	<1 pH Units	TM256		7.38 #	7.75 #	7.34 #	7.71 #	7.19 #	7.99 #
Phenol	<0.002 mg/l	TM259		<0.002 #	<0.002 #	<0.002 #	<0.002 #	<0.002 #	<0.002 #
Cresols	<0.006 mg/l	TM259		<0.006 #	<0.006 #	<0.006 #	0.01 #	0.01 #	<0.006 #
Xylenols	<0.008 mg/l	TM259		<0.008 #	<0.008 #	<0.008 #	<0.008 #	<0.008 #	<0.008 #
Phenols, Total Detected monohydric	<0.016 mg/l	TM259		<0.016 #	<0.016 #	<0.016 #	<0.016 #	<0.016 #	<0.016 #

CERTIFICATE OF ANALYSIS

SDG:	150202-38	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	301600
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+&@	Sample deviation (see appendix)

Customer Sample R	SA4	SA5	SW-A	SW-B	SW-C	SW-D
Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
Date Sampled	30/01/2015	29/01/2015	29/01/2015	29/01/2015	29/01/2015	29/01/2015
Sample Time						
Date Received	02/02/2015	02/02/2015	02/02/2015	02/02/2015	02/02/2015	02/02/2015
SDG Ref	150202-38	150202-38	150202-38	150202-38	150202-38	150202-38
Lab Sample No.(s)	10760986	10761005	10760815	10760893	10760929	10760911
AGS Reference						

Component	LOD/Units	Method	SA4	SA5	SW-A	SW-B	SW-C	SW-D
Ammoniacal Nitrogen as N	<0.2 mg/l	TM099	41 #	32.7 #	<0.2 #	0.345 #	<0.2 #	0.269 #
Sulphide	<0.01 mg/l	TM101	0.267 #	0.0723 #	0.0125 #	0.0837 #	<0.01 #	0.117 #
Arsenic (diss.filt)	<0.12 µg/l	TM152	12.7 #	44.1 #	6.08 #	8.06 #	10.8 #	6.47 #
Boron (diss.filt)	<9.4 µg/l	TM152	1930 #	1700 #	384 #	308 #	494 #	300 #
Cadmium (diss.filt)	<0.1 µg/l	TM152	0.317 #	<0.1 #	0.132 #	0.19 #	0.102 #	0.145 #
Chromium (diss.filt)	<0.22 µg/l	TM152	6.6 #	11.1 #	1.68 #	2.22 #	2.82 #	3.14 #
Copper (diss.filt)	<0.85 µg/l	TM152	20.3 #	3.91 #	24.8 #	31.9 #	61.8 #	37.9 #
Lead (diss.filt)	<0.02 µg/l	TM152	1.68 #	0.141 #	0.159 #	0.341 #	0.26 #	0.404 #
Nickel (diss.filt)	<0.15 µg/l	TM152	15.4 #	4.11 #	5.51 #	4.6 #	4.68 #	4.06 #
Selenium (diss.filt)	<0.39 µg/l	TM152	10.3 #	8.9 #	2.87 #	2.43 #	10.8 #	3.92 #
Zinc (diss.filt)	<0.41 µg/l	TM152	31.4 #	8.55 #	9.43 #	5.49 #	3.58 #	9.76 #
Mercury (diss.filt)	<0.01 µg/l	TM183	0.0209 #	<0.01 #	0.274 #	0.189 #	0.172 #	0.162 #
Sulphate	<2 mg/l	TM184	815 #	93.4 #	381 #	218 #	181 #	212 #
Chloride	<2 mg/l	TM184	2180 #	295 #	157 #	149 #	204 #	185 #
Nitrate as NO3	<0.3 mg/l	TM184	1.25 #	<0.3 #	<0.3 #	2.42 #	14.4 #	<0.3 #
Oxygen, dissolved	<0.3 mg/l	TM187	0.36 #	1.05 #	14 #	14.1 #	16.4 #	12.4 #
PCB congener 118	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 77	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 81	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 105	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 114	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 123	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 126	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 156	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 157	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 167	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 169	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 189	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Methane, dissolved	<1 µg/l	TM223	9840	13100	1.66	3.28	2.45	2.92
Cyanide, Total	<0.05 mg/l	TM227	<0.05 #	<0.05 @#	<0.05 @#	<0.05 #	<0.05 #	<0.05 @#
Cyanide, Free	<0.05 mg/l	TM227	<0.05 #	<0.05 @#	<0.05 @#	<0.05 #	<0.05 #	<0.05 @#
Hardness, Total as CaCO3 unfiltered	<0.35 mg/l	TM228	1620	936	559	492	468	410

CERTIFICATE OF ANALYSIS

SDG:	150202-38	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	301600
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
^^	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+$@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	SA4	SA5	SW-A	SW-B	SW-C	SW-D
			Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
			Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
			Date Sampled	30/01/2015	29/01/2015	29/01/2015	29/01/2015	29/01/2015	29/01/2015
			Sample Time	-	-	-	-	-	-
			Date Received	02/02/2015	02/02/2015	02/02/2015	02/02/2015	02/02/2015	02/02/2015
			SDG Ref	150202-38	150202-38	150202-38	150202-38	150202-38	150202-38
			Lab Sample No.(s)	10760986	10761005	10760815	10760893	10760929	10760911
			AGS Reference						
Chromium, Hexavalent	<0.03 mg/l	TM241		<0.03 #	<0.03 #	<0.03 #	<0.03 #	<0.03 #	<0.03 #
pH	<1 pH Units	TM256		7.21 #	7.36 #	8.16 #	7.97 #	8.07 #	7.71 #
Phenol	<0.002 mg/l	TM259		<0.002 #	<0.002 #	<0.002 #	<0.002 2 #	<0.002 #	<0.002 #
Cresols	<0.006 mg/l	TM259		<0.006 #	<0.006 #	<0.006 #	<0.006 2 #	<0.006 #	<0.006 #
Xylenols	<0.008 mg/l	TM259		<0.008 #	<0.008 #	<0.008 #	<0.008 2 #	<0.008 #	<0.008 #
Phenols, Total Detected monohydric	<0.016 mg/l	TM259		<0.016 #	<0.016 #	<0.016 #	<0.016 2 #	<0.016 #	<0.016 #

CERTIFICATE OF ANALYSIS

SDG:	150202-38	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	301600
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend	
#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+&@	Sample deviation (see appendix)

	Customer Sample R
	SW-HOOLPOOL
Depth (m)	0.00 - 0.00
Sample Type	Water(GW/SW)
Date Sampled	30/01/2015
Sample Time	
Date Received	02/02/2015
SDG Ref	150202-38
Lab Sample No.(s)	10760945
AGS Reference	

Component	LOD/Units	Method	
Ammoniacal Nitrogen as N	<0.2 mg/l	TM099	1.57 #
Sulphide	<0.01 mg/l	TM101	0.0395 #
Arsenic (diss.filt)	<0.12 µg/l	TM152	3.95 #
Boron (diss.filt)	<9.4 µg/l	TM152	62.5 #
Cadmium (diss.filt)	<0.1 µg/l	TM152	<0.1 #
Chromium (diss.filt)	<0.22 µg/l	TM152	8.64 #
Copper (diss.filt)	<0.85 µg/l	TM152	6.4 #
Lead (diss.filt)	<0.02 µg/l	TM152	0.405 #
Nickel (diss.filt)	<0.15 µg/l	TM152	3.6 #
Selenium (diss.filt)	<0.39 µg/l	TM152	7.66 #
Zinc (diss.filt)	<0.41 µg/l	TM152	11.4 #
Mercury (diss.filt)	<0.01 µg/l	TM183	<0.01 #
Sulphate	<2 mg/l	TM184	85.4 #
Chloride	<2 mg/l	TM184	190 #
Nitrate as NO3	<0.3 mg/l	TM184	37.4 #
Oxygen, dissolved	<0.3 mg/l	TM187	9.04 #
PCB congener 118	<0.015 µg/l	TM197	<0.015
PCB congener 77	<0.015 µg/l	TM197	<0.015
PCB congener 81	<0.015 µg/l	TM197	<0.015
PCB congener 105	<0.015 µg/l	TM197	<0.015
PCB congener 114	<0.015 µg/l	TM197	<0.015
PCB congener 123	<0.015 µg/l	TM197	<0.015
PCB congener 126	<0.015 µg/l	TM197	<0.015
PCB congener 156	<0.015 µg/l	TM197	<0.015
PCB congener 157	<0.015 µg/l	TM197	<0.015
PCB congener 167	<0.015 µg/l	TM197	<0.015
PCB congener 169	<0.015 µg/l	TM197	<0.015
PCB congener 189	<0.015 µg/l	TM197	<0.015
Methane, dissolved	<1 µg/l	TM223	2.71
Cyanide, Total	<0.05 mg/l	TM227	<0.05 @#
Cyanide, Free	<0.05 mg/l	TM227	<0.05 @#
Hardness, Total as CaCO3 unfiltered	<0.35 mg/l	TM228	278

CERTIFICATE OF ANALYSIS

SDG:	150202-38	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	301600
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
^^	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

	Customer Sample R	Depth (m)	Sample Type	Date Sampled	Sample Time	Date Received	SDG Ref	Lab Sample No.(s)	AGS Reference
	SW-HODLPOOL	0.00 - 0.00	Water(GW/SW)	30/01/2015	-	02/02/2015	150202-38	10760945	

Component	LOD/Units	Method	
Chromium, Hexavalent	<0.03 mg/l	TM241	<0.03 #
pH	<1 pH Units	TM256	7.65 #
Phenol	<0.002 mg/l	TM259	<0.002 #
Cresols	<0.006 mg/l	TM259	<0.006 #
Xylenols	<0.008 mg/l	TM259	<0.008 #
Phenols, Total Detected monohydric	<0.016 mg/l	TM259	<0.016 #

CERTIFICATE OF ANALYSIS

SDG:	150202-38	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	301600
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

PAH Spec MS - Aqueous (W)

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+&@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	BH05	BH24	BH29	BH32	SA1	SA3
			Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
			Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
			Date Sampled	30/01/2015	30/01/2015	29/01/2015	29/01/2015	30/01/2015	30/01/2015
			Sample Time						
			Date Received	02/02/2015	02/02/2015	02/02/2015	02/02/2015	02/02/2015	02/02/2015
			SDG Ref	150202-38	150202-38	150202-38	150202-38	150202-38	150202-38
			Lab Sample No.(s)	10760877	10760863	10760848	10760830	10760961	10760974
			AGS Reference						
Naphthalene (aq)	<0.1 µg/l	TM178		0.13 #	<0.1 #	0.172 #	0.173 #	0.115 #	<0.1 #
Acenaphthene (aq)	<0.015 µg/l	TM178		0.16 #	0.0225 #	0.0568 #	0.166 #	0.045 #	<0.015 #
Acenaphthylene (aq)	<0.011 µg/l	TM178		0.0775 #	0.0494 #	0.0638 #	0.0436 #	0.0184 #	0.0127 #
Fluoranthene (aq)	<0.017 µg/l	TM178		0.614 #	0.63 #	0.641 #	0.413 #	0.129 #	<0.017 #
Anthracene (aq)	<0.015 µg/l	TM178		0.234 #	0.072 #	0.142 #	0.0796 #	0.098 #	<0.015 #
Phenanthrene (aq)	<0.022 µg/l	TM178		0.256 #	0.315 #	0.281 #	0.292 #	0.217 #	<0.022 #
Fluorene (aq)	<0.014 µg/l	TM178		0.156 #	0.0493 #	0.0543 #	0.108 #	0.0733 #	<0.014 #
Chrysene (aq)	<0.013 µg/l	TM178		0.348 #	0.572 #	0.614 #	0.195 #	0.024 #	0.0143 #
Pyrene (aq)	<0.015 µg/l	TM178		0.74 #	0.602 #	0.601 #	0.362 #	0.105 #	<0.015 #
Benzo(a)anthracene (aq)	<0.017 µg/l	TM178		0.3 #	0.557 #	0.571 #	0.212 #	0.018 #	<0.017 #
Benzo(b)fluoranthene (aq)	<0.023 µg/l	TM178		0.488 #	1.48 #	1.62 #	0.343 #	<0.023 #	<0.023 #
Benzo(k)fluoranthene (aq)	<0.027 µg/l	TM178		0.176 #	0.557 #	0.65 #	0.137 #	<0.027 #	<0.027 #
Benzo(a)pyrene (aq)	<0.009 µg/l	TM178		0.396 #	1.11 #	1.25 #	0.257 #	0.0155 #	0.0145 #
Dibenzo(a,h)anthracene (aq)	<0.016 µg/l	TM178		0.0812 #	0.24 #	0.304 #	0.0528 #	<0.016 #	<0.016 #
Benzo(g,h,i)perylene (aq)	<0.016 µg/l	TM178		0.328 #	0.981 #	1.16 #	0.199 #	<0.016 #	<0.016 #
Indeno(1,2,3-cd)pyrene (aq)	<0.014 µg/l	TM178		0.256 #	0.982 #	1.17 #	0.206 #	<0.014 #	0.0142 #
PAH, Total Detected USEPA 16 (aq)	<0.344 µg/l	TM178		4.74	8.22	9.36	3.24	0.857	<0.344

CERTIFICATE OF ANALYSIS

SDG:	150202-38	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	301600
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

PAH Spec MS - Aqueous (W)

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+&@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	SA4	SA5	SW-A	SW-B	SW-C	SW-D
			Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
			Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
			Date Sampled	30/01/2015	29/01/2015	29/01/2015	29/01/2015	29/01/2015	29/01/2015
			Sample Time						
			Date Received	02/02/2015	02/02/2015	02/02/2015	02/02/2015	02/02/2015	02/02/2015
			SDG Ref	150202-38	150202-38	150202-38	150202-38	150202-38	150202-38
			Lab Sample No.(s)	10760986	10761005	10760815	10760893	10760929	10760911
			AGS Reference						
Naphthalene (aq)	<0.1 µg/l	TM178		0.121 #	<0.1 #	<0.1 #	<0.1 #	<0.2 #	<0.5 #
Acenaphthene (aq)	<0.015 µg/l	TM178		0.0999 #	0.305 #	<0.015 #	<0.015 #	<0.03 #	<0.075 #
Acenaphthylene (aq)	<0.011 µg/l	TM178		0.0376 #	0.0419 #	0.0137 #	0.0259 #	0.036 #	0.0779 #
Fluoranthene (aq)	<0.017 µg/l	TM178		0.103 #	0.309 #	<0.017 #	0.0594 #	0.0422 #	0.097 #
Anthracene (aq)	<0.015 µg/l	TM178		0.202 #	0.0968 #	0.0193 #	0.0271 #	0.047 #	0.0757 #
Phenanthrene (aq)	<0.022 µg/l	TM178		0.145 #	0.107 #	<0.022 #	0.0325 #	<0.044 #	<0.11 #
Fluorene (aq)	<0.014 µg/l	TM178		0.082 #	0.2 #	0.0157 #	0.0187 #	<0.028 #	<0.07 #
Chrysene (aq)	<0.013 µg/l	TM178		0.0536 #	0.0901 #	0.015 #	0.0497 #	0.0505 #	0.116 #
Pyrene (aq)	<0.015 µg/l	TM178		0.129 #	0.234 #	0.0203 #	0.0638 #	0.0399 #	0.103 #
Benzo(a)anthracene (aq)	<0.017 µg/l	TM178		0.0585 #	0.104 #	<0.017 #	0.0643 #	0.0577 #	0.114 #
Benzo(b)fluoranthene (aq)	<0.023 µg/l	TM178		0.08 #	0.157 #	<0.023 #	0.109 #	0.0733 #	0.227 #
Benzo(k)fluoranthene (aq)	<0.027 µg/l	TM178		0.0349 #	0.0669 #	<0.027 #	0.0461 #	<0.054 #	<0.135 #
Benzo(a)pyrene (aq)	<0.009 µg/l	TM178		0.0544 #	0.108 #	0.0133 #	0.0777 #	0.0599 #	0.158 #
Dibenzo(a,h)anthracene (aq)	<0.016 µg/l	TM178		0.0193 #	0.0283 #	<0.016 #	0.0329 #	0.0388 #	0.086 #
Benzo(g,h,i)perylene (aq)	<0.016 µg/l	TM178		0.0566 #	0.0839 #	0.0163 #	0.122 #	0.0761 #	0.227 #
Indeno(1,2,3-cd)pyrene (aq)	<0.014 µg/l	TM178		0.0507 #	0.0879 #	0.0161 #	0.101 #	0.0819 #	0.219 #
PAH, Total Detected USEPA 16 (aq)	<0.344 µg/l	TM178		1.33	2.02	<0.344	0.83	0.738	1.81

CERTIFICATE OF ANALYSIS

SDG:	150202-38	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	301600
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

PAH Spec MS - Aqueous (W)

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+&@	Sample deviation (see appendix)

Customer Sample R	SW-HOOLPOOL
Depth (m)	0.00 - 0.00
Sample Type	Water(GW/SW)
Date Sampled	30/01/2015
Sample Time	
Date Received	02/02/2015
SDG Ref	150202-38
Lab Sample No.(s)	10760945
AGS Reference	

Component	LOD/Units	Method	
Naphthalene (aq)	<0.1 µg/l	TM178	<0.1 #
Acenaphthene (aq)	<0.015 µg/l	TM178	<0.015 #
Acenaphthylene (aq)	<0.011 µg/l	TM178	0.0121 #
Fluoranthene (aq)	<0.017 µg/l	TM178	0.0507 #
Anthracene (aq)	<0.015 µg/l	TM178	0.0151 #
Phenanthrene (aq)	<0.022 µg/l	TM178	0.0266 #
Fluorene (aq)	<0.014 µg/l	TM178	0.014 #
Chrysene (aq)	<0.013 µg/l	TM178	0.0401 #
Pyrene (aq)	<0.015 µg/l	TM178	0.0495 #
Benzo(a)anthracene (aq)	<0.017 µg/l	TM178	0.0306 #
Benzo(b)fluoranthene (aq)	<0.023 µg/l	TM178	0.059 #
Benzo(k)fluoranthene (aq)	<0.027 µg/l	TM178	0.0312 #
Benzo(a)pyrene (aq)	<0.009 µg/l	TM178	0.0412 #
Dibenzo(a,h)anthracene (aq)	<0.016 µg/l	TM178	<0.016 #
Benzo(g,h,i)perylene (aq)	<0.016 µg/l	TM178	0.0426 #
Indeno(1,2,3-cd)pyrene (aq)	<0.014 µg/l	TM178	0.0447 #
PAH, Total Detected USEPA 16 (aq)	<0.344 µg/l	TM178	0.457

CERTIFICATE OF ANALYSIS

SDG:	150202-38	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	301600
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

TPH CWG (W)

Results Legend			Customer Sample R	BH05	BH24	BH29	BH32	SA1	SA3
#	ISO17025 accredited.								
M	mCERTS accredited.								
aq	Aqueous / settled sample.		Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
diss.filt	Dissolved / filtered sample.		Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
tot.unfilt	Total / unfiltered sample.		Date Sampled	30/01/2015	30/01/2015	29/01/2015	29/01/2015	30/01/2015	30/01/2015
*	Subcontracted test.		Sample Time						
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery		Date Received	02/02/2015	02/02/2015	02/02/2015	02/02/2015	02/02/2015	02/02/2015
			SDG Ref	150202-38	150202-38	150202-38	150202-38	150202-38	150202-38
(F)	Trigger breach confirmed		Lab Sample No.(s)	10760877	10760863	10760848	10760830	10760961	10760974
1-5&+5@	Sample deviation (see appendix)		AGS Reference						
Component		**LOD/Units**	**Method**						
CRO Surrogate % recovery**		%	TM245	78 1	77	72 1	87	90	83
CRO >C5-C12		<50 µg/l	TM245	57 1 #	<50 #	52 1 #	<50 #	<50 #	<50 #
Methyl tertiary butyl ether (MTBE)		<3 µg/l	TM245	<3 1 #	<3 #	<3 1 #	<3 #	<3 #	<3 #
Benzene		<7 µg/l	TM245	<7 1 #	<7 #	<7 1 #	<7 #	<7 #	<7 #
Toluene		<4 µg/l	TM245	<4 1 #	<4 #	<4 1 #	<4 #	<4 #	<4 #
Ethylbenzene		<5 µg/l	TM245	<5 1 #	<5 #	<5 1 #	<5 #	<5 #	<5 #
m,p-Xylene		<8 µg/l	TM245	<8 1 #	<8 #	<8 1 #	<8 #	<8 #	<8 #
o-Xylene		<3 µg/l	TM245	<3 1 #	<3 #	<3 1 #	<3 #	<3 #	<3 #
Sum of detected Xylenes		<11 µg/l	TM245	<11 1	<11	<11 1	<11	<11	<11
Sum of detected BTEX		<28 µg/l	TM245	<28 1	<28	<28 1	<28	<28	<28
Aliphatics >C5-C6		<10 µg/l	TM245	<10 1	<10	<10 1	<10	<10	<10
Aliphatics >C6-C8		<10 µg/l	TM245	<10 1	<10	<10 1	<10	<10	<10
Aliphatics >C8-C10		<10 µg/l	TM245	10 1	<10	10 1	<10	<10	<10
Aliphatics >C10-C12		<10 µg/l	TM245	17 1	<10	13 1	<10	<10	<10
Aliphatics >C12-C16 (aq)		<10 µg/l	TM174	122	<10	513	<10	<10	<10
Aliphatics >C16-C21 (aq)		<10 µg/l	TM174	182	14	58	<10	<10	<10
Aliphatics >C21-C35 (aq)		<10 µg/l	TM174	404	53	262	<10	<10	23
Total Aliphatics >C12-C35 (aq)		<10 µg/l	TM174	708	67	833	<10	<10	23
Aromatics >EC5-EC7		<10 µg/l	TM245	<10 1	<10	<10 1	<10	<10	<10
Aromatics >EC7-EC8		<10 µg/l	TM245	<10 1	<10	<10 1	<10	<10	<10
Aromatics >EC8-EC10		<10 µg/l	TM245	<10 1	<10	<10 1	<10	<10	<10
Aromatics >EC10-EC12		<10 µg/l	TM245	11 1	<10	<10 1	<10	<10	<10
Aromatics >EC12-EC16 (aq)		<10 µg/l	TM174	44	<10	20	<10	<10	<10
Aromatics >EC16-EC21 (aq)		<10 µg/l	TM174	116	<10	35	<10	<10	<10
Aromatics >EC21-EC35 (aq)		<10 µg/l	TM174	237	20	132	<10	<10	<10
Total Aromatics >EC12-EC35 (aq)		<10 µg/l	TM174	397	20	187	<10	<10	<10
Total Aliphatics & Aromatics >C5-35 (aq)		<10 µg/l	TM174	1160	100	1070	<10	<10	27

CERTIFICATE OF ANALYSIS

SDG:	150202-38	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	301600
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

TPH CWG (W)

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+5@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	SA4	SA5	SW-A	SW-B	SW-C	SW-D
			Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
			Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
			Date Sampled	30/01/2015	29/01/2015	29/01/2015	29/01/2015	29/01/2015	29/01/2015
			Sample Time						
			Date Received	02/02/2015	02/02/2015	02/02/2015	02/02/2015	02/02/2015	02/02/2015
			SDG Ref	150202-38	150202-38	150202-38	150202-38	150202-38	150202-38
			Lab Sample No.(s)	10760986	10761005	10760815	10760893	10760929	10760911
			AGS Reference						
CRO Surrogate % recovery**	%	TM245		74	82	84	84	83	85
CRO >C5-C12	<50 µg/l	TM245		<50 #	<50 #	<50 #	<50 #	<50 #	<50 #
Methyl tertiary butyl ether (MTBE)	<3 µg/l	TM245		<3 #	<3 #	<3 #	<3 #	<3 #	<3 #
Benzene	<7 µg/l	TM245		<7 #	<7 #	<7 #	<7 #	<7 #	<7 #
Toluene	<4 µg/l	TM245		<4 #	<4 #	<4 #	<4 #	<4 #	<4 #
Ethylbenzene	<5 µg/l	TM245		<5 #	<5 #	<5 #	<5 #	<5 #	<5 #
m,p-Xylene	<8 µg/l	TM245		<8 #	<8 #	<8 #	<8 #	<8 #	<8 #
o-Xylene	<3 µg/l	TM245		<3 #	<3 #	<3 #	<3 #	<3 #	<3 #
Sum of detected Xylenes	<11 µg/l	TM245		<11	<11	<11	<11	<11	<11
Sum of detected BTEX	<28 µg/l	TM245		<28	<28	<28	<28	<28	<28
Aliphatics >C5-C6	<10 µg/l	TM245		<10	<10	<10	<10	<10	<10
Aliphatics >C6-C8	<10 µg/l	TM245		13	<10	<10	<10	<10	<10
Aliphatics >C8-C10	<10 µg/l	TM245		<10	<10	<10	<10	<10	<10
Aliphatics >C10-C12	<10 µg/l	TM245		<10	<10	<10	<10	<10	<10
Aliphatics >C12-C16 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	25
Aliphatics >C16-C21 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	58
Aliphatics >C21-C35 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	124
Total Aliphatics >C12-C35 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	207
Aromatics >EC5-EC7	<10 µg/l	TM245		<10	<10	<10	<10	<10	<10
Aromatics >EC7-EC8	<10 µg/l	TM245		<10	<10	<10	<10	<10	<10
Aromatics >EC8-EC10	<10 µg/l	TM245		<10	<10	<10	<10	<10	<10
Aromatics >EC10-EC12	<10 µg/l	TM245		<10	<10	<10	<10	<10	<10
Aromatics >EC12-EC16 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	<10
Aromatics >EC16-EC21 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	18
Aromatics >EC21-EC35 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	90
Total Aromatics >EC12-EC35 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	108
Total Aliphatics & Aromatics >C5-35 (aq)	<10 µg/l	TM174		46	<10	<10	<10	<10	326

CERTIFICATE OF ANALYSIS

SDG:	150202-38	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	301600
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

TPH CWG (W)

Results Legend	
#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+$@	Sample deviation (see appendix)

Customer Sample R	SW-HOOLPOOL
Depth (m)	0.00 - 0.00
Sample Type	Water(GW/SW)
Date Sampled	30/01/2015
Sample Time	
Date Received	02/02/2015
SDG Ref	150202-38
Lab Sample No.(s)	10760945
AGS Reference	

Component	LOD/Units	Method	
GRO Surrogate % recovery**	%	TM245	79
GRO >C5-C12	<50 µg/l	TM245	<50 #
Methyl tertiary butyl ether (MTBE)	<3 µg/l	TM245	<3 #
Benzene	<7 µg/l	TM245	<7 #
Toluene	<4 µg/l	TM245	<4 #
Ethylbenzene	<5 µg/l	TM245	<5 #
m,p-Xylene	<8 µg/l	TM245	<8 #
o-Xylene	<3 µg/l	TM245	<3 #
Sum of detected Xylenes	<11 µg/l	TM245	<11
Sum of detected BTEX	<28 µg/l	TM245	<28
Aliphatics >C5-C6	<10 µg/l	TM245	<10
Aliphatics >C6-C8	<10 µg/l	TM245	<10
Aliphatics >C8-C10	<10 µg/l	TM245	<10
Aliphatics >C10-C12	<10 µg/l	TM245	<10
Aliphatics >C12-C16 (aq)	<10 µg/l	TM174	<10
Aliphatics >C16-C21 (aq)	<10 µg/l	TM174	<10
Aliphatics >C21-C35 (aq)	<10 µg/l	TM174	<10
Total Aliphatics >C12-C35 (aq)	<10 µg/l	TM174	<10
Aromatics >EC5-EC7	<10 µg/l	TM245	<10
Aromatics >EC7-EC8	<10 µg/l	TM245	<10
Aromatics >EC8-EC10	<10 µg/l	TM245	<10
Aromatics >EC10-EC12	<10 µg/l	TM245	<10
Aromatics >EC12-EC16 (aq)	<10 µg/l	TM174	<10
Aromatics >EC16-EC21 (aq)	<10 µg/l	TM174	<10
Aromatics >EC21-EC35 (aq)	<10 µg/l	TM174	<10
Total Aromatics >EC12-EC35 (aq)	<10 µg/l	TM174	<10
Total Aliphatics & Aromatics >C5-35 (aq)	<10 µg/l	TM174	<10

CERTIFICATE OF ANALYSIS

SDG:	150202-38	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	301600
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Table of Results - Appendix

Method No	Reference	Description	Wet/Dry Sample [1]	Surrogate Corrected
TM061	Method for the Determination of EPH,Massachusetts Dept of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)		
TM099	BS 2690: Part 7:1968 / BS 6068: Part2.11:1984	Determination of Ammonium in Water Samples using the Kone Analyser		
TM101	Method 4500B & C, AWWA/APHA, 20th Ed., 1999	Determination of Sulphide in soil and water samples using the Kone Analyser		
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS		
TM174	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Waters by GC-FID		
TM176	Modified: US EPA Method 8100	Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS in Waters		
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry		
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers		
TM187	Winkler, L.W, Ber Deutsch. Chem. Ges, 21,2843,1688."	Dissolved Oxygen in Natural and Waste Waters HMSO 1979 ISBN 011 751442		
TM191	Standard Methods for the examination of waters and wastewaters 16th Edition, ALPHA, Washington DC, USA. ISBN 0-87553-131-8.	Determination of Unfiltered Metals in Water Matrices by ICP-MS		
TM197	Modified: US EPA Method 8082.EA Method 174 and 5109631	Determination of WHO12 and EC7 Polychlorinated Biphenyl Congeners by GC-MS in Waters		
TM223	ASTM D-1945-91	Determination of Dissolved C1-7 Hydrocarbon gases in waters		
TM227	Standard methods for the examination of waters and wastewaters 20th Edition, AWWA/APHA Method 4500.	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate		
TM228	US EPA Method 6010B	Determination of Major Cations in Water by iCap 6500 Duo ICP-OES		
TM241	Methods for the Examination of Waters and Associated Materials; Chromium in Raw and Potable Waters and Sewage Effluents 1980.	The Determination of Hexavalent Chromium in Waters and Leachates using the Kone Analyser		
TM245	By GC-FID	Determination of CRO by Headspace in waters		
TM256	The measurement of Electrical Conductivity and the Laboratory determination of pH Value of Natural, Treated and Wastewaters. HMSO, 1978. ISBN 011 751428 4.	Determination of pH in Water and Leachate using the GLpH pH Meter		
TM259	by HPLC	Determination of Phenols in Waters and Leachates by HPLC		

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

CERTIFICATE OF ANALYSIS

SDG:	150202-38	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	301600
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	10760877	10760863	10760848	10760830	10760961	10760974	10760986	10761005	10760815	10760893
Customer Sample Ref.	BH05	BH24	BH29	BH32	SA1	SA3	SA4	SA5	SW-A	SW-B
AGS Ref.										
Depth	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Type	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID
Ammoniacal Nitrogen	10-Feb-2015	10-Feb-2015	10-Feb-2015	10-Feb-2015	10-Feb-2015	10-Feb-2015	10-Feb-2015	10-Feb-2015	10-Feb-2015	10-Feb-2015
Anions by Kone (w)	10-Feb-2015	11-Feb-2015	10-Feb-2015	10-Feb-2015	10-Feb-2015	10-Feb-2015	10-Feb-2015	10-Feb-2015	10-Feb-2015	10-Feb-2015
Cyanide Comp/Free/Total/Thiocyanate	09-Feb-2015	05-Feb-2015	07-Feb-2015	06-Feb-2015	06-Feb-2015	09-Feb-2015	06-Feb-2015	07-Feb-2015	07-Feb-2015	06-Feb-2015
Determination of Dissolved Gases	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015
Dissolved Metals by ICP-MS	08-Feb-2015	08-Feb-2015	08-Feb-2015	08-Feb-2015	08-Feb-2015	08-Feb-2015	08-Feb-2015	08-Feb-2015	08-Feb-2015	08-Feb-2015
Dissolved Oxygen by Titration	06-Feb-2015	06-Feb-2015	06-Feb-2015	06-Feb-2015	06-Feb-2015	06-Feb-2015	06-Feb-2015	06-Feb-2015	06-Feb-2015	06-Feb-2015
EPH CWG (Aliphatic) Aqueous GC (W)	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015
EPH CWG (Aromatic) Aqueous GC (W)	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015
GRO by GC-FID (W)	10-Feb-2015	09-Feb-2015	10-Feb-2015	09-Feb-2015	09-Feb-2015	09-Feb-2015	09-Feb-2015	09-Feb-2015	09-Feb-2015	09-Feb-2015
Hexavalent Chromium (w)	11-Feb-2015	11-Feb-2015	11-Feb-2015	09-Feb-2015	09-Feb-2015	09-Feb-2015	11-Feb-2015	11-Feb-2015	07-Feb-2015	11-Feb-2015
Mercury Dissolved	06-Feb-2015	06-Feb-2015	06-Feb-2015	05-Feb-2015	06-Feb-2015	05-Feb-2015	06-Feb-2015	09-Feb-2015	06-Feb-2015	06-Feb-2015
Metals by iCap-OES Unfiltered (W)	06-Feb-2015	09-Feb-2015	09-Feb-2015	06-Feb-2015	06-Feb-2015	06-Feb-2015	06-Feb-2015	06-Feb-2015	06-Feb-2015	06-Feb-2015
Nitrite by Kone (w)	07-Feb-2015	09-Feb-2015	07-Feb-2015	09-Feb-2015	07-Feb-2015	07-Feb-2015	07-Feb-2015	07-Feb-2015	07-Feb-2015	09-Feb-2015
PAH Spec MS - Aqueous (W)	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015
PCB Congeners - Aqueous (W)	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015
pH Value	10-Feb-2015	10-Feb-2015	10-Feb-2015	10-Feb-2015	10-Feb-2015	10-Feb-2015	10-Feb-2015	10-Feb-2015	10-Feb-2015	10-Feb-2015
Phenols by HPLC (W)	12-Feb-2015	12-Feb-2015	12-Feb-2015	12-Feb-2015	12-Feb-2015	12-Feb-2015	12-Feb-2015	12-Feb-2015	12-Feb-2015	12-Feb-2015
Sulphide	07-Feb-2015	04-Feb-2015	07-Feb-2015	06-Feb-2015	07-Feb-2015	07-Feb-2015	07-Feb-2015	06-Feb-2015	06-Feb-2015	07-Feb-2015
TPH CWG (W)	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015	11-Feb-2015

Lab Sample No(s)	10760929	10760911	10760945
Customer Sample Ref.	SW-C	SW-D	SW-HOOLPOOL
AGS Ref.			
Depth	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Type	LIQUID	LIQUID	LIQUID
Ammoniacal Nitrogen	10-Feb-2015	10-Feb-2015	03-Feb-2015
Anions by Kone (w)	10-Feb-2015	10-Feb-2015	10-Feb-2015
Cyanide Comp/Free/Total/Thiocyanate	06-Feb-2015	07-Feb-2015	07-Feb-2015
Determination of Dissolved Gases	11-Feb-2015	11-Feb-2015	11-Feb-2015
Dissolved Metals by ICP-MS	08-Feb-2015	08-Feb-2015	08-Feb-2015
Dissolved Oxygen by Titration	06-Feb-2015	06-Feb-2015	06-Feb-2015
EPH CWG (Aliphatic) Aqueous GC (W)	11-Feb-2015	11-Feb-2015	11-Feb-2015
EPH CWG (Aromatic) Aqueous GC (W)	11-Feb-2015	11-Feb-2015	11-Feb-2015
GRO by GC-FID (W)	09-Feb-2015	09-Feb-2015	09-Feb-2015
Hexavalent Chromium (w)	07-Feb-2015	07-Feb-2015	09-Feb-2015
Mercury Dissolved	06-Feb-2015	06-Feb-2015	06-Feb-2015
Metals by iCap-OES Unfiltered (W)	06-Feb-2015	06-Feb-2015	06-Feb-2015
Nitrite by Kone (w)	07-Feb-2015	09-Feb-2015	07-Feb-2015
PAH Spec MS - Aqueous (W)	11-Feb-2015	11-Feb-2015	11-Feb-2015
PCB Congeners - Aqueous (W)	11-Feb-2015	11-Feb-2015	11-Feb-2015
pH Value	10-Feb-2015	10-Feb-2015	10-Feb-2015
Phenols by HPLC (W)	12-Feb-2015	12-Feb-2015	12-Feb-2015
Sulphide	06-Feb-2015	07-Feb-2015	06-Feb-2015
TPH CWG (W)	11-Feb-2015	11-Feb-2015	11-Feb-2015

SDG:	150202-38	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	301600
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Appendix

General

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICS and SVOC TICS.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible. The quantity of asbestos present is not determined unless specifically requested.

7. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP -No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals -total metals must be requested separately.

11. Results relate only to the items tested.

12. LODs for wet tests reported on a dry weight basis are not corrected for moisture content.

13. **Surrogate recoveries** -Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 -130 %.

14. **Product analyses** -Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5 -C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

Sample Deviations

1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Holding time exceeded before sample received**
5	**Samples exceeded holding time before presevation was performed**
§	**Sampled on date not provided**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to sampled on date**
&	**Sample Holding Time exceeded - Late arrival of instructions.**

Asbestos

Identification of Asbestos in Bulk Materials & Soils:

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

ALcontrol Laboratories

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Wardell Armstrong LLP
Sir Henry Doulton House
Forge Lane
Etruria
Stoke on Trent
Staffordshire
ST1 5BD

Attention: Tim Cawood

CERTIFICATE OF ANALYSIS

Date:	25 February 2015
Customer:	H_WARDELL_SKT
Sample Delivery Group (SDG):	150213-80
Your Reference:	ST13418
Location:	Frodsham
Report No:	303317

We received 14 samples on Friday February 13, 2015 and 14 of these samples were scheduled for analysis which was completed on Wednesday February 25, 2015. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

[redacted]
Operations Manager

CERTIFICATE OF ANALYSIS

SDG:	150213-80	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	303317
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
10830233	BH05		0.00 - 0.00	12/02/2015
10830247	BH24		0.00 - 0.00	11/02/2015
10830260	BH29		0.00 - 0.00	11/02/2015
10830276	BH32		0.00 - 0.00	11/02/2015
10830347	SA1		0.00 - 0.00	12/02/2015
10830359	SA2		0.00 - 0.00	12/02/2015
10830374	SA3		0.00 - 0.00	12/02/2015
10830365	SA4		0.00 - 0.00	11/02/2015
10830220	SA5		0.00 - 0.00	11/02/2015
10830292	SW-A		0.00 - 0.00	11/02/2015
10830307	SW-B		0.00 - 0.00	11/02/2015
10830319	SW-C		0.00 - 0.00	11/02/2015
10830333	SW-D		0.00 - 0.00	11/02/2015
10830208	SW-HOOLPOOL		0.00 - 0.00	11/02/2015

Only received samples which have had analysis scheduled will be shown on the following pages.

CERTIFICATE OF ANALYSIS

SDG:	150213-80	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	303317
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

LIQUID

Results Legend

X Test

N No Determination Possible

Lab Sample No(s)	10830233	10830247	10830260	10830276	10830347
Customer Sample Reference	BH05	BH24	BH29	BH32	SA1
AGS Reference					
Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00

| Container | | | | |

CERTIFICATE OF ANALYSIS

SDG:	150213-80	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	303317
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

LIQUID

Results Legend

X Test

N No Determination Possible

Lab Sample No(s)	10830233	10830247	10830260	10830275	10830347
Customer Sample Reference	BH05	BH24	BH29	BH32	SA1
AGS Reference					
Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00

Container	1l Glass bottle (ALE	500ml Plastic (ALE2	Dissolved Metals Pr	DO KIT + DO 250 m	H2SO4 (ALE244)	NaOH (ALE245)	Vial (ALE297)	ZnAc (ALE248)	1l Glass bottle (ALE	500ml Plastic (ALE2	Dissolved Metals Pr	DO KIT + DO 250 m	H2SO4 (ALE244)	NaOH (ALE245)	Vial (ALE297)	ZnAc (ALE248)	1l Glass bottle (ALE	500ml Plastic (ALE2	Dissolved Metals Pr	DO KIT + DO 250 m	H2SO4 (ALE244)	NaOH (ALE245)	Vial (ALE297)	ZnAc (ALE248)	1l Glass bottle (ALE	500ml Plastic (ALE2	Dissolved Metals Pr	DO KIT + DO 250 m	H2SO4 (ALE244)	NaOH (ALE245)	Vial (ALE297)	ZnAc (ALE248)
Phenols by HPLC (W) All — NDPs: 0 Tests: 14					X							X								X								X				
Sulphide All — NDPs: 0 Tests: 14								X								X								X								X
TPH CWG (W) All — NDPs: 0 Tests: 14	X								X								X								X							

CERTIFICATE OF ANALYSIS

SDG:	150213-80	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	303317
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

LIQUID

Results Legend

X Test

N No Determination Possible

Lab Sample No(s)	10830359	10830374	10830385	10830220	10830292	
Customer Sample Reference	SA2	SA3	SA4	SA5	SW-A	
AGS Reference						
Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	
Container	1l Glass bottle (ALE	500ml Plastic (ALE2	Dissolved Metals Pr	DO KIT + DO 250 m	H2SO4 (ALE244)	NaOH (ALE245)	Vial (ALE297)	ZnAc (ALE246)

| | | | | | |

CERTIFICATE OF ANALYSIS

SDG:	150213-80	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	303317
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

LIQUID

Results Legend

X Test

N No Determination Possible

Lab Sample No(s)			10830359	10830374	10830385	10830220	10830292
Customer Sample Reference			SA2	SA3	SA4	SA5	SW-A
AGS Reference							
Depth (m)			0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Container			1l Glass bottle (ALE	500ml Plastic (ALE2	Dissolved Metals Pr	DO KIT + DO 250 m	H2SO4 (ALE244)	NaOH (ALE245)	Vial (ALE297)	ZnAc (ALE248)
Phenols by HPLC (W)	All	NDPs: 0 Tests: 14					X					X														
Sulphide	All	NDPs: 0 Tests: 14								X					X								X			X
TPH CWG (W)	All	NDPs: 0 Tests: 14	X								X					X						X				

CERTIFICATE OF ANALYSIS

SDG:	150213-80	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	303317
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

LIQUID

Results Legend

X Test

N No Determination Possible

Lab Sample No(s)	10830307	10830319	10830333	10830208
Customer Sample Reference	SW-B	SW-C	SW-D	SW-HOOLPOOL
AGS Reference				
Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00

Container	1l Glass bottle (ALE	500ml Plastic (ALE2	Dissolved Metals Pr	DO KIT + DO 250 m	H2SO4 (ALE244)	NaOH (ALE245)	Vial (ALE297)	ZnAc (ALE248)	1l Glass bottle (ALE	500ml Plastic (ALE2	Dissolved Metals Pr	H2SO4 (ALE244)	NaOH (ALE245)	Vial (ALE297)	ZnAc (ALE248)	1l Glass bottle (ALE	500ml Plastic (ALE2	Dissolved Metals Pr	DO KIT + DO 250 m	H2SO4 (ALE244)	NaOH (ALE245)	Vial (ALE297)	ZnAc (ALE248)	1l Glass bottle (ALE	500ml Plastic (ALE2	Dissolved Metals Pr	DO KIT + DO 250 m	H2SO4 (ALE244)	NaOH (ALE245)	Vial (ALE297)	ZnAc (ALE248)
Ammoniacal Nitrogen	All	NDPs: 0 Tests: 14				X						X								X								X				
Anions by Kone (w)	All	NDPs: 0 Tests: 14		X							X						X								X							
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 14					X							X							X									X		
Determination of Dissolved Gases	All	NDPs: 0 Tests: 14							X							X							X									X
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 14		X							X						X								X							
Dissolved Oxygen by Probe	All	NDPs: 0 Tests: 1									X																					
Dissolved Oxygen by Titration	All	NDPs: 1 Tests: 12				X														X								X				
EPH CWG (Aliphatic) Aqueous GC (W)	All	NDPs: 0 Tests: 14	X								X						X								X							
EPH CWG (Aromatic) Aqueous GC (W)	All	NDPs: 0 Tests: 14	X								X						X								X							
GRO by GC-FID (W)	All	NDPs: 0 Tests: 14							X							X							X									X
Hexavalent Chromium (w)	All	NDPs: 0 Tests: 14		X							X						X								X							
Mercury Dissolved	All	NDPs: 0 Tests: 14			X							X							X							X						
Metals by iCap-OES Unfiltered (W)	All	NDPs: 0 Tests: 14		X							X						X								X							
PAH Spec MS - Aqueous (W)	All	NDPs: 0 Tests: 14	X								X						X								X							
PCB Congeners - Aqueous (W)	All	NDPs: 0 Tests: 14	X								X						X								X							

CERTIFICATE OF ANALYSIS

SDG:	150213-80	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	303317
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

LIQUID

Results Legend

X Test

N No Determination Possible

Lab Sample No(s)			10830307	10830319	10830333	10830208
Customer Sample Reference			SW-B	SW-C	SW-D	SW-HOOLPOOL
AGS Reference						
Depth (m)			0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Container			1l Glass bottle (ALE	500ml Plastic (ALE2	Dissolved Metals Pr	DO KIT + DO 250 m
			H2SO4 (ALE244)	NaOH (ALE245)	Vial (ALE297)	ZnAc (ALE245)
pH Value	All	NDPs: 0 Tests: 14		X		X
Phenols by HPLC (W)	All	NDPs: 0 Tests: 14	X		X	
Sulphide	All	NDPs: 0 Tests: 14		X		X
TPH CWG (W)	All	NDPs: 0 Tests: 14	X		X	

CERTIFICATE OF ANALYSIS

SDG:	150213-80	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	303317
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+&@	Sample deviation (see appendix)

Customer Sample R	BH05	BH24	BH29	BH32	SA1	SA2
Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
Date Sampled	12/02/2015	11/02/2015	11/02/2015	11/02/2015	12/02/2015	12/02/2015
Sample Time						
Date Received	13/02/2015	13/02/2015	13/02/2015	13/02/2015	13/02/2015	13/02/2015
SDG Ref	150213-80	150213-80	150213-80	150213-80	150213-80	150213-80
Lab Sample No.(s)	10830233	10830247	10830260	10830276	10830347	10830359
AGS Reference						

Component	LOD/Units	Method						
Ammoniacal Nitrogen as N	<0.2 mg/l	TM099	12.3 #	1.52 #	136 #	55 #	12.5 #	5.19 #
Sulphide	<0.01 mg/l	TM101	0.0156 #	<0.01 #	<0.01 #	<0.01 #	0.0317 #	<0.01 #
Arsenic (diss.filt)	<0.12 µg/l	TM152	6.95 #	7.82 #	42.5 #	38.7 #	6.66 #	16.6 #
Boron (diss.filt)	<9.4 µg/l	TM152	2920 #	653 #	1930 #	2030 #	772 #	837 #
Cadmium (diss.filt)	<0.1 µg/l	TM152	<0.1 #	<0.1 #	<0.1 #	<0.1 #	1 #	<0.1 #
Chromium (diss.filt)	<0.22 µg/l	TM152	18.6 #	6.74 #	26.1 #	31.3 #	7.38 #	19.7 #
Copper (diss.filt)	<0.85 µg/l	TM152	0.964 #	6.34 #	1.85 #	1.86 #	24.5 #	1.4 #
Lead (diss.filt)	<0.02 µg/l	TM152	0.174 #	0.06 #	0.226 #	0.096 #	0.149 #	3.44 #
Nickel (diss.filt)	<0.15 µg/l	TM152	4.39 #	6.28 #	12.5 #	3.65 #	23.4 #	22.7 #
Selenium (diss.filt)	<0.39 µg/l	TM152	5.6 #	4.68 #	52 #	21.3 #	10.7 #	13.7 #
Zinc (diss.filt)	<0.41 µg/l	TM152	3.5 #	4.85 #	5.66 #	3.44 #	83.7 #	6.1 #
Mercury (diss.filt)	<0.01 µg/l	TM183	<0.01 #	<0.01 #	<0.01 #	<0.01 #	0.0119 #	<0.01 #
Sulphate	<2 mg/l	TM184	169 #	482 #	<2 #	<2 #	667 #	108 #
Chloride	<2 mg/l	TM184	392 #	295 #	7930 #	1390 #	994 #	1960 #
Nitrate as NO3	<0.3 mg/l	TM184	<0.3 #	114 #	<0.3 #	<0.3 #	0.788 #	<0.3 #
Oxygen, dissolved	<0.3 mg/l	TM187	2.19 #	1.05 #	<0.3 #	<0.3 #	7.78 #	<0.3 #
PCB congener 118	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 77	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 81	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 105	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 114	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 123	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 126	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 156	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 157	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 167	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 169	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 189	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Methane, dissolved	<1 µg/l	TM223	5950	43.4	21100	21200	234	12400
Cyanide, Total	<0.05 mg/l	TM227	<0.05 ♦#	<0.05 #	<0.05 #	<0.05 ♦#	<0.05 ♦#	<0.05 #
Cyanide, Free	<0.05 mg/l	TM227	<0.05 ♦#	<0.05 #	<0.05 #	<0.05 ♦#	<0.05 ♦#	<0.05 #
Hardness, Total as CaCO3 unfiltered	<0.35 mg/l	TM228	727	842	3500	1110	1300	1680

CERTIFICATE OF ANALYSIS

SDG:	150213-80	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	303317
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
^^	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	BH05	BH24	BH29	BH32	SA1	SA2
			Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
			Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
			Date Sampled	12/02/2015	11/02/2015	11/02/2015	11/02/2015	12/02/2015	12/02/2015
			Sample Time	-	-	-	-	-	-
			Date Received	13/02/2015	13/02/2015	13/02/2015	13/02/2015	13/02/2015	13/02/2015
			SDG Ref	150213-80	150213-80	150213-80	150213-80	150213-80	150213-80
			Lab Sample No.(s)	10830233	10830247	10830260	10830276	10830347	10830359
			AGS Reference						
Chromium, Hexavalent	<0.03 mg/l	TM241		<0.03 #	<0.03 #	<0.03 #	<0.03 #	<0.03 #	<0.03 #
pH	<1 pH Units	TM256		7.41 #	7.91 #	7.39 #	7.67 #	7.44 #	7.03 #
Phenol	<0.002 mg/l	TM259		<0.002 #	<0.002 #	<0.002 #	<0.002 #	<0.002 #	<0.002 #
Cresols	<0.006 mg/l	TM259		<0.006 #	<0.006 #	<0.006 #	0.01 #	<0.006 #	<0.006 #
Xylenols	<0.008 mg/l	TM259		<0.008 #	<0.008 #	<0.008 #	<0.008 #	<0.008 #	<0.008 #
Phenols, Total Detected monohydric	<0.016 mg/l	TM259		<0.016 #	<0.016 #	<0.016 #	<0.016 #	<0.016 #	<0.016 #

CERTIFICATE OF ANALYSIS

SDG:	150213-80	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	303317
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+&@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	SA3	SA4	SA5	SW-A	SW-B	SW-C
			Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
			Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
			Date Sampled	12/02/2015	11/02/2015	11/02/2015	11/02/2015	11/02/2015	11/02/2015
			Sample Time						
			Date Received	13/02/2015	13/02/2015	13/02/2015	13/02/2015	13/02/2015	13/02/2015
			SDG Ref	150213-80	150213-80	150213-80	150213-80	150213-80	150213-80
			Lab Sample No.(s)	10830374	10830385	10830220	10830292	10830307	10830319
			AGS Reference						
Oxygen, dissolved	<0.3 mg/l	TM046							6.39 ♦ #
Ammoniacal Nitrogen as N	<0.2 mg/l	TM099		0.216 #	33.3 #	34.4 #	<0.2 #	<0.2 #	0.744 #
Sulphide	<0.01 mg/l	TM101		0.0706 #	0.153 #	0.0329 #	0.065 #	0.0873 #	<0.01 #
Arsenic (diss.filt)	<0.12 µg/l	TM152		4.65 #	36.5 #	61 #	7.59 #	7.34 #	10.9 #
Boron (diss.filt)	<9.4 µg/l	TM152		27.6 #	1980 #	1690 #	443 #	341 #	488 #
Cadmium (diss.filt)	<0.1 µg/l	TM152		<0.1 #	<0.1 #	<0.1 #	0.256 #	0.179 #	<0.1 #
Chromium (diss.filt)	<0.22 µg/l	TM152		2.15 #	17.1 #	30.5 #	3.05 #	9.24 #	10.2 #
Copper (diss.filt)	<0.85 µg/l	TM152		<0.85 #	3.84 #	1.16 #	27.2 #	31.5 #	64 #
Lead (diss.filt)	<0.02 µg/l	TM152		0.045 #	2.12 #	0.031 #	0.155 #	0.18 #	0.255 #
Nickel (diss.filt)	<0.15 µg/l	TM152		0.568 #	15.2 #	4.11 #	7.24 #	4.94 #	5.53 #
Selenium (diss.filt)	<0.39 µg/l	TM152		0.507 #	23.6 #	6.84 #	3.82 #	3.67 #	11.2 #
Zinc (diss.filt)	<0.41 µg/l	TM152		0.637 #	2.14 #	3.32 #	15.1 #	7.81 #	4.39 #
Mercury (diss.filt)	<0.01 µg/l	TM183		<0.01 #	0.0336 #	<0.01 #	0.131 #	0.203 #	0.0393 #
Sulphate	<2 mg/l	TM184		36.4 #	705 #	50 #	453 #	227 #	176 #
Chloride	<2 mg/l	TM184		59 #	2610 #	240 #	184 #	160 #	207 #
Nitrate as NO3	<0.3 mg/l	TM184		0.547 #	<0.3 #	<0.3 #	<0.3 #	<0.3 #	4.57 #
Oxygen, dissolved	<0.3 mg/l	TM187		2.49 #		<0.3 #	8.52 #	11.8 #	
PCB congener 118	<0.015 µg/l	TM197		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 77	<0.015 µg/l	TM197		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 81	<0.015 µg/l	TM197		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 105	<0.015 µg/l	TM197		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 114	<0.015 µg/l	TM197		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 123	<0.015 µg/l	TM197		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 126	<0.015 µg/l	TM197		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 156	<0.015 µg/l	TM197		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 157	<0.015 µg/l	TM197		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 167	<0.015 µg/l	TM197		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 169	<0.015 µg/l	TM197		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 189	<0.015 µg/l	TM197		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Methane, dissolved	<1 µg/l	TM223		1.41	11100	12000	144	13.5	2.33
Cyanide, Total	<0.05 mg/l	TM227		<0.05 ♦ #	<0.05 ♦ #	<0.05 ♦ #	<0.05 #	<0.05 #	<0.05 #
Cyanide, Free	<0.05 mg/l	TM227		<0.05 ♦ #	<0.05 ♦ #	<0.05 ♦ #	<0.05 #	<0.05 #	<0.05 #

CERTIFICATE OF ANALYSIS

SDG:	150213-80	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	303317
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
^^	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	SA3	SA4	SA5	SW-A	SW-B	SW-C
			Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
			Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
			Date Sampled	12/02/2015	11/02/2015	11/02/2015	11/02/2015	11/02/2015	11/02/2015
			Sample Time	-	-	-	-	-	-
			Date Received	13/02/2015	13/02/2015	13/02/2015	13/02/2015	13/02/2015	13/02/2015
			SDG Ref	150213-80	150213-80	150213-80	150213-80	150213-80	150213-80
			Lab Sample No.(s)	10830374	10830385	10830220	10830292	10830307	10830319
			AGS Reference						
Hardness, Total as CaCO3 unfiltered	<0.35 mg/l	TM228		194	8100	933	620	407	319
Chromium, Hexavalent	<0.03 mg/l	TM241		<0.03 #	<0.03 #	<0.03 #	<0.03 #	<0.03 #	<0.03 #
pH	<1 pH Units	TM256		7.93 #	7.41 #	7.38 #	8.04 #	7.63 #	7.98 #
Phenol	<0.002 mg/l	TM259		<0.002 #	<0.002 #	<0.002 #	<0.002 #	<0.002 #	<0.002 #
Cresols	<0.006 mg/l	TM259		<0.006 #	<0.006 #	<0.006 #	<0.006 #	<0.006 #	<0.006 #
Xylenols	<0.008 mg/l	TM259		<0.008 #	<0.008 #	<0.008 #	<0.008 #	<0.008 #	<0.008 #
Phenols, Total Detected monohydric	<0.016 mg/l	TM259		<0.016 #	<0.016 #	<0.016 #	<0.016 #	<0.016 #	<0.016 #

CERTIFICATE OF ANALYSIS

SDG:	150213-80	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	303317
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+&@	Sample deviation (see appendix)

Customer Sample R	SW-D	SW-HOOLPOOL				
Depth (m)	0.00 - 0.00	0.00 - 0.00				
Sample Type	Water(GW/SW)	Water(GW/SW)				
Date Sampled	11/02/2015	11/02/2015				
Sample Time						
Date Received	13/02/2015	13/02/2015				
SDG Ref	150213-80	150213-80				
Lab Sample No.(s)	10830333	10830208				
AGS Reference						

Component	LOD/Units	Method						
Ammoniacal Nitrogen as N	<0.2 mg/l	TM099	0.221 #	0.454 #				
Sulphide	<0.01 mg/l	TM101	0.128 #	<0.01 #				
Arsenic (diss.filt)	<0.12 µg/l	TM152	7.73 #	4.06 #				
Boron (diss.filt)	<9.4 µg/l	TM152	312 #	95.9 #				
Cadmium (diss.filt)	<0.1 µg/l	TM152	0.195 #	<0.1 #				
Chromium (diss.filt)	<0.22 µg/l	TM152	14.4 #	8.35 #				
Copper (diss.filt)	<0.85 µg/l	TM152	40.4 #	4.92 #				
Lead (diss.filt)	<0.02 µg/l	TM152	0.714 #	0.391 #				
Nickel (diss.filt)	<0.15 µg/l	TM152	4.47 #	3.79 #				
Selenium (diss.filt)	<0.39 µg/l	TM152	4.57 #	2.3 #				
Zinc (diss.filt)	<0.41 µg/l	TM152	11.7 #	13.5 #				
Mercury (diss.filt)	<0.01 µg/l	TM183	0.0641 #	<0.01 #				
Sulphate	<2 mg/l	TM184	233 #	124 #				
Chloride	<2 mg/l	TM184	197 #	191 #				
Nitrate as NO3	<0.3 mg/l	TM184	<0.3 #	55.9 #				
Oxygen, dissolved	<0.3 mg/l	TM187	13.3 #	8.66 #				
PCB congener 118	<0.015 µg/l	TM197	<0.015	<0.015				
PCB congener 77	<0.015 µg/l	TM197	<0.015	<0.015				
PCB congener 81	<0.015 µg/l	TM197	<0.015	<0.015				
PCB congener 105	<0.015 µg/l	TM197	<0.015	<0.015				
PCB congener 114	<0.015 µg/l	TM197	<0.015	<0.015				
PCB congener 123	<0.015 µg/l	TM197	<0.015	<0.015				
PCB congener 126	<0.015 µg/l	TM197	<0.015	<0.015				
PCB congener 156	<0.015 µg/l	TM197	<0.015	<0.015				
PCB congener 157	<0.015 µg/l	TM197	<0.015	<0.015				
PCB congener 167	<0.015 µg/l	TM197	<0.015	<0.015				
PCB congener 169	<0.015 µg/l	TM197	<0.015	<0.015				
PCB congener 189	<0.015 µg/l	TM197	<0.015	<0.015				
Methane, dissolved	<1 µg/l	TM223	1.14	<2.21				
Cyanide, Total	<0.05 mg/l	TM227	<0.05 #	<0.05 #				
Cyanide, Free	<0.05 mg/l	TM227	<0.05 #	<0.05 #				
Hardness, Total as CaCO3 unfiltered	<0.35 mg/l	TM228	402	364				

CERTIFICATE OF ANALYSIS

SDG:	150213-80	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	303317
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
^^	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Customer Sample R	SW-D	SW-HOOLPOOL
Depth (m)	0.00 - 0.00	0.00 - 0.00
Sample Type	Water(GW/SW)	Water(GW/SW)
Date Sampled	11/02/2015	11/02/2015
Sample Time	-	-
Date Received	13/02/2015	13/02/2015
SDG Ref	150213-80	150213-80
Lab Sample No.(s)	10830333	10830208
AGS Reference		

Component	LOD/Units	Method		
Chromium, Hexavalent	<0.03 mg/l	TM241	<0.03 #	<0.03 #
pH	<1 pH Units	TM256	7.57 #	7.88 #
Phenol	<0.002 mg/l	TM259	<0.002 #	<0.002 #
Cresols	<0.006 mg/l	TM259	<0.006 #	<0.006 #
Xylenols	<0.008 mg/l	TM259	<0.008 #	<0.008 #
Phenols, Total Detected monohydric	<0.016 mg/l	TM259	<0.016 #	<0.016 #

CERTIFICATE OF ANALYSIS

SDG:	150213-80	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	303317
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

PAH Spec MS - Aqueous (W)

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+&@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	BH05	BH24	BH29	BH32	SA1	SA2
			Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
			Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
			Date Sampled	12/02/2015	11/02/2015	11/02/2015	11/02/2015	12/02/2015	12/02/2015
			Sample Time						
			Date Received	13/02/2015	13/02/2015	13/02/2015	13/02/2015	13/02/2015	13/02/2015
			SDG Ref	150213-80	150213-80	150213-80	150213-80	150213-80	150213-80
			Lab Sample No.(s)	10830233	10830247	10830260	10830276	10830347	10830359
			AGS Reference						
Naphthalene (aq)	<0.1 µg/l	TM178		<0.1 #	<0.1 #	0.126 #	0.153 #	<0.1 #	0.172 #
Acenaphthene (aq)	<0.015 µg/l	TM178		0.148 #	<0.015 #	<0.015 #	0.175 #	0.0424 #	0.192 #
Acenaphthylene (aq)	<0.011 µg/l	TM178		0.0153 #	0.0131 #	<0.011 #	0.0183 #	<0.011 #	0.0756 #
Fluoranthene (aq)	<0.017 µg/l	TM178		0.156 #	0.05 #	0.0297 #	0.397 #	0.0558 #	0.548 #
Anthracene (aq)	<0.015 µg/l	TM178		0.0763 #	<0.015 #	<0.015 #	0.0713 #	0.0207 #	0.597 #
Phenanthrene (aq)	<0.022 µg/l	TM178		0.106 #	0.0303 #	0.0252 #	0.278 #	0.0568 #	0.446 #
Fluorene (aq)	<0.014 µg/l	TM178		0.0913 #	<0.014 #	<0.014 #	0.101 #	0.0397 #	0.162 #
Chrysene (aq)	<0.013 µg/l	TM178		0.0537 #	0.0383 #	0.0173 #	0.16 #	<0.013 #	0.281 #
Pyrene (aq)	<0.015 µg/l	TM178		0.176 #	0.0518 #	0.0263 #	0.338 #	0.0646 #	0.702 #
Benzo(a)anthracene (aq)	<0.017 µg/l	TM178		0.052 #	<0.017 #	<0.017 #	0.163 #	<0.017 #	0.289 #
Benzo(b)fluoranthene (aq)	<0.023 µg/l	TM178		0.0646 #	0.0675 #	0.0281 #	0.314 #	<0.023 #	0.545 #
Benzo(k)fluoranthene (aq)	<0.027 µg/l	TM178		<0.027 #	0.0315 #	<0.027 #	0.122 #	<0.027 #	0.2 #
Benzo(a)pyrene (aq)	<0.009 µg/l	TM178		0.0568 #	0.0472 #	0.0273 #	0.249 #	0.0112 #	0.454 #
Dibenzo(a,h)anthracene (aq)	<0.016 µg/l	TM178		<0.016 #	<0.016 #	<0.016 #	0.0496 #	<0.016 #	0.104 #
Benzo(g,h,i)perylene (aq)	<0.016 µg/l	TM178		0.0375 #	0.049 #	0.0241 #	0.179 #	<0.016 #	0.415 #
Indeno(1,2,3-cd)pyrene (aq)	<0.014 µg/l	TM178		0.0255 #	0.0335 #	<0.014 #	0.133 #	<0.014 #	0.225 #
PAH, Total Detected USEPA 16 (aq)	<0.344 µg/l	TM178		1.06	0.412	<0.344	2.9	<0.344	5.41

CERTIFICATE OF ANALYSIS

SDG:	150213-80	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	303317
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

PAH Spec MS - Aqueous (W)

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+&@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	SA3	SA4	SA5	SW-A	SW-B	SW-C
			Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
			Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
			Date Sampled	12/02/2015	11/02/2015	11/02/2015	11/02/2015	11/02/2015	11/02/2015
			Sample Time						
			Date Received	13/02/2015	13/02/2015	13/02/2015	13/02/2015	13/02/2015	13/02/2015
			SDG Ref	150213-80	150213-80	150213-80	150213-80	150213-80	150213-80
			Lab Sample No.(s)	10830374	10830385	10830220	10830292	10830307	10830319
			AGS Reference						
Naphthalene (aq)	<0.1 µg/l	TM178		<0.1 #	<0.1 #	<0.1 #	<0.1 #	<0.1 #	<0.5 #
Acenaphthene (aq)	<0.015 µg/l	TM178		<0.015 #	0.219 #	0.345 #	<0.015 #	<0.015 #	<0.075 #
Acenaphthylene (aq)	<0.011 µg/l	TM178		<0.011 #	0.156 #	0.0221 #	<0.011 #	<0.011 #	<0.055 #
Fluoranthene (aq)	<0.017 µg/l	TM178		<0.017 #	1.69 #	0.301 #	<0.017 #	<0.017 #	<0.085 #
Anthracene (aq)	<0.015 µg/l	TM178		<0.015 #	1.51 #	0.0801 #	<0.015 #	<0.015 #	<0.075 #
Phenanthrene (aq)	<0.022 µg/l	TM178		<0.022 #	0.985 #	0.083 #	<0.022 #	<0.022 #	<0.11 #
Fluorene (aq)	<0.014 µg/l	TM178		<0.014 #	0.263 #	0.194 #	<0.014 #	<0.014 #	<0.07 #
Chrysene (aq)	<0.013 µg/l	TM178		<0.013 #	0.971 #	0.0446 #	<0.013 #	<0.013 #	<0.065 #
Pyrene (aq)	<0.015 µg/l	TM178		<0.015 #	2.17 #	0.21 #	0.0152 #	<0.015 #	<0.075 #
Benzo(a)anthracene (aq)	<0.017 µg/l	TM178		<0.017 #	0.909 #	0.07 #	<0.017 #	<0.017 #	<0.085 #
Benzo(b)fluoranthene (aq)	<0.023 µg/l	TM178		<0.023 #	1.73 #	0.0639 #	<0.023 #	0.0239 #	<0.115 #
Benzo(k)fluoranthene (aq)	<0.027 µg/l	TM178		<0.027 #	0.601 #	<0.027 #	<0.027 #	<0.027 #	<0.135 #
Benzo(a)pyrene (aq)	<0.009 µg/l	TM178		<0.009 #	1.4 #	0.0453 #	0.0102 #	0.013 #	<0.045 #
Dibenzo(a,h)anthracene (aq)	<0.016 µg/l	TM178		<0.016 #	0.258 #	<0.016 #	<0.016 #	<0.016 #	<0.08 #
Benzo(g,h,i)perylene (aq)	<0.016 µg/l	TM178		<0.016 #	1.12 #	0.032 #	0.0169 #	0.0329 #	<0.08 #
Indeno(1,2,3-cd)pyrene (aq)	<0.014 µg/l	TM178		<0.014 #	0.689 #	0.0206 #	<0.014 #	0.0224 #	<0.07 #
PAH, Total Detected USEPA 16 (aq)	<0.344 µg/l	TM178		<0.344	14.7	1.51	<0.344	<0.344	<1.72

CERTIFICATE OF ANALYSIS

SDG:	150213-80	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	303317
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

PAH Spec MS - Aqueous (W)

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+&@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	SW-D	SW-HOOLPOOL				
			Depth (m)	0.00 - 0.00	0.00 - 0.00				
			Sample Type	Water(GW/SW)	Water(GW/SW)				
			Date Sampled	11/02/2015	11/02/2015				
			Sample Time						
			Date Received	13/02/2015	13/02/2015				
			SDG Ref	150213-80	150213-80				
			Lab Sample No.(s)	10830333	10830208				
			AGS Reference						
Naphthalene (aq)	<0.1 µg/l	TM178		<0.4 #	<0.1 #				
Acenaphthene (aq)	<0.015 µg/l	TM178		0.0684 #	<0.015 #				
Acenaphthylene (aq)	<0.011 µg/l	TM178		0.0988 #	<0.011 #				
Fluoranthene (aq)	<0.017 µg/l	TM178		0.129 #	0.0178 #				
Anthracene (aq)	<0.015 µg/l	TM178		0.113 #	<0.015 #				
Phenanthrene (aq)	<0.022 µg/l	TM178		0.148 #	<0.022 #				
Fluorene (aq)	<0.014 µg/l	TM178		0.103 #	<0.014 #				
Chrysene (aq)	<0.013 µg/l	TM178		0.13 #	<0.013 #				
Pyrene (aq)	<0.015 µg/l	TM178		0.119 #	0.0196 #				
Benzo(a)anthracene (aq)	<0.017 µg/l	TM178		0.153 #	<0.017 #				
Benzo(b)fluoranthene (aq)	<0.023 µg/l	TM178		0.14 #	<0.023 #				
Benzo(k)fluoranthene (aq)	<0.027 µg/l	TM178		0.113 #	<0.027 #				
Benzo(a)pyrene (aq)	<0.009 µg/l	TM178		0.115 #	0.0105 #				
Dibenzo(a,h)anthracene (aq)	<0.016 µg/l	TM178		0.108 #	<0.016 #				
Benzo(g,h,i)perylene (aq)	<0.016 µg/l	TM178		0.151 #	<0.016 #				
Indeno(1,2,3-cd)pyrene (aq)	<0.014 µg/l	TM178		0.12 #	<0.014 #				
PAH, Total Detected USEPA 16 (aq)	<0.344 µg/l	TM178		1.81	<0.344				

CERTIFICATE OF ANALYSIS

SDG:	150213-80	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	303317
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

TPH CWG (W)

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+5@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	BH05	BH24	BH29	BH32	SA1	SA2
			Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
			Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
			Date Sampled	12/02/2015	11/02/2015	11/02/2015	11/02/2015	12/02/2015	12/02/2015
			Sample Time						
			Date Received	13/02/2015	13/02/2015	13/02/2015	13/02/2015	13/02/2015	13/02/2015
			SDG Ref	150213-80	150213-80	150213-80	150213-80	150213-80	150213-80
			Lab Sample No.(s)	10830233	10830247	10830260	10830276	10830347	10830359
			AGS Reference						
CRO Surrogate % recovery**	%	TM245		71	79	72	76	78	76
CRO >C5-C12	<50 µg/l	TM245		<50 #	<50 #	<50 #	<50 #	66 #	223 #
Methyl tertiary butyl ether (MTBE)	<3 µg/l	TM245		<3 #	<3 #	<3 #	<3 #	<3 #	<3 #
Benzene	<7 µg/l	TM245		<7 #	<7 #	<7 #	<7 #	<7 #	<7 #
Toluene	<4 µg/l	TM245		<4 #	<4 #	<4 #	<4 #	<4 #	<4 #
Ethylbenzene	<5 µg/l	TM245		<5 #	<5 #	<5 #	<5 #	<5 #	<5 #
m,p-Xylene	<8 µg/l	TM245		<8 #	<8 #	<8 #	<8 #	<8 #	<8 #
o-Xylene	<3 µg/l	TM245		<3 #	<3 #	<3 #	<3 #	<3 #	<3 #
Sum of detected Xylenes	<11 µg/l	TM245		<11	<11	<11	<11	<11	<11
Sum of detected BTEX	<28 µg/l	TM245		<28	<28	<28	<28	<28	<28
Aliphatics >C5-C6	<10 µg/l	TM245		<10	<10	<10	<10	<10	14
Aliphatics >C6-C8	<10 µg/l	TM245		<10	<10	<10	<10	15	58
Aliphatics >C8-C10	<10 µg/l	TM245		<10	<10	<10	<10	12	51
Aliphatics >C10-C12	<10 µg/l	TM245		<10	<10	<10	<10	14	40
Aliphatics >C12-C16 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	129
Aliphatics >C16-C21 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	241
Aliphatics >C21-C35 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	665
Total Aliphatics >C12-C35 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	1040
Aromatics >EC5-EC7	<10 µg/l	TM245		<10	<10	<10	<10	<10	<10
Aromatics >EC7-EC8	<10 µg/l	TM245		<10	<10	<10	<10	<10	<10
Aromatics >EC8-EC10	<10 µg/l	TM245		<10	<10	<10	<10	<10	34
Aromatics >EC10-EC12	<10 µg/l	TM245		<10	<10	<10	<10	<10	27
Aromatics >EC12-EC16 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	27
Aromatics >EC16-EC21 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	149
Aromatics >EC21-EC35 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	331
Total Aromatics >EC12-EC35 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	507
Total Aliphatics & Aromatics >C5-35 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	66	1770

CERTIFICATE OF ANALYSIS

SDG:	150213-80	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	303317
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

TPH CWG (W)

Results Legend		Customer Sample R	SA3	SA4	SA5	SW-A	SW-B	SW-C
#	ISO17025 accredited.							
M	mCERTS accredited.							
aq	Aqueous / settled sample.							
diss.filt	Dissolved / filtered sample.							
tot.unfilt	Total / unfiltered sample.							
*	Subcontracted test.							
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery	Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
		Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
		Date Sampled	12/02/2015	11/02/2015	11/02/2015	11/02/2015	11/02/2015	11/02/2015
		Sample Time						
		Date Received	13/02/2015	13/02/2015	13/02/2015	13/02/2015	13/02/2015	13/02/2015
		SDG Ref	150213-80	150213-80	150213-80	150213-80	150213-80	150213-80
(F)	Trigger breach confirmed	Lab Sample No.(s)	10830374	10830385	10830220	10830292	10830307	10830319
1-5&+5@	Sample deviation (see appendix)	AGS Reference						

Component	LOD/Units	Method						
GRO Surrogate % recovery**	%	TM245	81	90	74	75	82	85
GRO >C5-C12	<50 µg/l	TM245	<50 #	77 #	<50 #	<50 #	<50 #	<50 #
Methyl tertiary butyl ether (MTBE)	<3 µg/l	TM245	<3 #	<3 #	<3 #	<3 #	<3 #	<3 #
Benzene	<7 µg/l	TM245	<7 #	<7 #	<7 #	<7 #	<7 #	<7 #
Toluene	<4 µg/l	TM245	<4 #	<4 #	<4 #	<4 #	<4 #	<4 #
Ethylbenzene	<5 µg/l	TM245	<5 #	<5 #	<5 #	<5 #	<5 #	<5 #
m,p-Xylene	<8 µg/l	TM245	<8 #	<8 #	<8 #	<8 #	<8 #	<8 #
o-Xylene	<3 µg/l	TM245	<3 #	<3 #	<3 #	<3 #	<3 #	<3 #
Sum of detected Xylenes	<11 µg/l	TM245	<11	<11	<11	<11	<11	<11
Sum of detected BTEX	<28 µg/l	TM245	<28	<28	<28	<28	<28	<28
Aliphatics >C5-C6	<10 µg/l	TM245	<10	12	<10	<10	<10	<10
Aliphatics >C6-C8	<10 µg/l	TM245	<10	20	<10	<10	<10	<10
Aliphatics >C8-C10	<10 µg/l	TM245	<10	17	<10	<10	<10	<10
Aliphatics >C10-C12	<10 µg/l	TM245	<10	10	<10	<10	<10	<10
Aliphatics >C12-C16 (aq)	<10 µg/l	TM174	<10	512	<10	<10	<10	<10
Aliphatics >C16-C21 (aq)	<10 µg/l	TM174	<10	786	<10	<10	<10	<10
Aliphatics >C21-C35 (aq)	<10 µg/l	TM174	<10	1690	<10	<10	<10	<10
Total Aliphatics >C12-C35 (aq)	<10 µg/l	TM174	<10	2990	<10	<10	<10	<10
Aromatics >EC5-EC7	<10 µg/l	TM245	<10	<10	<10	<10	<10	<10
Aromatics >EC7-EC8	<10 µg/l	TM245	<10	<10	<10	<10	<10	<10
Aromatics >EC8-EC10	<10 µg/l	TM245	<10	11	<10	<10	<10	<10
Aromatics >EC10-EC12	<10 µg/l	TM245	<10	<10	<10	<10	<10	<10
Aromatics >EC12-EC16 (aq)	<10 µg/l	TM174	<10	69	<10	<10	<10	<10
Aromatics >EC16-EC21 (aq)	<10 µg/l	TM174	<10	395	<10	<10	<10	<10
Aromatics >EC21-EC35 (aq)	<10 µg/l	TM174	<10	834	<10	<10	<10	33
Total Aromatics >EC12-EC35 (aq)	<10 µg/l	TM174	<10	1300	<10	<10	<10	33
Total Aliphatics & Aromatics >C5-35 (aq)	<10 µg/l	TM174	<10	4360	<10	<10	<10	33

CERTIFICATE OF ANALYSIS

SDG:	150213-80	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	303317
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

TPH CWG (W)

Results Legend		Customer Sample R	SW-D	SW-HOOLPOOL				
#	ISO17025 accredited.							
M	mCERTS accredited.							
aq	Aqueous / settled sample.							
diss.filt	Dissolved / filtered sample.	Depth (m)	0.00 - 0.00	0.00 - 0.00				
tot.unfilt	Total / unfiltered sample.	Sample Type	Water(GW/SW)	Water(GW/SW)				
*	Subcontracted test.	Date Sampled	11/02/2015	11/02/2015				
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery	Sample Time						
		Date Received	13/02/2015	13/02/2015				
		SDG Ref	150213-80	150213-80				
(F)	Trigger breach confirmed	Lab Sample No.(s)	10830333	10830208				
1-5&+&@	Sample deviation (see appendix)	AGS Reference						

Component	LOD/Units	Method						
GRO Surrogate % recovery**	%	TM245	88	88				
GRO >C5-C12	<50 µg/l	TM245	<50 #	<50 #				
Methyl tertiary butyl ether (MTBE)	<3 µg/l	TM245	<3 #	<3 #				
Benzene	<7 µg/l	TM245	<7 #	<7 #				
Toluene	<4 µg/l	TM245	<4 #	<4 #				
Ethylbenzene	<5 µg/l	TM245	<5 #	<5 #				
m,p-Xylene	<8 µg/l	TM245	<8 #	<8 #				
o-Xylene	<3 µg/l	TM245	<3 #	<3 #				
Sum of detected Xylenes	<11 µg/l	TM245	<11	<11				
Sum of detected BTEX	<28 µg/l	TM245	<28	<28				
Aliphatics >C5-C6	<10 µg/l	TM245	<10	<10				
Aliphatics >C6-C8	<10 µg/l	TM245	<10	<10				
Aliphatics >C8-C10	<10 µg/l	TM245	<10	<10				
Aliphatics >C10-C12	<10 µg/l	TM245	<10	<10				
Aliphatics >C12-C16 (aq)	<10 µg/l	TM174	<10	<10				
Aliphatics >C16-C21 (aq)	<10 µg/l	TM174	<10	<10				
Aliphatics >C21-C35 (aq)	<10 µg/l	TM174	14	<10				
Total Aliphatics >C12-C35 (aq)	<10 µg/l	TM174	14	<10				
Aromatics >EC5-EC7	<10 µg/l	TM245	<10	<10				
Aromatics >EC7-EC8	<10 µg/l	TM245	<10	<10				
Aromatics >EC8-EC10	<10 µg/l	TM245	<10	<10				
Aromatics >EC10-EC12	<10 µg/l	TM245	<10	<10				
Aromatics >EC12-EC16 (aq)	<10 µg/l	TM174	<10	<10				
Aromatics >EC16-EC21 (aq)	<10 µg/l	TM174	<10	<10				
Aromatics >EC21-EC35 (aq)	<10 µg/l	TM174	11	45				
Total Aromatics >EC12-EC35 (aq)	<10 µg/l	TM174	11	45				
Total Aliphatics & Aromatics >C5-35 (aq)	<10 µg/l	TM174	25	45				

CERTIFICATE OF ANALYSIS

SDG:	150213-80	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	303317
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Notification of NDPs (No determination possible)

Date Received : 13/02/2015 12:07:27

Sample No	Customer Sample Ref.	Depth (m)	Test	Comment
10830385	SA4	0.00 - 0.00	Dissolved Oxygen by Titration	Sample unsuitable for analysis

SDG:	150213-80	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	303317
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Table of Results - Appendix

Method No	Reference	Description	Wet/Dry Sample [1]	Surrogate Corrected
TM046	Method 4500G, AWWA/APHA, 20th Ed., 1999	Measurement of Dissolved Oxygen by Oxygen Meter		
TM061	Method for the Determination of EPH,Massachusetts Dept.of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)		
TM099	BS 2690: Part 7:1968 / BS 6068: Part2.11:1984	Determination of Ammonium in Water Samples using the Kone Analyser		
TM101	Method 4500B & C, AWWA/APHA, 20th Ed., 1999	Determination of Sulphide in soil and water samples using the Kone Analyser		
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS		
TM174	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Waters by GC-FID		
TM178	Modified: US EPA Method 8100	Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS in Waters		
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry		
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers		
TM187	Winkler, L.W, Ber Deutsch. Chem. Ges, 21,2843,1888."	Dissolved Oxygen in Natural and Waste Waters HMSO 1979 ISBN 011 751442		
TM191	Standard Methods for the examination of waters and wastewaters 16th Edition, ALPHA, Washington DC, USA. ISBN 0-87553-131-8.	Determination of Unfiltered Metals in Water Matrices by ICP-MS		
TM197	Modified: US EPA Method 8082.EA Method 174 and 5109631	Determination of WHO12 and EC7 Polychlorinated Biphenyl Congeners by GC-MS in Waters		
TM223	ASTM D-1945-91	Determination of Dissolved C1-7 Hydrocarbon gases in waters		
TM227	Standard methods for the examination of waters and wastewaters 20th Edition, AWWA/APHA Method 4500.	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate		
TM228	US EPA Method 6010B	Determination of Major Cations in Water by iCap 6500 Duo ICP-OES		
TM241	Methods for the Examination of Waters and Associated Materials; Chromium in Raw and Potable Waters and Sewage Effluents 1980.	The Determination of Hexavalent Chromium in Waters and Leachates using the Kone Analyser		
TM245	By GC-FID	Determination of CRO by Headspace in waters		
TM256	The measurement of Electrical Conductivity and the Laboratory determination of pH Value of Natural, Treated and Wastewaters. HMSO, 1978. ISBN 011 751428 4.	Determination of pH in Water and Leachate using the GLpH pH Meter		
TM259	by HPLC	Determination of Phenols in Waters and Leachates by HPLC		

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

CERTIFICATE OF ANALYSIS

SDG:	150213-80	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	303317
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	10830233	10830247	10830260	10830276	10830347	10830359	10830374	10830385	10830220	10830292
Customer Sample Ref.	BH05	BH24	BH29	BH32	SA1	SA2	SA3	SA4	SA5	SW-A
AGS Ref.										
Depth	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Type	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID
Ammoniacal Nitrogen	24-Feb-2015	24-Feb-2015	25-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	20-Feb-2015
Anions by Kone (w)	23-Feb-2015	23-Feb-2015	21-Feb-2015	23-Feb-2015	23-Feb-2015	23-Feb-2015	23-Feb-2015	23-Feb-2015	23-Feb-2015	21-Feb-2015
Cyanide Comp/Free/Total/Thiocyanate	21-Feb-2015	23-Feb-2015	23-Feb-2015	21-Feb-2015	21-Feb-2015	23-Feb-2015	21-Feb-2015	21-Feb-2015	23-Feb-2015	23-Feb-2015
Determination of Dissolved Gases	20-Feb-2015	20-Feb-2015	20-Feb-2015	20-Feb-2015	20-Feb-2015	20-Feb-2015	20-Feb-2015	20-Feb-2015	20-Feb-2015	20-Feb-2015
Dissolved Metals by ICP-MS	22-Feb-2015	22-Feb-2015	22-Feb-2015	22-Feb-2015	22-Feb-2015	22-Feb-2015	22-Feb-2015	22-Feb-2015	22-Feb-2015	22-Feb-2015
Dissolved Oxygen by Titration	20-Feb-2015	20-Feb-2015	20-Feb-2015	20-Feb-2015	20-Feb-2015	20-Feb-2015	20-Feb-2015		20-Feb-2015	20-Feb-2015
EPH CWG (Aliphatic) Aqueous GC (W)	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015
EPH CWG (Aromatic) Aqueous GC (W)	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015
GRO by GC-FID (W)	21-Feb-2015	21-Feb-2015	21-Feb-2015	21-Feb-2015	21-Feb-2015	21-Feb-2015	21-Feb-2015	21-Feb-2015	21-Feb-2015	23-Feb-2015
Hexavalent Chromium (w)	23-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	23-Feb-2015	24-Feb-2015
Mercury Dissolved	20-Feb-2015	20-Feb-2015	20-Feb-2015	20-Feb-2015	20-Feb-2015	20-Feb-2015	20-Feb-2015	20-Feb-2015	20-Feb-2015	20-Feb-2015
Metals by iCap-OES Unfiltered (W)	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015
Nitrite by Kone (w)	21-Feb-2015	21-Feb-2015	21-Feb-2015	21-Feb-2015	21-Feb-2015	21-Feb-2015	21-Feb-2015	21-Feb-2015	21-Feb-2015	21-Feb-2015
PAH Spec MS - Aqueous (W)	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	23-Feb-2015
PCB Congeners - Aqueous (W)	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015
pH Value	24-Feb-2015	23-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	20-Feb-2015	23-Feb-2015
Phenols by HPLC (W)	24-Feb-2015	24-Feb-2015	21-Feb-2015	21-Feb-2015	21-Feb-2015	23-Feb-2015	23-Feb-2015	24-Feb-2015	21-Feb-2015	23-Feb-2015
Sulphide	24-Feb-2015	23-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	23-Feb-2015
TPH CWG (W)	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015

Lab Sample No(s)	10830307	10830319	10830333	10830208
Customer Sample Ref.	SW-B	SW-C	SW-D	SW-HOOLPOOL
AGS Ref.				
Depth	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Type	LIQUID	LIQUID	LIQUID	LIQUID
Ammoniacal Nitrogen	25-Feb-2015	24-Feb-2015	24-Feb-2015	20-Feb-2015
Anions by Kone (w)	23-Feb-2015	21-Feb-2015	23-Feb-2015	21-Feb-2015
Cyanide Comp/Free/Total/Thiocyanate	23-Feb-2015	23-Feb-2015	23-Feb-2015	23-Feb-2015
Determination of Dissolved Gases	20-Feb-2015	20-Feb-2015	20-Feb-2015	20-Feb-2015
Dissolved Metals by ICP-MS	22-Feb-2015	22-Feb-2015	22-Feb-2015	22-Feb-2015
Dissolved Oxygen by Probe		25-Feb-2015		
Dissolved Oxygen by Titration	20-Feb-2015		20-Feb-2015	20-Feb-2015
EPH CWG (Aliphatic) Aqueous GC (W)	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015
EPH CWG (Aromatic) Aqueous GC (W)	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015
GRO by GC-FID (W)	23-Feb-2015	21-Feb-2015	21-Feb-2015	21-Feb-2015
Hexavalent Chromium (w)	24-Feb-2015	23-Feb-2015	24-Feb-2015	24-Feb-2015
Mercury Dissolved	20-Feb-2015	20-Feb-2015	20-Feb-2015	20-Feb-2015
Metals by iCap-OES Unfiltered (W)	24-Feb-2015	24-Feb-2015	24-Feb-2015	23-Feb-2015
Nitrite by Kone (w)	21-Feb-2015	21-Feb-2015	21-Feb-2015	21-Feb-2015
PAH Spec MS - Aqueous (W)	24-Feb-2015	23-Feb-2015	23-Feb-2015	23-Feb-2015
PCB Congeners - Aqueous (W)	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015
pH Value	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015
Phenols by HPLC (W)	21-Feb-2015	24-Feb-2015	24-Feb-2015	23-Feb-2015
Sulphide	24-Feb-2015	23-Feb-2015	24-Feb-2015	23-Feb-2015
TPH CWG (W)	24-Feb-2015	24-Feb-2015	24-Feb-2015	24-Feb-2015

SDG:	150213-80	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	303317
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Appendix

General

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICS and SVOC TICS.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible. The quantity of asbestos present is not determined unless specifically requested.

7. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP -No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals -total metals must be requested separately.

11. Results relate only to the items tested.

12. LODs for wet tests reported on a dry weight basis are not corrected for moisture content.

13. **Surrogate recoveries** -Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 -130 %.

14. **Product analyses** -Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5 -C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

Sample Deviations

1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Holding time exceeded before sample received**
5	**Samples exceeded holding time before presevation was performed**
§	**Sampled on date not provided**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to sampled on date**
&	**Sample Holding Time exceeded - Late arrival of instructions.**

Asbestos

Identification of Asbestos in Bulk Materials & Soils:

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

ALcontrol Laboratories

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Wardell Armstrong LLP
Sir Henry Doulton House
Forge Lane
Etruria
Stoke on Trent
Staffordshire
ST1 5BD

Attention: Tim Cawood

CERTIFICATE OF ANALYSIS

Date:	12 March 2015
Customer:	H_WARDELL_SKT
Sample Delivery Group (SDG):	150227-74
Your Reference:	ST13418
Location:	Frodsham
Report No:	305088

We received 14 samples on Friday February 27, 2015 and 14 of these samples were scheduled for analysis which was completed on Thursday March 12, 2015. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

[redacted]
Operations Manager

CERTIFICATE OF ANALYSIS

SDG:	150227-74	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	305088
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
10917592	BH5		0.00 - 0.00	26/02/2015
10917556	BH24		0.00 - 0.00	25/02/2015
10917508	BH29		0.00 - 0.00	25/02/2015
10917456	BH32		0.00 - 0.00	25/02/2015
10917360	SA1		0.00 - 0.00	26/02/2015
10917628	SA2		0.00 - 0.00	26/02/2015
10917669	SA3		0.00 - 0.00	26/02/2015
10917709	SA4		0.00 - 0.00	25/02/2015
10917748	SA5		0.00 - 0.00	25/02/2015
10917781	SW-A		0.00 - 0.00	25/02/2015
10917822	SW-B		0.00 - 0.00	25/02/2015
10917859	SW-C		0.00 - 0.00	25/02/2015
10917882	SW-D		0.00 - 0.00	25/02/2015
10917406	SW-HOOLPOOL		0.00 - 0.00	26/02/2015

Only received samples which have had analysis scheduled will be shown on the following pages.

CERTIFICATE OF ANALYSIS

SDG:	150227-74	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	305088
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

LIQUID

Results Legend

X Test

N No Determination Possible

Lab Sample No(s)	1091760	1091756	1091750	1091756	1091760
Customer Sample Reference	SA1	BH32	BH29	BH24	BH5
AGS Reference					
Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00

| Container | ZnAc (ALE245) | 1l Glass bottle (ALE | 500ml Plastic (ALE2 | Dissolved Metals Pr | DO KIT + DO 250 m | H2SO4 (ALE244) | NaOH (ALE245) | Vial (ALE297)

CERTIFICATE OF ANALYSIS

SDG:	150227-74	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	305088
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

LIQUID

Results Legend

X Test

N No Determination Possible

Lab Sample No(s)		1091592	1091568	1091508	1091456	1091360
Customer Sample Reference		BH5	BH24	BH29	BH32	SA1
AGS Reference						
Depth (m)		0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Container		1l Glass bottle (ALE	1l Glass bottle (ALE	1l Glass bottle (ALE	1l Glass bottle (ALE	1l Glass bottle (ALE
		500ml Plastic (ALE2	500ml Plastic (ALE2	500ml Plastic (ALE2	500ml Plastic (ALE2	500ml Plastic (ALE2
		Dissolved Metals Pr	Dissolved Metals Pr	Dissolved Metals Pr	Dissolved Metals Pr	Dissolved Metals Pr
		DO KIT + DO 250 m	DO KIT + DO 250 m	DO KIT + DO 250 m	DO KIT + DO 250 m	DO KIT + DO 250 m
		H2SO4 (ALE244)	H2SO4 (ALE244)	H2SO4 (ALE244)	H2SO4 (ALE244)	H2SO4 (ALE244)
		NaOH (ALE245)	NaOH (ALE245)	NaOH (ALE245)	NaOH (ALE245)	NaOH (ALE245)
		Vial (ALE297)	Vial (ALE297)	Vial (ALE297)	Vial (ALE297)	Vial (ALE297)
		ZnAc (ALE248)	ZnAc (ALE248)	ZnAc (ALE248)	ZnAc (ALE248)	ZnAc (ALE248)
Phenols by HPLC (W)	All	NDPs: 0 Tests: 14		X	X	X	X	X
Sulphide	All	NDPs: 0 Tests: 14	X		X		X	X
TPH CWG (W)	All	NDPs: 0 Tests: 14	X	X		X		X

CERTIFICATE OF ANALYSIS

SDG:	150227-74	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	305088
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

LIQUID

Results Legend

X Test

N No Determination Possible

Lab Sample No(s)	10917628	10917689	10917709	10917748	10917781
Customer Sample Reference	SA2	SA3	SA4	SA5	SW-A
AGS Reference					
Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00

Container	1L Glass bottle (ALE	500ml Plastic (ALE2	Dissolved Metals Pr	DO KIT + DO 250 m	H2SO4 (ALE244)	NaOH (ALE245)	Vial (ALE297)	ZnAc (ALE248)
Ammoniacal Nitrogen				X				
Anions by Kone (w)		X						
Cyanide Comp/Free/Total/Thiocyanate						X		
Determination of Dissolved Gases							X	
Dissolved Metals by ICP-MS		X						
Dissolved Oxygen by Titration				X				
EPH CWG (Aliphatic) Aqueous GC (W)	X							
EPH CWG (Aromatic) Aqueous GC (W)	X							
GRO by GC-FID (W)							X	
Hexavalent Chromium (w)		X						
Mercury Dissolved			X					
Metals by iCap-OES Unfiltered (W)		X						
PAH Spec MS - Aqueous (W)	X							
PCB Congeners - Aqueous (W)	X							
pH Value		X						

Ammoniacal Nitrogen	All	NDPs: 0 Tests: 14				X				
Anions by Kone (w)	All	NDPs: 0 Tests: 14		X						
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 14					X			
Determination of Dissolved Gases	All	NDPs: 0 Tests: 14						X		
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 14		X						
Dissolved Oxygen by Titration	All	NDPs: 0 Tests: 14				X				
EPH CWG (Aliphatic) Aqueous GC (W)	All	NDPs: 0 Tests: 14	X							
EPH CWG (Aromatic) Aqueous GC (W)	All	NDPs: 0 Tests: 14	X							
GRO by GC-FID (W)	All	NDPs: 0 Tests: 14						X		
Hexavalent Chromium (w)	All	NDPs: 0 Tests: 14		X						
Mercury Dissolved	All	NDPs: 0 Tests: 14			X					
Metals by iCap-OES Unfiltered (W)	All	NDPs: 0 Tests: 14		X						
PAH Spec MS - Aqueous (W)	All	NDPs: 0 Tests: 14	X							
PCB Congeners - Aqueous (W)	All	NDPs: 0 Tests: 14	X							
pH Value	All	NDPs: 0 Tests: 14		X						

CERTIFICATE OF ANALYSIS

SDG:	150227-74	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	305088
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

LIQUID

Results Legend

X Test

N No Determination Possible

Lab Sample No(s)			10917625	10917689	10917709	10917748	10917781
Customer Sample Reference			SA2	SA3	SA4	SA5	SW-A
AGS Reference							
Depth (m)			0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Container			1l Glass bottle (ALE	500ml Plastic (ALE2	Dissolved Metals Pr	DO KIT + DO 250 m	H2SO4 (ALE244)	NaOH (ALE245)	Vial (ALE297)	ZnAc (ALE248)
Phenols by HPLC (W)	All	NDPs: 0 Tests: 14					X				X						X										X					
Sulphide	All	NDPs: 0 Tests: 14								X						X										X						X
TPH CWG (W)	All	NDPs: 0 Tests: 14	X								X				X										X							

CERTIFICATE OF ANALYSIS

SDG:	150227-74	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	305088
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

LIQUID

Results Legend

X Test

N No Determination Possible

Lab Sample No(s)			10917822	10917859	10917882	10917405
Customer Sample Reference			SW-B	SW-C	SW-D	SW-HOOLPOOL
AGS Reference						
Depth (m)			0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Container			1l Glass bottle (ALE 500ml Plastic (ALE2 Dissolved Metals Pr DO KIT + DO 250 m H2SO4 (ALE244) NaOH (ALE245) Vial (ALE297) ZnAc (ALE248)	1l Glass bottle (ALE 500ml Plastic (ALE2 Dissolved Metals Pr DO KIT + DO 250 m H2SO4 (ALE244) NaOH (ALE245) Vial (ALE297) ZnAc (ALE248)	1l Glass bottle (ALE 500ml Plastic (ALE2 Dissolved Metals Pr DO KIT + DO 250 m H2SO4 (ALE244) NaOH (ALE245) Vial (ALE297) ZnAc (ALE248)	1l Glass bottle (ALE 500ml Plastic (ALE2 Dissolved Metals Pr DO KIT + DO 250 m H2SO4 (ALE244) NaOH (ALE245) Vial (ALE297) ZnAc (ALE248)

Ammoniacal Nitrogen	All	NDPs: 0 Tests: 14					X							X					X						X							
Anions by Kone (w)	All	NDPs: 0 Tests: 14		X							X							X							X							
Cyanide Comp/Free/Total/Thiocyanate	All	NDPs: 0 Tests: 14						X							X							X							X			
Determination of Dissolved Gases	All	NDPs: 0 Tests: 14							X							X							X									X
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 14		X							X							X							X							
Dissolved Oxygen by Titration	All	NDPs: 0 Tests: 14				X							X							X							X					
EPH CWG (Aliphatic) Aqueous GC (W)	All	NDPs: 0 Tests: 14	X							X							X							X								
EPH CWG (Aromatic) Aqueous GC (W)	All	NDPs: 0 Tests: 14	X							X							X							X								
GRO by GC-FID (W)	All	NDPs: 0 Tests: 14							X							X							X									X
Hexavalent Chromium (w)	All	NDPs: 0 Tests: 14		X							X							X							X							
Mercury Dissolved	All	NDPs: 0 Tests: 14			X							X							X							X						
Metals by iCap-OES Unfiltered (W)	All	NDPs: 0 Tests: 14		X							X							X							X							
PAH Spec MS - Aqueous (W)	All	NDPs: 0 Tests: 14	X							X							X							X								
PCB Congeners - Aqueous (W)	All	NDPs: 0 Tests: 14	X							X							X							X								
pH Value	All	NDPs: 0 Tests: 14		X							X							X							X							

CERTIFICATE OF ANALYSIS

SDG:	150227-74	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	305088
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

LIQUID

Results Legend

X Test

N No Determination Possible

Lab Sample No(s)			1091822	1091859	1091882	1091405
Customer Sample Reference			SW-B	SW-C	SW-D	SW-HOOLPOOL
AGS Reference						
Depth (m)			0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Container			1l Glass bottle (ALE 500ml Plastic (ALE2 Dissolved Metals Pr DO KIT + DO 250 m H2SO4 (ALE244) NaOH (ALE245) Vial (ALE297) ZnAc (ALE248) 1l Glass bottle (ALE 500ml Plastic (ALE2 Dissolved Metals Pr DO KIT + DO 250 m H2SO4 (ALE244) NaOH (ALE245) Vial (ALE297) ZnAc (ALE248) 1l Glass bottle (ALE 500ml Plastic (ALE2 Dissolved Metals Pr DO KIT + DO 250 m H2SO4 (ALE244) NaOH (ALE245) Vial (ALE297) ZnAc (ALE248) 1l Glass bottle (ALE 500ml Plastic (ALE2 Dissolved Metals Pr DO KIT + DO 250 m H2SO4 (ALE244) NaOH (ALE245) Vial (ALE297) ZnAc (ALE248)			
Phenols by HPLC (W)	All	NDPs: 0 Tests: 14				
				X		
				X		
					X	
					X	
Sulphide	All	NDPs: 0 Tests: 14				
				X		
				X		
					X	
					X	
TPH CWG (W)	All	NDPs: 0 Tests: 14				
			X			
				X		
					X	
					X	

CERTIFICATE OF ANALYSIS

SDG:	150227-74	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	305088
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+&@	Sample deviation (see appendix)

Customer Sample R	BH5	BH24	BH29	BH32	SA1	SA2
Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
Date Sampled	26/02/2015	25/02/2015	25/02/2015	25/02/2015	26/02/2015	26/02/2015
Sample Time						
Date Received	27/02/2015	27/02/2015	27/02/2015	27/02/2015	27/02/2015	27/02/2015
SDG Ref	150227-74	150227-74	150227-74	150227-74	150227-74	150227-74
Lab Sample No.(s)	10917592	10917666	10917508	10917456	10917360	10917628
AGS Reference						

Component	LOD/Units	Method					
Ammoniacal Nitrogen as N	<0.2 mg/l	TM099	15.4 #	1.88 #	93.8 #	50.3 #	14.4 #	6.43 #
Sulphide	<0.01 mg/l	TM101	0.07 #	0.0102 #	<0.01 #	0.113 #	0.166 #	<0.01 #
Arsenic (diss.filt)	<0.12 µg/l	TM152	11.6 #	9.23 #	31.5 #	20.1 #	6.35 #	13.5 #
Boron (diss.filt)	<9.4 µg/l	TM152	3160 #	711 #	1520 #	1980 #	696 #	688 #
Cadmium (diss.filt)	<0.1 µg/l	TM152	<0.1 #	<0.1 #	<0.1 #	<0.1 #	0.682 #	<0.1 #
Chromium (diss.filt)	<0.22 µg/l	TM152	37.3 #	14.6 #	17.5 #	57.7 #	9.52 #	9.18 #
Copper (diss.filt)	<0.85 µg/l	TM152	1.16 #	4.17 #	1.58 #	0.86 #	24.2 #	<0.85 #
Lead (diss.filt)	<0.02 µg/l	TM152	0.237 #	0.129 #	0.354 #	0.167 #	0.183 #	3.9 #
Nickel (diss.filt)	<0.15 µg/l	TM152	6.82 #	5.03 #	10.8 #	3.09 #	22.7 #	20.6 #
Selenium (diss.filt)	<0.39 µg/l	TM152	5.9 #	3.5 #	53 #	19.8 #	8.18 #	10.8 #
Zinc (diss.filt)	<0.41 µg/l	TM152	11 #	2.56 #	5.24 #	2.26 #	76.1 #	4.19 #
Mercury (diss.filt)	<0.01 µg/l	TM183	<0.01 #	<0.01 #	<0.01 #	<0.01 #	0.0149 #	0.0127 #
Sulphate	<2 mg/l	TM184	124 #	437 #	<2 #	<2 #	705 #	82.4 #
Chloride	<2 mg/l	TM184	478 #	292 #	7620 #	1270 #	743 #	1430 #
Nitrate as NO3	<0.3 mg/l	TM184	<0.3 #	99.5 #	<0.3 #	<0.3 #	0.314 #	<0.3 #
Oxygen, dissolved	<0.3 mg/l	TM187	2.99 #	1.14 #	<0.3 #	<0.3 #	7.17 #	<0.3 #
PCB congener 118	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 77	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 81	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 105	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 114	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 123	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 126	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 156	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 157	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 167	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 169	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 189	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Methane, dissolved	<1 µg/l	TM223	8240	59	18400	21500	3650	21100
Cyanide, Total	<0.05 mg/l	TM227	<0.05 #	<0.05 #	<0.05 #	<0.05 #	<0.05 #	<0.05 #
Cyanide, Free	<0.05 mg/l	TM227	<0.05 #	<0.05 #	<0.05 #	<0.05 #	<0.05 #	<0.05 #
Hardness, Total as CaCO3 unfiltered	<0.35 mg/l	TM228	731	1480	4080	1160	1330	1560

CERTIFICATE OF ANALYSIS

SDG:	150227-74	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	305088
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
^^	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	BH5	BH24	BH29	BH32	SA1	SA2
			Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
			Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
			Date Sampled	26/02/2015	25/02/2015	25/02/2015	25/02/2015	26/02/2015	26/02/2015
			Sample Time	-	-	-	-	-	-
			Date Received	27/02/2015	27/02/2015	27/02/2015	27/02/2015	27/02/2015	27/02/2015
			SDG Ref	150227-74	150227-74	150227-74	150227-74	150227-74	150227-74
			Lab Sample No.(s)	10917592	10917556	10917508	10917456	10917360	10917528
			AGS Reference						
Chromium, Hexavalent	<0.03 mg/l	TM241		<0.03 #	<0.03 #	<0.03 #	<0.03 #	<0.03 #	<0.03 #
pH	<1 pH Units	TM256		8.13 #	8.1 #	7.4 #	7.93 #	8.16 #	7.16 #
Phenol	<0.002 mg/l	TM259		<0.002 #	<0.002 #	<0.002 #	<0.002 #	<0.002 #	<0.002 #
Cresols	<0.006 mg/l	TM259		<0.006 #	<0.006 #	<0.006 #	<0.006 #	0.01 #	<0.006 #
Xylenols	<0.008 mg/l	TM259		<0.008 #	<0.008 #	<0.008 #	<0.008 #	<0.008 #	<0.008 #
Phenols, Total Detected monohydric	<0.016 mg/l	TM259		<0.016 #	<0.016 #	<0.016 #	<0.016 #	<0.016 #	<0.016 #

CERTIFICATE OF ANALYSIS

SDG:	150227-74	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	305088
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+&@	Sample deviation (see appendix)

Customer Sample R	SA3	SA4	SA5	SW-A	SW-B	SW-C
Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
Date Sampled	26/02/2015	25/02/2015	25/02/2015	25/02/2015	25/02/2015	25/02/2015
Sample Time						
Date Received	27/02/2015	27/02/2015	27/02/2015	27/02/2015	27/02/2015	27/02/2015
SDG Ref	150227-74	150227-74	150227-74	150227-74	150227-74	150227-74
Lab Sample No.(s)	10917689	10917709	10917748	10917781	10917822	10917859
AGS Reference						

Component	LOD/Units	Method						
Ammoniacal Nitrogen as N	<0.2 mg/l	TM099	<0.2 #	31.7 #	25.5 #	<0.2 #	<0.2 #	<0.2 #
Sulphide	<0.01 mg/l	TM101	0.0529 #	0.19 #	0.0184 #	0.0399 #	0.0643 #	0.0956 #
Arsenic (diss.filt)	<0.12 µg/l	TM152	4.85 #	13.9 #	34.5 #	6.72 #	6.97 #	14.5 #
Boron (diss.filt)	<9.4 µg/l	TM152	37.7 #	1870 #	1300 #	508 #	344 #	520 #
Cadmium (diss.filt)	<0.1 µg/l	TM152	<0.1 #	0.107 #	<0.1 #	0.187 #	0.171 #	0.229 #
Chromium (diss.filt)	<0.22 µg/l	TM152	3.86 #	26.8 #	39.1 #	4.16 #	7.21 #	5.7 #
Copper (diss.filt)	<0.85 µg/l	TM152	<0.85 #	9.6 #	3.39 #	29.4 #	30.7 #	64.8 #
Lead (diss.filt)	<0.02 µg/l	TM152	0.089 #	1.57 #	0.072 #	0.314 #	0.368 #	0.466 #
Nickel (diss.filt)	<0.15 µg/l	TM152	0.425 #	13.1 #	4.25 #	7.35 #	5.37 #	6.15 #
Selenium (diss.filt)	<0.39 µg/l	TM152	0.514 #	18.9 #	5.93 #	4.06 #	3.19 #	9.91 #
Zinc (diss.filt)	<0.41 µg/l	TM152	<0.41 #	20 #	6.28 #	11.9 #	7.61 #	13.3 #
Mercury (diss.filt)	<0.01 µg/l	TM183	<0.01 #	0.0415 #	0.0102 #	<0.01 #	0.217 #	0.392 #
Sulphate	<2 mg/l	TM184	38.2 #	869 #	153 #	528 #	215 #	171 #
Chloride	<2 mg/l	TM184	61.3 #	1900 #	166 #	212 #	148 #	203 #
Nitrate as NO3	<0.3 mg/l	TM184	0.59 #	<0.3 #	0.424 #	<0.3 #	<0.3 #	<0.3 #
Oxygen, dissolved	<0.3 mg/l	TM187	2.13 #	<0.3 #	1.2 #	12.3 #	11.7 #	13.1 #
PCB congener 118	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 77	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 81	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 105	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 114	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 123	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 126	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 156	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 157	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 167	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 169	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
PCB congener 189	<0.015 µg/l	TM197	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Methane, dissolved	<1 µg/l	TM223	7.64	18400	69.8	4.61	3.95	<2.25
Cyanide, Total	<0.05 mg/l	TM227	<0.05 #	<0.05 #	<0.05 #	<0.05 #	<0.05 #	<0.05 #
Cyanide, Free	<0.05 mg/l	TM227	<0.05 #	<0.05 #	<0.05 #	<0.05 #	<0.05 #	<0.05 #
Hardness, Total as CaCO3 unfiltered	<0.35 mg/l	TM228	279	1780	821	825	487	429

CERTIFICATE OF ANALYSIS

SDG:	150227-74	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	305088
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
^^	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	SA3	SA4	SA5	SW-A	SW-B	SW-C
			Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
			Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
			Date Sampled	26/02/2015	25/02/2015	25/02/2015	25/02/2015	25/02/2015	25/02/2015
			Sample Time	-	-	-	-	-	-
			Date Received	27/02/2015	27/02/2015	27/02/2015	27/02/2015	27/02/2015	27/02/2015
			SDG Ref	150227-74	150227-74	150227-74	150227-74	150227-74	150227-74
			Lab Sample No.(s)	10917689	10917709	10917748	10917781	10917822	10917859
			AGS Reference						
Chromium, Hexavalent	<0.03 mg/l	TM241		<0.03 #	<0.03 #	<0.03 #	<0.03 #	<0.03 #	<0.03 #
pH	<1 pH Units	TM256		8.18 #	7.81 #	7.45 #	7.62 #	7.92 #	7.57 #
Phenol	<0.002 mg/l	TM259		<0.002 #	<0.002 #	<0.002 #	<0.002 #	<0.002 #	<0.002 #
Cresols	<0.006 mg/l	TM259		<0.006 #	<0.006 #	<0.006 #	<0.006 #	<0.006 #	<0.006 #
Xylenols	<0.008 mg/l	TM259		<0.008 #	<0.008 #	<0.008 #	<0.008 #	<0.008 #	<0.008 #
Phenols, Total Detected monohydric	<0.016 mg/l	TM259		<0.016 #	<0.016 #	<0.016 #	<0.016 #	<0.016 #	<0.016 #

CERTIFICATE OF ANALYSIS

SDG:	150227-74	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	305088
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+&@	Sample deviation (see appendix)

Customer Sample R			SW-D	SW-HOOLPOOL				
Depth (m)			0.00 - 0.00	0.00 - 0.00				
Sample Type			Water(GW/SW)	Water(GW/SW)				
Date Sampled			26/02/2015	26/02/2015				
Sample Time								
Date Received			27/02/2015	27/02/2015				
SDG Ref			150227-74	150227-74				
Lab Sample No.(s)			10917882	10917408				
AGS Reference								
Component	**LOD/Units**	**Method**						
Ammoniacal Nitrogen as N	<0.2 mg/l	TM099	<0.2 #	0.398 #				
Sulphide	<0.01 mg/l	TM101	0.0698 #	0.01 #				
Arsenic (diss.filt)	<0.12 µg/l	TM152	5.82 #	3.1 #				
Boron (diss.filt)	<9.4 µg/l	TM152	316 #	121 #				
Cadmium (diss.filt)	<0.1 µg/l	TM152	0.245 #	<0.1 #				
Chromium (diss.filt)	<0.22 µg/l	TM152	5.64 #	5.57 #				
Copper (diss.filt)	<0.85 µg/l	TM152	36.4 #	4.87 #				
Lead (diss.filt)	<0.02 µg/l	TM152	0.463 #	0.356 #				
Nickel (diss.filt)	<0.15 µg/l	TM152	4.48 #	3.8 #				
Selenium (diss.filt)	<0.39 µg/l	TM152	4.11 #	2.64 #				
Zinc (diss.filt)	<0.41 µg/l	TM152	13.8 #	9.83 #				
Mercury (diss.filt)	<0.01 µg/l	TM183	0.178 #	<0.01 #				
Sulphate	<2 mg/l	TM184	206 #	149 #				
Chloride	<2 mg/l	TM184	187 #	278 #				
Nitrate as NO3	<0.3 mg/l	TM184	<0.3 #	47.2 #				
Oxygen, dissolved	<0.3 mg/l	TM187	12.5 #	8.79 #				
PCB congener 118	<0.015 µg/l	TM197	<0.015	<0.015				
PCB congener 77	<0.015 µg/l	TM197	<0.015	<0.015				
PCB congener 81	<0.015 µg/l	TM197	<0.015	<0.015				
PCB congener 105	<0.015 µg/l	TM197	<0.015	<0.015				
PCB congener 114	<0.015 µg/l	TM197	<0.015	<0.015				
PCB congener 123	<0.015 µg/l	TM197	<0.015	<0.015				
PCB congener 126	<0.015 µg/l	TM197	<0.015	<0.015				
PCB congener 156	<0.015 µg/l	TM197	<0.015	<0.015				
PCB congener 157	<0.015 µg/l	TM197	<0.015	<0.015				
PCB congener 167	<0.015 µg/l	TM197	<0.015	<0.015				
PCB congener 169	<0.015 µg/l	TM197	<0.015	<0.015				
PCB congener 189	<0.015 µg/l	TM197	<0.015	<0.015				
Methane, dissolved	<1 µg/l	TM223	<2.25	4.16				
Cyanide, Total	<0.05 mg/l	TM227	<0.05 #	<0.05 #				
Cyanide, Free	<0.05 mg/l	TM227	<0.05 #	<0.05 #				
Hardness, Total as CaCO3 unfiltered	<0.35 mg/l	TM228	451	391				

CERTIFICATE OF ANALYSIS

SDG:	150227-74	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	305088
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
^^	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+$@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	SW-D	SW-HOOLPOOL
			Depth (m)	0.00 - 0.00	0.00 - 0.00
			Sample Type	Water(GW/SW)	Water(GW/SW)
			Date Sampled	26/02/2015	26/02/2015
			Sample Time	-	-
			Date Received	27/02/2015	27/02/2015
			SDG Ref	150227-74	150227-74
			Lab Sample No.(s)	10917882	10917406
			AGS Reference		
Chromium, Hexavalent	<0.03 mg/l	TM241		<0.03 #	<0.03 #
pH	<1 pH Units	TM256		7.79 #	8.02 #
Phenol	<0.002 mg/l	TM259		<0.002 #	<0.002 #
Cresols	<0.006 mg/l	TM259		<0.006 #	<0.006 #
Xylenols	<0.008 mg/l	TM259		<0.008 #	<0.008 #
Phenols, Total Detected monohydric	<0.016 mg/l	TM259		<0.016 #	<0.016 #

CERTIFICATE OF ANALYSIS

SDG:	150227-74	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	305088
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

PAH Spec MS - Aqueous (W)

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+&@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	BH5	BH24	BH29	BH32	SA1	SA2
			Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
			Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
			Date Sampled	26/02/2015	25/02/2015	25/02/2015	25/02/2015	26/02/2015	26/02/2015
			Sample Time						
			Date Received	27/02/2015	27/02/2015	27/02/2015	27/02/2015	27/02/2015	27/02/2015
			SDG Ref	150227-74	150227-74	150227-74	150227-74	150227-74	150227-74
			Lab Sample No.(s)	10917592	10917666	10917508	10917456	10917360	10917628
			AGS Reference						
Naphthalene (aq)	<0.1 µg/l	TM178		<0.1 #	<0.1 ♦ #	<0.1 ♦ #	<0.1 ♦ #	<0.1 #	<5 #
Acenaphthene (aq)	<0.015 µg/l	TM178		<0.015 #	<0.015 ♦ #	<0.015 ♦ #	0.0587 ♦ #	<0.015 #	<0.75 #
Acenaphthylene (aq)	<0.011 µg/l	TM178		<0.011 #	0.0309 ♦ #	0.0159 ♦ #	0.0152 ♦ #	0.0171 #	0.651 #
Fluoranthene (aq)	<0.017 µg/l	TM178		0.0635 #	0.199 ♦ #	0.144 ♦ #	0.228 ♦ #	0.0293 #	2.64 #
Anthracene (aq)	<0.015 µg/l	TM178		<0.015 #	0.0261 ♦ #	0.0187 ♦ #	0.0226 ♦ #	<0.015 #	2.46 #
Phenanthrene (aq)	<0.022 µg/l	TM178		<0.022 #	0.105 ♦ #	0.0452 ♦ #	0.0918 ♦ #	0.0231 #	1.92 #
Fluorene (aq)	<0.014 µg/l	TM178		<0.014 #	0.0146 ♦ #	<0.014 ♦ #	0.0302 ♦ #	<0.014 #	<0.7 #
Chrysene (aq)	<0.013 µg/l	TM178		0.0262 #	0.159 ♦ #	0.0861 ♦ #	0.0895 ♦ #	<0.013 #	1.28 #
Pyrene (aq)	<0.015 µg/l	TM178		0.107 #	0.195 ♦ #	0.146 ♦ #	0.218 ♦ #	0.178 #	3.49 #
Benzo(a)anthracene (aq)	<0.017 µg/l	TM178		<0.017 #	0.124 ♦ #	0.0502 ♦ #	0.0662 ♦ #	<0.017 #	<0.85 #
Benzo(b)fluoranthene (aq)	<0.023 µg/l	TM178		0.0563 #	0.323 ♦ #	0.227 ♦ #	0.151 ♦ #	0.133 #	2.05 #
Benzo(k)fluoranthene (aq)	<0.027 µg/l	TM178		<0.027 #	0.145 ♦ #	0.0947 ♦ #	0.0568 ♦ #	0.0412 #	<1.35 #
Benzo(a)pyrene (aq)	<0.009 µg/l	TM178		0.044 #	0.25 ♦ #	0.17 ♦ #	0.121 ♦ #	0.124 #	1.42 #
Dibenzo(a,h)anthracene (aq)	<0.016 µg/l	TM178		<0.016 #	0.111 ♦ #	0.0355 ♦ #	0.0252 ♦ #	0.0197 #	<0.8 #
Benzo(g,h,i)perylene (aq)	<0.016 µg/l	TM178		0.0356 #	0.303 ♦ #	0.159 ♦ #	0.0994 ♦ #	0.0956 #	1.66 #
Indeno(1,2,3-cd)pyrene (aq)	<0.014 µg/l	TM178		0.0268 #	0.29 ♦ #	0.14 ♦ #	0.0904 ♦ #	0.068 #	1.1 #
PAH, Total Detected USEPA 16 (aq)	<0.344 µg/l	TM178		0.359	2.28 ♦	1.33 ♦	1.36 ♦	0.728	23.6

CERTIFICATE OF ANALYSIS

SDG:	150227-74	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	305088
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

PAH Spec MS - Aqueous (W)

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+&@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	SA3	SA4	SA5	SW-A	SW-B	SW-C
			Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
			Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
			Date Sampled	26/02/2015	25/02/2015	25/02/2015	25/02/2015	25/02/2015	25/02/2015
			Sample Time						
			Date Received	27/02/2015	27/02/2015	27/02/2015	27/02/2015	27/02/2015	27/02/2015
			SDG Ref	150227-74	150227-74	150227-74	150227-74	150227-74	150227-74
			Lab Sample No.(s)	10917689	10917709	10917748	10917781	10917822	10917859
			AGS Reference						
Naphthalene (aq)	<0.1 µg/l	TM178		<0.1 #	<0.2 ♦ #	<0.5 ♦ #	<0.1 ♦ #	<0.1 ♦ #	<0.5 ♦ #
Acenaphthene (aq)	<0.015 µg/l	TM178		<0.015 #	0.0315 ♦ #	<0.075 ♦ #	<0.015 ♦ #	<0.015 ♦ #	<0.075 ♦ #
Acenaphthylene (aq)	<0.011 µg/l	TM178		<0.011 #	0.0559 ♦ #	<0.055 ♦ #	0.0124 ♦ #	<0.011 ♦ #	<0.055 ♦ #
Fluoranthene (aq)	<0.017 µg/l	TM178		<0.017 #	0.135 ♦ #	0.0987 ♦ #	<0.017 ♦ #	<0.017 ♦ #	<0.085 ♦ #
Anthracene (aq)	<0.015 µg/l	TM178		<0.015 #	0.0577 ♦ #	<0.075 ♦ #	<0.015 ♦ #	<0.015 ♦ #	<0.075 ♦ #
Phenanthrene (aq)	<0.022 µg/l	TM178		<0.022 #	0.0849 ♦ #	<0.11 ♦ #	<0.022 ♦ #	<0.022 ♦ #	<0.11 ♦ #
Fluorene (aq)	<0.014 µg/l	TM178		<0.014 #	<0.028 ♦ #	<0.07 ♦ #	<0.014 ♦ #	<0.014 ♦ #	<0.07 ♦ #
Chrysene (aq)	<0.013 µg/l	TM178		<0.013 #	0.057 ♦ #	<0.065 ♦ #	<0.013 ♦ #	<0.013 ♦ #	0.0858 ♦ #
Pyrene (aq)	<0.015 µg/l	TM178		<0.015 #	0.345 ♦ #	0.106 ♦ #	0.0204 ♦ #	<0.015 ♦ #	<0.075 ♦ #
Benzo(a)anthracene (aq)	<0.017 µg/l	TM178		<0.017 #	<0.034 ♦ #	<0.085 ♦ #	<0.017 ♦ #	<0.017 ♦ #	<0.085 ♦ #
Benzo(b)fluoranthene (aq)	<0.023 µg/l	TM178		<0.023 #	0.199 ♦ #	<0.115 ♦ #	0.0326 ♦ #	<0.023 ♦ #	<0.115 ♦ #
Benzo(k)fluoranthene (aq)	<0.027 µg/l	TM178		<0.027 #	0.0667 ♦ #	<0.135 ♦ #	<0.027 ♦ #	<0.027 ♦ #	<0.135 ♦ #
Benzo(a)pyrene (aq)	<0.009 µg/l	TM178		<0.009 #	0.158 ♦ #	<0.045 ♦ #	0.0185 ♦ #	0.0107 ♦ #	0.0836 ♦ #
Dibenzo(a,h)anthracene (aq)	<0.016 µg/l	TM178		<0.016 #	0.05 ♦ #	<0.08 ♦ #	<0.016 ♦ #	<0.016 ♦ #	0.098 ♦ #
Benzo(g,h,i)perylene (aq)	<0.016 µg/l	TM178		<0.016 #	0.167 ♦ #	<0.08 ♦ #	0.0385 ♦ #	0.0312 ♦ #	0.138 ♦ #
Indeno(1,2,3-cd)pyrene (aq)	<0.014 µg/l	TM178		<0.014 #	0.131 ♦ #	<0.07 ♦ #	0.0329 ♦ #	0.023 ♦ #	0.104 ♦ #
PAH, Total Detected USEPA 16 (aq)	<0.344 µg/l	TM178		<0.344	1.59 ♦	<1.72 ♦	<0.344 ♦	<0.344 ♦	<1.72 ♦

CERTIFICATE OF ANALYSIS

SDG:	150227-74	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	305088
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

PAH Spec MS - Aqueous (W)

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+&@	Sample deviation (see appendix)

	Customer Sample R	SW-D	SW-HOOLPOOL				
	Depth (m)	0.00 - 0.00	0.00 - 0.00				
	Sample Type	Water(GW/SW)	Water(GW/SW)				
	Date Sampled	26/02/2015	26/02/2015				
	Sample Time						
	Date Received	27/02/2015	27/02/2015				
	SDG Ref	150227-74	150227-74				
	Lab Sample No.(s)	10917882	10917408				
	AGS Reference						
Component	**LOD/Units**	**Method**					
Naphthalene (aq)	<0.1 µg/l	TM178	<0.1 ♦#	<0.1 #			
Acenaphthene (aq)	<0.015 µg/l	TM178	<0.015 ♦#	<0.015 #			
Acenaphthylene (aq)	<0.011 µg/l	TM178	<0.011 ♦#	<0.011 #			
Fluoranthene (aq)	<0.017 µg/l	TM178	<0.017 ♦#	<0.017 #			
Anthracene (aq)	<0.015 µg/l	TM178	<0.015 ♦#	<0.015 #			
Phenanthrene (aq)	<0.022 µg/l	TM178	<0.022 ♦#	<0.022 #			
Fluorene (aq)	<0.014 µg/l	TM178	<0.014 ♦#	<0.014 #			
Chrysene (aq)	<0.013 µg/l	TM178	<0.013 ♦#	<0.013 #			
Pyrene (aq)	<0.015 µg/l	TM178	<0.015 ♦#	0.0217 #			
Benzo(a)anthracene (aq)	<0.017 µg/l	TM178	<0.017 ♦#	<0.017 #			
Benzo(b)fluoranthene (aq)	<0.023 µg/l	TM178	0.0286 ♦#	<0.023 #			
Benzo(k)fluoranthene (aq)	<0.027 µg/l	TM178	<0.027 ♦#	<0.027 #			
Benzo(a)pyrene (aq)	<0.009 µg/l	TM178	0.0112 ♦#	0.00955 #			
Dibenzo(a,h)anthracene (aq)	<0.016 µg/l	TM178	<0.016 ♦#	<0.016 #			
Benzo(g,h,i)perylene (aq)	<0.016 µg/l	TM178	0.0353 ♦#	<0.016 #			
Indeno(1,2,3-cd)pyrene (aq)	<0.014 µg/l	TM178	0.0248 ♦#	<0.014 #			
PAH, Total Detected USEPA 16 (aq)	<0.344 µg/l	TM178	<0.344 ♦	<0.344			

CERTIFICATE OF ANALYSIS

SDG:	150227-74	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	305088
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

TPH CWG (W)

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+5@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	BH5	BH24	BH29	BH32	SA1	SA2
			Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
			Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
			Date Sampled	26/02/2015	25/02/2015	25/02/2015	25/02/2015	26/02/2015	26/02/2015
			Sample Time						
			Date Received	27/02/2015	27/02/2015	27/02/2015	27/02/2015	27/02/2015	27/02/2015
			SDG Ref	150227-74	150227-74	150227-74	150227-74	150227-74	150227-74
			Lab Sample No.(s)	10917592	10917566	10917508	10917456	10917360	10917628
			AGS Reference						
CRO Surrogate % recovery**	%	TM245		76	81	59	78	78	72
CRO >C5-C12	<50 µg/l	TM245		<50 #	<50 #	<50 #	<50 #	<50 #	296 #
Methyl tertiary butyl ether (MTBE)	<3 µg/l	TM245		<3 #	<3 #	<3 #	<3 #	<3 #	<3 #
Benzene	<7 µg/l	TM245		<7 #	<7 #	<7 #	<7 #	<7 #	<7 #
Toluene	<4 µg/l	TM245		<4 #	<4 #	<4 #	<4 #	<4 #	<4 #
Ethylbenzene	<5 µg/l	TM245		<5 #	<5 #	<5 #	<5 #	<5 #	<5 #
m,p-Xylene	<8 µg/l	TM245		<8 #	<8 #	<8 #	<8 #	<8 #	<8 #
o-Xylene	<3 µg/l	TM245		<3 #	<3 #	<3 #	<3 #	<3 #	<3 #
Sum of detected Xylenes	<11 µg/l	TM245		<11	<11	<11	<11	<11	<11
Sum of detected BTEX	<28 µg/l	TM245		<28	<28	<28	<28	<28	<28
Aliphatics >C5-C6	<10 µg/l	TM245		<10	<10	<10	<10	<10	12
Aliphatics >C6-C8	<10 µg/l	TM245		<10	<10	<10	<10	<10	72
Aliphatics >C8-C10	<10 µg/l	TM245		<10	<10	<10	<10	<10	70
Aliphatics >C10-C12	<10 µg/l	TM245		<10	<10	<10	<10	<10	58
Aliphatics >C12-C16 (aq)	<10 µg/l	TM174		<10	<10	159	<10	<10	80
Aliphatics >C16-C21 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	237
Aliphatics >C21-C35 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	447
Total Aliphatics >C12-C35 (aq)	<10 µg/l	TM174		<10	<10	159	<10	<10	764
Aromatics >EC5-EC7	<10 µg/l	TM245		<10	<10	<10	<10	<10	<10
Aromatics >EC7-EC8	<10 µg/l	TM245		<10	<10	<10	<10	<10	<10
Aromatics >EC8-EC10	<10 µg/l	TM245		<10	<10	<10	<10	<10	47
Aromatics >EC10-EC12	<10 µg/l	TM245		<10	<10	<10	<10	<10	39
Aromatics >EC12-EC16 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	34
Aromatics >EC16-EC21 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	109
Aromatics >EC21-EC35 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	227
Total Aromatics >EC12-EC35 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	370
Total Aliphatics & Aromatics >C5-35 (aq)	<10 µg/l	TM174		<10	<10	171	<10	<10	1430

CERTIFICATE OF ANALYSIS

SDG:	150227-74	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	305088
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

TPH CWG (W)

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+5@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	SA3	SA4	SA5	SW-A	SW-B	SW-C
			Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
			Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
			Date Sampled	26/02/2015	25/02/2015	25/02/2015	25/02/2015	25/02/2015	25/02/2015
			Sample Time						
			Date Received	27/02/2015	27/02/2015	27/02/2015	27/02/2015	27/02/2015	27/02/2015
			SDG Ref	150227-74	150227-74	150227-74	150227-74	150227-74	150227-74
			Lab Sample No.(s)	10917689	10917709	10917748	10917781	10917822	10917859
			AGS Reference						
CRO Surrogate % recovery**	%	TM245		79	88	79	80	77	74
CRO >C5-C12	<50 µg/l	TM245		<50 #	66 #	<50 #	<50 #	<50 #	<50 #
Methyl tertiary butyl ether (MTBE)	<3 µg/l	TM245		<3 #	<3 #	<3 #	<3 #	<3 #	<3 #
Benzene	<7 µg/l	TM245		<7 #	<7 #	<7 #	<7 #	<7 #	<7 #
Toluene	<4 µg/l	TM245		<4 #	<4 #	<4 #	<4 #	<4 #	<4 #
Ethylbenzene	<5 µg/l	TM245		<5 #	<5 #	<5 #	<5 #	<5 #	<5 #
m,p-Xylene	<8 µg/l	TM245		<8 #	<8 #	<8 #	<8 #	<8 #	<8 #
o-Xylene	<3 µg/l	TM245		<3 #	<3 #	<3 #	<3 #	<3 #	<3 #
Sum of detected Xylenes	<11 µg/l	TM245		<11	<11	<11	<11	<11	<11
Sum of detected BTEX	<28 µg/l	TM245		<28	<28	<28	<28	<28	<28
Aliphatics >C5-C6	<10 µg/l	TM245		<10	<10	<10	<10	<10	<10
Aliphatics >C6-C8	<10 µg/l	TM245		<10	14	<10	<10	<10	<10
Aliphatics >C8-C10	<10 µg/l	TM245		<10	13	<10	<10	<10	<10
Aliphatics >C10-C12	<10 µg/l	TM245		<10	14	<10	<10	<10	<10
Aliphatics >C12-C16 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	<10
Aliphatics >C16-C21 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	<10
Aliphatics >C21-C35 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	<10
Total Aliphatics >C12-C35 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	<10
Aromatics >EC5-EC7	<10 µg/l	TM245		<10	<10	<10	<10	<10	<10
Aromatics >EC7-EC8	<10 µg/l	TM245		<10	<10	<10	<10	<10	<10
Aromatics >EC8-EC10	<10 µg/l	TM245		<10	10	<10	<10	<10	<10
Aromatics >EC10-EC12	<10 µg/l	TM245		<10	<10	<10	<10	<10	<10
Aromatics >EC12-EC16 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	<10
Aromatics >EC16-EC21 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	<10
Aromatics >EC21-EC35 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	62
Total Aromatics >EC12-EC35 (aq)	<10 µg/l	TM174		<10	<10	<10	<10	<10	62
Total Aliphatics & Aromatics >C5-35 (aq)	<10 µg/l	TM174		<10	65	<10	<10	<10	62

CERTIFICATE OF ANALYSIS

SDG:	150227-74	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	305088
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

TPH CWG (W)

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+&@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	SW-D	SW-HOOLPOOL				
			Depth (m)	0.00 - 0.00	0.00 - 0.00				
			Sample Type	Water(GW/SW)	Water(GW/SW)				
			Date Sampled	26/02/2015	26/02/2015				
			Sample Time						
			Date Received	27/02/2015	27/02/2015				
			SDG Ref	150227-74	150227-74				
			Lab Sample No.(s)	10917882	10917408				
			AGS Reference						
CRO Surrogate % recovery**	%	TM245		92	95				
CRO >C5-C12	<50 µg/l	TM245		<50 #	<50 #				
Methyl tertiary butyl ether (MTBE)	<3 µg/l	TM245		<3 #	<3 #				
Benzene	<7 µg/l	TM245		<7 #	<7 #				
Toluene	<4 µg/l	TM245		<4 #	<4 #				
Ethylbenzene	<5 µg/l	TM245		<5 #	<5 #				
m,p-Xylene	<8 µg/l	TM245		<8 #	<8 #				
o-Xylene	<3 µg/l	TM245		<3 #	<3 #				
Sum of detected Xylenes	<11 µg/l	TM245		<11	<11				
Sum of detected BTEX	<28 µg/l	TM245		<28	<28				
Aliphatics >C5-C6	<10 µg/l	TM245		<10	<10				
Aliphatics >C6-C8	<10 µg/l	TM245		<10	<10				
Aliphatics >C8-C10	<10 µg/l	TM245		<10	<10				
Aliphatics >C10-C12	<10 µg/l	TM245		<10	<10				
Aliphatics >C12-C16 (aq)	<10 µg/l	TM174		<10	<10				
Aliphatics >C16-C21 (aq)	<10 µg/l	TM174		<10	<10				
Aliphatics >C21-C35 (aq)	<10 µg/l	TM174		<10	<10				
Total Aliphatics >C12-C35 (aq)	<10 µg/l	TM174		<10	<10				
Aromatics >EC5-EC7	<10 µg/l	TM245		<10	<10				
Aromatics >EC7-EC8	<10 µg/l	TM245		<10	<10				
Aromatics >EC8-EC10	<10 µg/l	TM245		<10	<10				
Aromatics >EC10-EC12	<10 µg/l	TM245		<10	<10				
Aromatics >EC12-EC16 (aq)	<10 µg/l	TM174		<10	<10				
Aromatics >EC16-EC21 (aq)	<10 µg/l	TM174		<10	<10				
Aromatics >EC21-EC35 (aq)	<10 µg/l	TM174		<10	<10				
Total Aromatics >EC12-EC35 (aq)	<10 µg/l	TM174		<10	<10				
Total Aliphatics & Aromatics >C5-35 (aq)	<10 µg/l	TM174		<10	<10				

CERTIFICATE OF ANALYSIS

SDG:	150227-74	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	305088
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Table of Results - Appendix

Method No	Reference	Description	Wet/Dry Sample [1]	Surrogate Corrected
TM061	Method for the Determination of EPH,Massachusetts Dept.of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)		
TM099	BS 2690: Part 7:1968 / BS 6068: Part2.11:1984	Determination of Ammonium in Water Samples using the Kone Analyser		
TM101	Method 4500B & C, AWWA/APHA, 20th Ed., 1999	Determination of Sulphide in soil and water samples using the Kone Analyser		
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS		
TM174	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Waters by GC-FID		
TM176	Modified: US EPA Method 8100	Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS in Waters		
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry		
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers		
TM187	Winkler, L.W, Ber Deutsch. Chem. Ges, 21,2843,1688."	Dissolved Oxygen in Natural and Waste Waters HMSO 1979 ISBN 011 751442		
TM191	Standard Methods for the examination of waters and wastewaters 16th Edition, ALPHA, Washington DC, USA. ISBN 0-87553-131-8.	Determination of Unfiltered Metals in Water Matrices by ICP-MS		
TM197	Modified: US EPA Method 8082.EA Method 174 and 5109631	Determination of WHO12 and EC7 Polychlorinated Biphenyl Congeners by GC-MS in Waters		
TM223	ASTM D-1945-91	Determination of Dissolved C1-7 Hydrocarbon gases in waters		
TM227	Standard methods for the examination of waters and wastewaters 20th Edition, AWWA/APHA Method 4500.	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate		
TM228	US EPA Method 6010B	Determination of Major Cations in Water by iCap 6500 Duo ICP-OES		
TM241	Methods for the Examination of Waters and Associated Materials; Chromium in Raw and Potable Waters and Sewage Effluents 1980.	The Determination of Hexavalent Chromium in Waters and Leachates using the Kone Analyser		
TM245	By GC-FID	Determination of CRO by Headspace in waters		
TM256	The measurement of Electrical Conductivity and the Laboratory determination of pH Value of Natural, Treated and Wastewaters. HMSO, 1978. ISBN 011 751428 4.	Determination of pH in Water and Leachate using the GLpH pH Meter		
TM259	by HPLC	Determination of Phenols in Waters and Leachates by HPLC		

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

CERTIFICATE OF ANALYSIS

SDG:	150227-74	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	305088
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	10917592	10917556	10917508	10917456	10917360	10917628	10917669	10917709	10917748	10917781
Customer Sample Ref.	BH5	BH24	BH29	BH32	SA1	SA2	SA3	SA4	SA5	SW-A
AGS Ref.										
Depth	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Type	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID
Ammoniacal Nitrogen	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015
Anions by Kone (w)	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015
Cyanide Comp/Free/Total/Thiocyanate	04-Mar-2015	04-Mar-2015	05-Mar-2015	04-Mar-2015	05-Mar-2015	05-Mar-2015	04-Mar-2015	04-Mar-2015	05-Mar-2015	04-Mar-2015
Determination of Dissolved Gases	03-Mar-2015	03-Mar-2015	03-Mar-2015	03-Mar-2015	02-Mar-2015	03-Mar-2015	03-Mar-2015	03-Mar-2015	03-Mar-2015	03-Mar-2015
Dissolved Metals by ICP-MS	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015
Dissolved Oxygen by Titration	04-Mar-2015	04-Mar-2015	06-Mar-2015	04-Mar-2015	04-Mar-2015	04-Mar-2015	04-Mar-2015	04-Mar-2015	04-Mar-2015	04-Mar-2015
EPH CWG (Aliphatic) Aqueous GC (W)	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015
EPH CWG (Aromatic) Aqueous GC (W)	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015
GRO by GC-FID (W)	11-Mar-2015	11-Mar-2015	10-Mar-2015	11-Mar-2015	09-Mar-2015	11-Mar-2015	09-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015
Hexavalent Chromium (w)	10-Mar-2015	10-Mar-2015	11-Mar-2015	11-Mar-2015	10-Mar-2015	11-Mar-2015	11-Mar-2015	10-Mar-2015	11-Mar-2015	10-Mar-2015
Mercury Dissolved	04-Mar-2015	04-Mar-2015	04-Mar-2015	04-Mar-2015	04-Mar-2015	04-Mar-2015	04-Mar-2015	04-Mar-2015	04-Mar-2015	05-Mar-2015
Metals by iCap-OES Unfiltered (W)	04-Mar-2015	05-Mar-2015	05-Mar-2015	05-Mar-2015	04-Mar-2015	05-Mar-2015	04-Mar-2015	05-Mar-2015	05-Mar-2015	04-Mar-2015
Nitrite by Kone (w)	06-Mar-2015	06-Mar-2015	06-Mar-2015	06-Mar-2015	07-Mar-2015	06-Mar-2015	10-Mar-2015	06-Mar-2015	07-Mar-2015	06-Mar-2015
PAH Spec MS - Aqueous (W)	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015
PCB Congeners - Aqueous (W)	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015
pH Value	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015
Phenols by HPLC (W)	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	12-Mar-2015	11-Mar-2015	11-Mar-2015	12-Mar-2015	11-Mar-2015
Sulphide	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015
TPH CWG (W)	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015

Lab Sample No(s)	10917822	10917859	10917882	10917406
Customer Sample Ref.	SW-B	SW-C	SW-D	SW-HOOLPOOL
AGS Ref.				
Depth	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
Type	LIQUID	LIQUID	LIQUID	LIQUID
Ammoniacal Nitrogen	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015
Anions by Kone (w)	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015
Cyanide Comp/Free/Total/Thiocyanate	05-Mar-2015	04-Mar-2015	05-Mar-2015	04-Mar-2015
Determination of Dissolved Gases	03-Mar-2015	04-Mar-2015	04-Mar-2015	02-Mar-2015
Dissolved Metals by ICP-MS	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015
Dissolved Oxygen by Titration	04-Mar-2015	04-Mar-2015	04-Mar-2015	04-Mar-2015
EPH CWG (Aliphatic) Aqueous GC (W)	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015
EPH CWG (Aromatic) Aqueous GC (W)	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015
GRO by GC-FID (W)	09-Mar-2015	11-Mar-2015	10-Mar-2015	11-Mar-2015
Hexavalent Chromium (w)	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015
Mercury Dissolved	04-Mar-2015	05-Mar-2015	04-Mar-2015	04-Mar-2015
Metals by iCap-OES Unfiltered (W)	04-Mar-2015	04-Mar-2015	04-Mar-2015	05-Mar-2015
Nitrite by Kone (w)	06-Mar-2015	06-Mar-2015	07-Mar-2015	06-Mar-2015
PAH Spec MS - Aqueous (W)	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015
PCB Congeners - Aqueous (W)	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015
pH Value	10-Mar-2015	10-Mar-2015	10-Mar-2015	10-Mar-2015
Phenols by HPLC (W)	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015
Sulphide	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015
TPH CWG (W)	11-Mar-2015	11-Mar-2015	11-Mar-2015	11-Mar-2015

SDG:	150227-74	**Location:**	Frodsham	**Order Number:**	ST14895
Job:	H_WARDELL_SKT-94	**Customer:**	Wardell Armstrong LLP	**Report Number:**	305088
Client Reference:	ST13418	**Attention:**	Tim Cawood	**Superseded Report:**	

Appendix

General

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICS and SVOC TICS.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible. The quantity of asbestos present is not determined unless specifically requested.

7. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP -No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals -total metals must be requested separately.

11. Results relate only to the items tested.

12. LODs for wet tests reported on a dry weight basis are not corrected for moisture content.

13. **Surrogate recoveries** -Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 -130 %.

14. **Product analyses** -Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5 -C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

Sample Deviations

1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Holding time exceeded before sample received**
5	**Samples exceeded holding time before presevation was performed**
§	**Sampled on date not provided**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to sampled on date**
&	**Sample Holding Time exceeded - Late arrival of instructions.**

Asbestos

Identification of Asbestos in Bulk Materials & Soils:

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

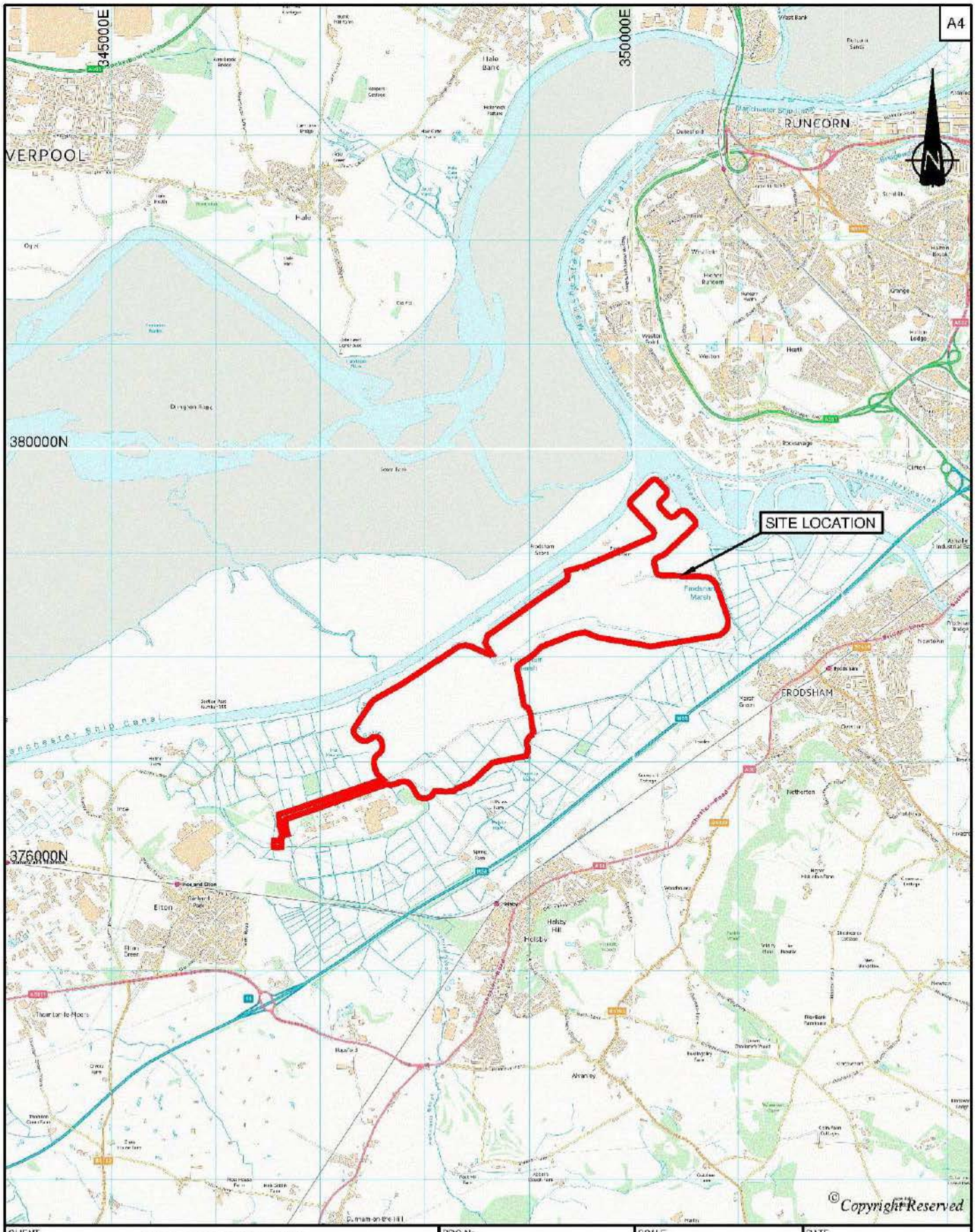
Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

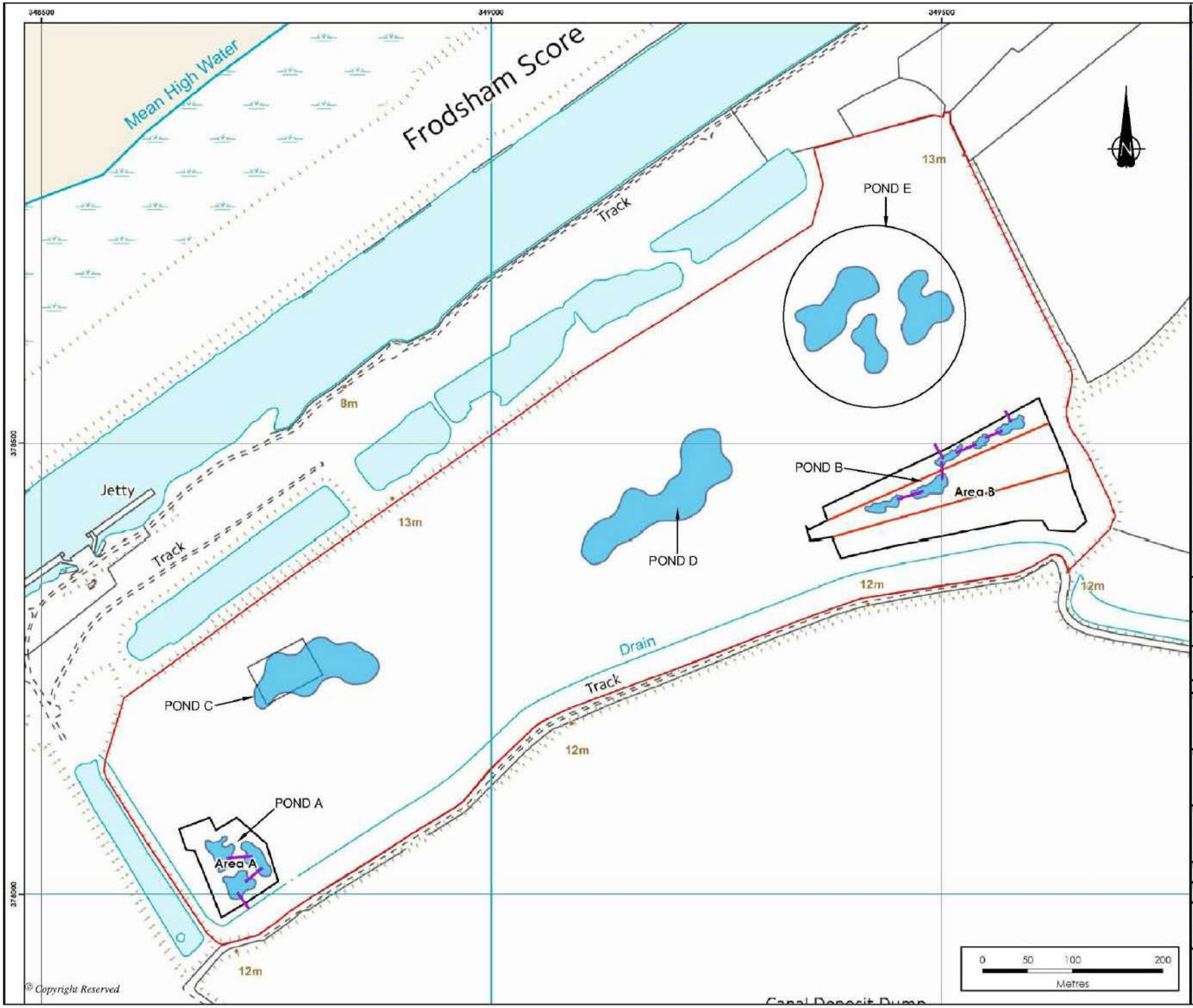
Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

DRAWINGS



CLIENT: Frodsham Windfarm Ltd	DRG No.: ST13418-009	SCALE: 1:10,000	DATE: 16/12/14
PROJECT: Piling Risk Assessment Frodsham Wind Farm, Cheshire	DRAWN BY: SJB	CHECKED BY: CS	APPROVED BY: CS
DRAWING TITLE: Site Location	wardell armstrong your earth our world		



DO NOT SCALE FROM THIS DRAWING | A3

Key

- Site boundary
- Excavated area
- Existing bund
- 200mm Id PE pipe
- Scrape

BASE PLAN PROVIDED BY ATMOS CONSULTING. REF: 8702/HY/007b

REVISION	DESCRIPTION	DATE	DRAWN	CHECKED	APPD
A	First Issue	09/03/15	SJB	MJW	CS

CLIENT: Frodsham Windfarm Ltd

PROJECT: Frodsham Wind Farm, Cheshire

DRAWING TITLE: Cell 3 Waterbody Locations

DRG No	SCALE	DATE
ST13418-012	Bar Scale	09/03/15

DRAWN BY	CHECKED BY	APPROVED BY
SJB	MJW	CS

STOKE-ON-TRENT (HEAD OFFICE) TEL 0845 111 7777
CARDIFF TEL 029 2072 9191
NEWCASTLE UPON TYNE TEL 0191 232 0943
LEIGH TEL 01942 260101
WEST BROMWICH TEL 0121 550 0699
SHEFFIELD TEL 0114 245 6244
LONDON TEL 020 7587 2672
EDINBURGH TEL 0131 555 3311
TAUNTON TEL 01823 700100

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Appendix D: Draft Memorandum of Understanding Between Frodsham Solar Ltd, Liverpool Bay Ccs Ltd and Cheshire West and Chester Council

MEMORANDUM OF UNDERSTANDING BETWEEN FRODSHAM SOLAR LTD, LIVERPOOL BAY CCS LTD AND CHESHIRE WEST AND CHESTER COUNCIL

This draft has been agreed with Liverpool Bay CCS Ltd and has been shared with Cheshire West and Chester Council. At present, the Applicant has not received feedback from the Council on this draft. Any references to agreement by all parties or by the Council should be considered draft statements in respect of the Council's views at present.

Introduction

The Examining Authority has requested that Frodsham Solar Ltd, Liverpool Bay CCS Ltd and Cheshire West and Chester Council submit a joint statement setting out a clear pathway to resolving the approach to the in-combination assessment in relation to the Proposed Development and the Runcorn Spur Carbon Dioxide (CO2) pipeline application which, without prejudice to any party, accords with the Habitats Regulations and enables an Adverse Effect on the Integrity of the Mersey Estuary Special Protection Area, including its functionally linked land, to be ruled out.

Liverpool Bay CCS Ltd (LBCCS) is the applicant for the Town and Country Planning Act 1990 (as amended) (TCPA) applications under references 25/02108/FUL (Chester West and Chester Council) and 25/00293/FULEIA (Halton Borough Council), which is an application for the construction of a new Carbon Dioxide Spur Pipeline and Above Ground Installation (AGI), together with ancillary equipment, to serve the Viridor Energy from Waste (EfW) Facility Carbon Capture Plant (the Runcorn Spur CO2 pipeline application).

Background to the Assessment Conducted

In relation to this Memorandum of Understanding, it is relevant that the Frodsham Solar application assessed the cumulative scenario of the pipeline being constructed either before or during the creation of the Non-Breeding Bird Mitigation Area (NBBMA). Based on the identified mitigation measures and the assumption that mitigation measures will be applied to the LBCCS consent, it concluded that neither of these cumulative scenarios would result in an Adverse Effect on the Integrity of the Mersey Estuary Special Protection Area, including its functionally linked land. Natural England have confirmed that it agrees with the conclusions of the Habitat Regulations Assessment for Frodsham Solar.

The LBCCS application assessed the scenario of the pipeline being constructed prior to the creation of the NBBMA and similarly concluded that, with mitigation measures in place, there would be no Adverse Effect on the Integrity of the Mersey Estuary Special Protection Area, including its functionally linked land.

Neither project assessed the scenario in which the pipeline would be constructed after the creation of the NBBMA. However, in response to questions raised during the examination, Frodsham Solar Ltd submitted an assessment of this scenario. That assessment was prepared without input from LBCCS and was submitted to demonstrate that, in principle, it would be possible for the pipeline project to be constructed after the creation of the NBBMA

without giving rise to Adverse Effect on the Integrity of the Mersey Estuary Special Protection Area, including its functionally linked land.

LBCCS has confirmed that this scenario is not something it has considered and, as such, it does not form part of their planning application or related assessments.

Points of Understanding

1. All parties agree that the Runcorn Spur CO2 Pipeline application has been submitted on the basis that the pipeline would be constructed in advance of Frodsham Solar and the NBBMA. This is clearly stated in the application documents, including the Habitats Regulations Assessment submitted by LBCCS.
2. All parties also agree that a planning application should be determined on the basis of the documents submitted and that, in order to ensure that the environmental effects of an application are acceptable, the determining authority may seek to impose condition(s) to secure that the development is carried out in accordance with the application as made.
3. All parties further agree that it is the duty of the competent authority to undertake an appropriate assessment under Regulation 63 of the Habitats Regulations (in a situation such as this where likely significant effects have not been able to be ruled out) and that the competent authority must be provided with sufficient information to undertake that assessment in accordance with the permission being sought.
4. All parties also agree that, under Regulation 70(2) of the Conservation of Habitats and Species Regulations 2017, the competent authority may impose planning conditions on a planning permission where it considers that any adverse effects of the plan or project on the integrity of a European site or a European offshore marine site would thereby be avoided.
5. All parties agree that it is possible in principle for Cheshire West and Chester Council to impose a condition which requires a Construction Environmental Management Plan to be approved and which requires such a CEMP to provide detail of how co-ordination with other developments is to be managed (without needing to name Frodsham Solar specifically) to ensure no effects on integrity. This is the approach proposed by Natural England in their Deadline 4 response [REP4-069].
6. LBCCS confirms that it intends to develop the project on the basis of the application as submitted, namely that the pipeline would be constructed in advance of Frodsham Solar. It therefore accepts that planning conditions could be imposed to ensure that the development is carried out in accordance with the submitted details and accept that due process will need to be followed if the pipeline cannot be installed prior to the NBBMA works by Frodsham Solar Ltd.
7. LBCCS is awaiting a consultation response from the Cheshire West and Chester Council biodiversity officer. It is also awaiting a further consultation response from Natural England following its submission made in response to Natural England's first consultation response dated 18 December 2025. LBCCS considers that it should be in receipt of those responses before discussing the precise terms of any planning conditions which would be applied to the planning permission; otherwise and until responses are received, the extent of what the conditions are seeking to address remains unclear.

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8. LBCCS and Frodsham Solar Ltd agree that the Local Planning Authority is able to determine the Runcorn Spur CO2 pipeline application on the terms in which it has been submitted, namely on the basis that the pipeline would be constructed in advance of Frodsham Solar, provided adequate conditions are imposed.
9. LBCCS and Frodsham Solar Ltd do not consider it appropriate for either the DCO or the TCPA planning permission to include requirements or conditions which would limit or restrict other development not authorised by that consent, as has been proposed by Cheshire West and Chester Council in its Deadline 4 submission [REP4-068].

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Frodsham Solar Limited

Name:

Signature:

Date:

Liverpool Bay CCS Limited

Name:

Signature:

Date:

Cheshire West and Chester Council

Name:

Signature:

Date:

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Appendix E: Ornithology Reference Papers

Kragten, S, Trimbos, KB & de Snoo, GR 2008, 'Breeding skylarks (Alauda arvensis) on organic and conventional arable farms in The Netherlands', *Agriculture, Ecosystems and Environment*, vol. 126, no. 3, pp. 163-167. https://doi.org/10.1016/j.agee.2008.01.021

Abstract

The aim of this study was to analyse the effects of differences in cropping pattern between organic and conventional arable farms on the breeding activity of skylarks and to assess the effects of arable crop management on skylark nest survival. Skylark nest density was seven times higher on organic farms than on conventional farms (0.63 vs. 0.09 nest per 10 ha). Skylarks showed a strong preference for spring cereals, lucerne and grass leys, all of which were mainly or exclusively grown on organic farms. On organic farms nests were initiated during the entire breeding season, but on conventional farms no nesting activity was found during the peak of the season (early May to early June). On organic farms 27% of all nests was successful. Increasing the availability of suitable breeding habitat during the peak of the breeding season on conventional farms might provide one means of enhancing breeding skylark populations. On organic farms, crop management should focus on reducing nest loss due to farming operations.

Fox, H. (2022) Blithe Spirit: Are Skylarks Being Overlooked in Impact Assessment? In Practice, 117 (September). Available at: [redacted]

Blithe Spirit: Are Skylarks Being Overlooked in Impact Assessment?

Figure 1. Skylark, *Alauda arvensis*, in flight. Photo credit: Keith Williams.

Keywords: arable farmland, bird mitigation, ground nesting birds, set-aside

In the absence of guidance, potential effects of development on ground-nesting birds (GNBs) of open habitats are being overlooked, with mitigation often being arbitrarily formulated. This article focuses on skylarks *Alauda arvensis* to encourage a re-examination and discussion of assessment and mitigation best practice for GNBs of conservation concern.

Introduction

The spiralling song of the skylark is so embedded in the national psyche that for many, it embodies much of the British landscape. The likely UK population is around 1.5 million pairs, less than half of what it was in the early 1980s (https://app.bto.org/birdtrends/species.jsp?s=skyla&year=2018). The steady decline of the skylark population since the 1970s due to agricultural intensification and habitat loss is well documented and has led to their inclusion on the IUCN Red List, as well as being Priority Species throughout the UK. Indeed, the species is emblematic of the general decline in populations of many farmland birds, especially ground-nesting birds (GNBs) of open habitats, including lapwing *Vanellus vanellus*, yellow wagtail *Motacilla flava* and grey partridge *Perdix perdix*. Yet despite the publicity, and their capability of being material considerations in the planning process, it appears that skylarks and other GNBs are often undervalued – or simply missed altogether – in ecological assessments. Furthermore, where mitigation *is* recommended, are we sure that it is based on an ecologically sound rationale?

The highest densities of skylarks occur in upland and coastal regions and the arable heartlands of the east of England. Here, and in Northern Ireland, are the scenes of the greatest losses of skylarks in recent decades (Figure 2). The Centre for Ecology and Hydrology reported in 2020 that some 768,000 ha of

grassland (including arable) were lost mostly to urban development and woodland planting between 1990 and 2015. Around 1–2% of greenbelt land is developed annually according to the Office for National Statistics, with the Government pledging to build a further 300,000 new homes per year. In a bid to tackle climate change and energy security, the Government has suggested the UK's solar energy generation capacity could grow five-fold to 70 GW and pledged a surge in support for onshore wind energy. While the fortunes of GNBs may be dramatically influenced by changes in agricultural policy, piecemeal developments have the potential to exacerbate local declines and place greater pressure on remaining habitats to absorb displaced birds.

Having examined publicly available Ecological Impact Assessments of developments on land supporting skylark territories, it would appear there is an inconsistency in understanding of not only skylark ecology, but opinion on what might constitute an impact, and what mitigation could be employed. This is likely to be the case for other GNBs but is understandable given the scant guidance on impact assessment for birds. Advice on the issue given to clients by different consultants varies wildly. This situation risks undermining the industry and creating a 'race to the bottom' where potentially ecologically

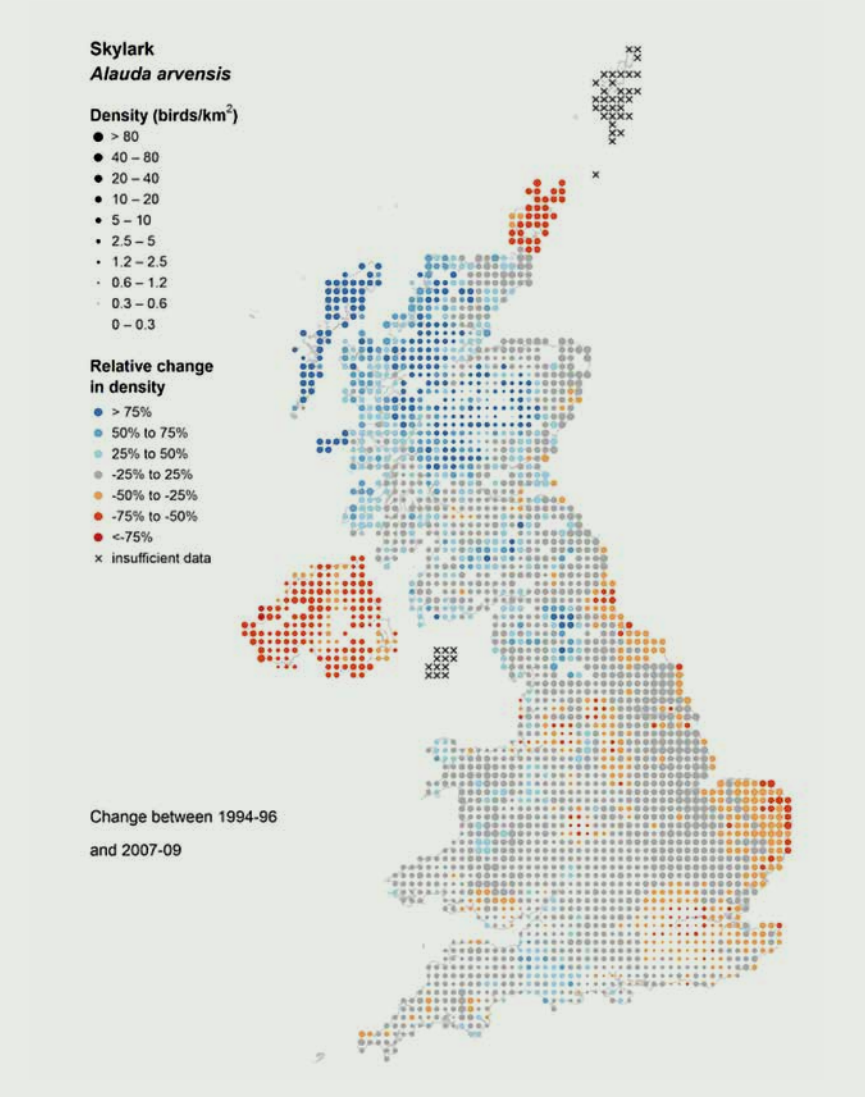

Figure 2. Skylark population change between 1994–96 and 2007–9. Data from the British Trust for Ornithology.

2008), while more spraying and an earlier harvest together cause significant nest mortality. The loss of spring cereals alone has been said to account for the majority of change in skylark population in the last 30 years (Donald 2004).

While chicks are almost exclusively fed on invertebrates, adult birds also feed on seeds, grains and leaf shoots. As grassland habitats are usually less productive for invertebrates than for example, woodland, skylarks nest at comparatively lower densities than many other songbirds. Table 1 shows the relative densities of skylarks foraging in different agricultural habitats. The greatest densities are in unimproved grasslands and heaths, but in an agricultural setting, set-aside and fallow (where weeds encroach) is best (Poulsen *et al.* 1998). Pasture and other improved grassland usually supports the very lowest densities of skylarks on farmland (Donald 2004).

Development impacts

On a typical housing or solar scheme, it is difficult to see how potential displacement impacts on skylarks can be overlooked. Even with the inclusion of amenity grassland, easements or buffers of retained habitats are likely to be incompatible with the requirements of nesting skylarks, unless very large, undisturbed and managed to promote invertebrates. For example, in preparing this article, no conclusive records of skylark nests within an active solar array were found. This includes data derived from the post-construction monitoring of over 100 solar installations in England and Wales by our company and from observations from associates in the industry.

Male skylarks are frequently observed advertising territories over solar arrays. However, singing is not a conclusive indicator of a viable nest. Skylarks, like many other birds, exhibit strong nest-site fidelity (Donald 2004) and results from one well-established 60 ha solar site that we monitor showed that numbers of singing birds waned following construction from a peak of seven in 2015 to zero in 2020 and 2021.

Skylarks have, however, been recorded many times foraging within solar arrays and even feeding recently fledged young. Fledglings can disperse considerable distances from their nests in just a few days and continue to be fed by parent birds for between 8 and 12 days after fledging (Donald 2004), so this behaviour alone may not be considered evidence of nesting on site. It is possible, therefore, that development sites with suitable grassland might even provide 'nursery' habitat where nesting takes place on adjacent farmland.

The fate of displaced skylarks is unclear. As ecologists we will need to decide the likely significance of effects and whether mitigation should be considered. This decision will be informed by the number of territories displaced versus retained, any wider habitat fragmentation, the habitat type and territory density on surrounding land and the management of any retained or created habitat.

Considering the above, if the carrying capacity of neighbouring habitat allows, some degree of 'absorption' into the surroundings is theoretically possible. Where sites are in proximity to heaths, moorland or coastal grassland this may be more likely. However, in intensive arable landscapes, this is less so and an acceleration of a decline of local breeding success is possible, especially in combination with other development.

Options for mitigation

Their specific nesting requirements mean that effective compensation for skylark displacement requires either the provision of newly available habitat or the enhancement of existing habitat. Habitat enhancement could be designed to increase either the carrying capacity within mitigation land (thereby hosting displaced pairs) or the breeding success of pairs already present.

Arable sward-diversification measures which have been trialled with success for GNB enhancement include 'beetle banks', wider uncultivated margins and increased numbers of tramlines. While margins may be less likely to host actual nest sites, they are often incorporated into territories to exploit the foraging habitat they support and reduce the distance flown per foraging bout (Wilson *et al.* 1997, Donald 2004).

Perhaps the most familiar enhancement is the inclusion of 'skylark plots' within neighbouring arable land. Developed

Table 1. Example skylark territory densities according to habitat type and management. Adapted from Donald (2004) with additional data from research in References.

Habitat	Average density per hectare
Coastal marshes	0.76
Organic set-aside	0.56
Heath and steppe	0.56
Spring cereals	0.46
Set-aside/fallow	0.39
Organic cereals	0.38
Organic winter cereals	0.36
Intensive set-aside	0.36
Arable farmland	0.28
Rootcrops	0.27
Natural grassland	0.27
Moorland	0.26
Winter cereals	0.23
Mixed farmland	0.23
Organic silage	0.22
Pastoral farmland	0.18
Intensive cereals	0.17
Intensive winter cereals	0.15
Legumes	0.12
Oilseed	0.12
Organic grazed pasture	0.1
Brassicas	0.1
Intensive silage	0.08
Orchards	0.07
Rough grazing	0.06
Improved grassland	0.05
Intensive grazed pasture	0.02

by the RSPB in the 1990s, skylark plots are small (approx. 5 × 5 m) patches of undrilled land within arable fields created by turning off the seed drill momentarily at a rate of two per hectare. Plots are not designed to provide nest locations; rather, once colonised by weeds, they act as oases for invertebrates upon which birds can feed, increasing prey accessibility by opening up the sward. Several studies indicate success of plots in increasing territory densities, especially later in the season as the sward rises (Ogilvy *et al.* 2006).

It is common to see ecologists propose a basic metric such as two plots for each skylark territory displaced. It is not clear how this is decided upon and appears to confuse the 2 plots/ha rate of RSPB farmland management advice with a suggested rate per displaced territory. Territory densities in cereal crops vary between approximately 0.1 and 0.4 territories/ha (Donald 2004), increasing up to 0.8/ha with plots, so it is highly unlikely that 1 ha with plots would be able to support an additional displaced territory. We therefore argue against using this rate.

More recent research suggests confounding effects of plots on breeding success. An increase in predation has been shown in fields with plots (especially alongside aforementioned sward-diversification measures which create 'edges'; Morris and Gilroy 2008). Other studies fail to show significant benefits from incorporating plots, possibly due to poor colonisation by weeds, or increased pesticide overspray (Smith *et al.* 2009, Field *et al.* 2010). It is clear that the use of plots must be carefully judged and be just one of several options used, although not in the same fields.

The reversion to traditional spring-sown regimes with retention of winter stubbles provides a longer nesting season and better winter forage (Donald 2004). This is perhaps the best conventional arable management for skylarks, while set-aside and fallow are also excellent habitats (Poulsen *et al.* 1998), with organic farming showing further benefits, owing to reduced pesticide use and slower growing varieties.

An alternative mitigation metric

In the absence of other guidance, an alternative metric is presented that promotes optimal off-site compensation based on research into territory densities across different habitat types. The following method determines the amount of land which, when managed or enhanced accordingly, should accommodate a desired number of displaced skylark territories.

1. Use survey data to quantify the number of breeding territories in the development footprint. Example: 20 territories.
2. Calculate the density of territories across all skylark-suitable habitat to be impacted (the 'donor' site). Example: 20 territories/100 ha site = 0.2 territories/ha.
3. Decide on the number of territories to be compensated.
    a. It may be appropriate to discuss 100% compensation with your client as a worst-case scenario. Depending on the balance of other likely ecological impacts and benefits, there may be an 'acceptable' number of un-compensated displaced territories. Ultimately, this will be a professional judgement call based on site and development specifics.
    b. Other ecological effects inherent in the proposals may allow for a reduction in the need for compensation. For example, where the development site will retain or create sufficient grassland *foraging* habitat for skylarks, territories close to the edges of the development may benefit through increased breeding productivity. For example, we might assume that 50% of on-site territories occurring within 75 m of the development edge may not need to be compensated when suitable foraging land will be present on site, provided *sufficient nesting habitat is present on adjacent land to absorb them*. Example: eight on-site territories within 75 m of development boundary; 50% × 8 = 4 so 20 territories to be compensated becomes 16.
    c. If sufficiently open habitat is retained within proposals, or where there is an abundance of suitable habitat nearby which is likely to be below carrying capacity for GNBs, some absorption may theoretically reduce this further. However, caution should be exercised, and this effect may require baseline survey evidence.
    d. Cumulative impacts due to other development in proximity to donor and receptor sites should be examined, potentially raising compensation requirements.

Figure 4. Skylark on the ground. Photo credit: Keith Williams.

4. Determine the baseline territory density at the receptor site either from site survey or referencing research-based figures by crop type/land use (e.g. Table 1). If the habitat is sufficiently similar to the 'donor site', it may be more appropriate to apply the figure calculated in step 2.
5. Calculate the net change in territory density possible at a receptor site before and after enhancement.
   a. Determine the theoretical territory density achievable through a positive change in management at the receptor site (see Table 1). Example: 0.56 territories/ha in set-aside.
   b. From this, subtract the actual (surveyed) or assumed (Table 1/step 2) receptor baseline. Example: 0.56 – 0.2 = 0.36.
6. Divide the number of territories to be compensated by the net density change figure (step 5b) to give the number of hectares to be positively managed to accommodate displaced territories. For example, 12/0.36 = 44.4 ha.

Candidate receptor fields should feature low (<2 m high) boundary features, no buildings and a short axis of >200 m. The more ambitious the proposed habitat enhancement (e.g. grazed pasture to set-aside), the less receptor land required. In the absence of grassland creation or arable de-intensification, this calculation could at least indicate the area over which measures such as skylark plots, margins, headlands, etc., should be adopted. The management prescriptions on farmed receptor sites resemble familiar agri-environment scheme options and would cause a slight reduction in agricultural productivity. The concept of reimbursement for income foregone is well-established and serves as a useful starting point for discussion with landowners. Agreements may need to build in a degree of crop rotation within the landholding. Compensatory management should be secured in the long term and be accompanied by a degree of monitoring to further understanding of development impacts and mitigation effectiveness.

Conclusions

The prototype methodology given here is not perfect, makes several assumptions and is as yet without monitoring data. However, it is anticipated to provide a starting point for discussion on GNB mitigation. Hopefully, potential impacts on GNBs can be better anticipated and considered within impact assessment. We look forward to hearing the opinions of other ecologists and researchers on the severity or otherwise of development upon GNBs and the potential for successful mitigation, including refinements to data in Table 1. We would like to see the development of a forum on bird mitigation for use by practitioners, with examples and resources. In time, this should improve the general understanding of bird ecology among ecologists and result in more consistency.

Since GNBs require a lot of space, it is unsurprising that these calculations often indicate large compensation areas might be required. Clearly, this is likely to result in difficult conversations with clients where previously none may have taken place. In our opinion, this only serves to reinforce the need for more scrutiny of the issue by the industry, and more widely by policy-makers.

On development projects, the onus is typically placed on developers or agents to source receptor sites, negotiate management contracts and ensure monitoring is undertaken. Often, this can lead to poor outcomes for wildlife with the breakdown of agreements or lack of follow-up, continuity of personnel or enforcement. Perhaps there is an opportunity to integrate compensation with targets under schemes such as the proposed Environmental Land Management programme? Or alternatively, a system for brokering ecological mitigation between developers and land managers along the lines of that carried out through district-level licensing or natural capital marketplaces. The reversion of relatively small areas of intensive farmland to traditional, low-intensity management with the inclusion of set-aside and wide headlands and winter stubbles could contribute meaningfully to net gain and Nature Recovery targets.

References

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About the Author

Harry Fox BSc MCIEEM has been an ecologist for 15 years and is Principal Ecologist at Clarkson and Woods. He is a lifelong birder and has also contributed to Bat Conservation Trust guidance on mitigating the effects of lighting on bats.

Email Harry at: harry@clarksonwoods.co.uk

Appendix F: Cheshire Fire and Rescue Service Letter

Cheshire
Fire & Rescue Service

CUBICO INVESTMENTS LTD
FRODSHAM MARSH SOLAR & BESS
HAPSFORD LANE
CHESTER
WA6 7BQ

Please ask for: [redacted]
Address: Cheshire Fire & Rescue Service
St Anne Street
Chester
CH1 2HP
Telephone: 01244 322222
Email: [redacted]
Website: https://www.cheshirefire.gov.uk/fire-protection/

Date: 25 March 2026

Mr [redacted]

THE REGULATORY REFORM (FIRE SAFETY) ORDER 2005
PREMISES: CUBICO INVESTMENTS LTD, FRODSHAM MARSH SOLAR & BESS, HAPSFORD LANE, CHESTER, WA6 7BQ

Thank you for your time on Thursday 19th March 2026.

To confirm our discussion points Cheshire Fire and Rescue Service (CFRS) have been and continue to be consulted with during the early planning stages of this project. At this stage, CFRS have no concerns regarding the project proposals. A review of the Frodsham Solar Outline Battery Safety Management Plan dated January 2026 has been made.

CFRS have specific operational plans to respond to incidents involving BESS sites. Prior to the BESS being commissioned and fully operational CFRS will complete a site- specific risk Information (SSRI) visit to the site to enable accurate operational risk information to be recorded. This information will be securely recorded and can be used during any operational incident on site to ensure firefighters are aware of the risk and operational plans to follow. Prior to this date CFRS should be invited to complete the SSRI with project management.

At this stage of the project CFRS have no concerns relating to contamination risks. As detailed in 4.5.7 of the Frodsham Solar Outline Battery Safety Management Plan firefighting water will be contained on site. For airborne contamination CFRS will work closely with Cheshire Resilience Forum partners to control and manage the risk.

There are no specific concerns at this time regarding the information contained in Appendix D of the applicants response to Chemicals mentioned that could be a risk to human health. CFRS have a specialist Hazardous Material Environmental Protection Officer (HMEPO) that will respond to any incident on site and will work closely with partners to control and reduce the risk of any ground or airborne contamination risk.

In regard to action point 42 of the applicants response, CFRS have no specific concerns at this stage of the project. CFRS have suitable operational and tactical plans in place to manage a fire within the BESS site.

The expectations at this time is that the project will continue to be inline with the National Fire Chiefs (NFCC) BESS Guidance and that any deviations from this guidance will require specific communication with CFRS.

Access for fire and rescue service

For BESS site access and facilities for the fire service should be in accordance with Section 15 Vehicle Access of Approved Document B volume 2: 2019, supporting the Building Regulations 2010.

- For small buildings access for a pumping appliance should be provided to within 45m of every point of the building footprint or 15% of the perimeter, whichever is less onerous. For all other buildings, provide access for a pumping appliance in accordance with Table 15.1.
- Access routes and hard standings should comply with the guidance in Table 15.2. Roads/hard standing capable of accommodating fire service vehicles in all weather conditions. As such there should be no extremes of grade.
- Dead- end access routes longer than 20m require turning facilities, as in Diagram 15.10. Turning facilities should comply with the guidance in Table 15.2.
- At least 2 separate access points to the site to account for opposite wind conditions/direction.
- A perimeter road or roads with passing places suitable for fire service vehicles.
- Road networks on sites must enable unobstructed access to all areas of the facility.

If you should require any further information or assistance please contact the Inspecting Officer.

Appendix G: Permitted Preliminary Works Comparison Table

Frodsham **"permitted preliminary works" means all or any of—**	**The Byers Gill Solar Order 2025**	**The Tillbridge Solar Order 2025**	**The Stonestreet Green Solar Order 2025**	**The Cory Decarbonisation Project Order 2025**	**The Oaklands Farm Solar Park Order 2025**	**The Fenwick Solar Farm Order 2026**	**The Longfield Solar Farm Order 2023**	**The East Yorkshire Solar Farm 2025**	**The Heckington Fen Solar Park Order 2025**
(a) environmental surveys to be carried out pursuant to the construction environmental management plan approved under requirement 12 (construction environmental management plan);	✓	✓	✓	✓	✓	✓	✓	✓	✓
(b) geotechnical surveys, and other investigations for the purpose of assessing ground conditions to be carried out pursuant to the ground conditions investigations and assessments strategy approved under requirement 17 (ground conditions);	✓	✓	✓ *"(f) investigations for the purpose of assessing ground conditions"*	✓ *"…monitoring investigations for the purpose of assessing ground conditions…"*	✓	✓	✓	✓	✓

Frodsham **"permitted preliminary works" means all or any of—**	**The Byers Gill Solar Order 2025**	**The Tillbridge Solar Order 2025**	**The Stonestreet Green Solar Order 2025**	**The Cory Decarbonisation Project Order 2025**	**The Oaklands Farm Solar Park Order 2025**	**The Fenwick Solar Farm Order 2026**	**The Longfield Solar Farm Order 2023**	**The East Yorkshire Solar Farm 2025**	**The Heckington Fen Solar Park Order 2025**
(c) intrusive archaeological surveys to be carried out pursuant to the written scheme of archaeological investigation (or multiple written schemes of archaeological investigation) approved under requirement 18 (archaeological mitigation strategy);	✓	✓	✓ *"(d) archaeological investigations"*	✓ *"…archaeological surveys and investigations, the creation of new ditches and the enhancement of existing ditches…"*	✓	✓	✓	✓	✓
(d) receipt and erection of construction plant and equipment;	✗	✗	✗	✓	✗	✗	✗	✗	✗
(e) removal of plant and machinery;	✓	✓	✗	✗	✓	✓	✓	✓	✓

Frodsham **"permitted preliminary works" means all or any of—**	**The Byers Gill Solar Order 2025**	**The Tillbridge Solar Order 2025**	**The Stonestreet Green Solar Order 2025**	**The Cory Decarbonisation Project Order 2025**	**The Oaklands Farm Solar Park Order 2025**	**The Fenwick Solar Farm Order 2026**	**The Longfield Solar Farm Order 2023**	**The East Yorkshire Solar Farm 2025**	**The Heckington Fen Solar Park Order 2025**
(f) above ground site preparation for temporary facilities for the use of contractors;	✓	✓	✗	✗	✓	✓	✓	✓	✓
(g) remedial work in respect of any contamination or other adverse ground conditions to be carried out pursuant to the ground conditions investigations and assessments strategy approved under requirement 17 (ground conditions);	✗	✓	✓	✗	✓	✓	✓	✓	✓
(h) diversion and laying of apparatus;	✓	✓	✓	✓	✓	✓	✓ *"(d) diversion*	✓	✓ *"(d) diversion of*

Frodsham **"permitted preliminary works" means all or any of—**	**The Byers Gill Solar Order 2025**	**The Tillbridge Solar Order 2025**	**The Stonestreet Green Solar Order 2025**	**The Cory Decarbonisation Project Order 2025**	**The Oaklands Farm Solar Park Order 2025**	**The Fenwick Solar Farm Order 2026**	**The Longfield Solar Farm Order 2023**	**The East Yorkshire Solar Farm 2025**	**The Heckington Fen Solar Park Order 2025**
							of existing services and the laying of temporary services"		*existing services and the laying of temporary services"*
(i) the provision of temporary means of enclosure and site security for construction;	✓	✓	✓	✓	✓	✓	✓	✓	✓
(j) the temporary display of site notices or advertisements;	✓	✓	✓	✓	✓	✓	✓	✓	✓

Frodsham **"permitted preliminary works" means all or any of—**	**The Byers Gill Solar Order 2025**	**The Tillbridge Solar Order 2025**	**The Stonestreet Green Solar Order 2025**	**The Cory Decarbonisation Project Order 2025**	**The Oaklands Farm Solar Park Order 2025**	**The Fenwick Solar Farm Order 2026**	**The Longfield Solar Farm Order 2023**	**The East Yorkshire Solar Farm 2025**	**The Heckington Fen Solar Park Order 2025**
(k) site clearance (comprising vegetation removal and demolition of existing buildings and structures); or	✓	✓	✓ *"(b) site clearance and/or vegetation works"*	✓ *"…site clearance including vegetation clearance, and Work No. 3 (utility connections)."*	✓	✓	✓	✓	✓
(l) access and highway improvements and use, comprising works to create, improve, repair or maintain streets, roads, haul roads and access points within the limits of deviation for Work No. 8 shown on the Works Plans.	✗	✗	✗	✗	✗	✗	✗	✗	✗