

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID
- Several of Type at Location

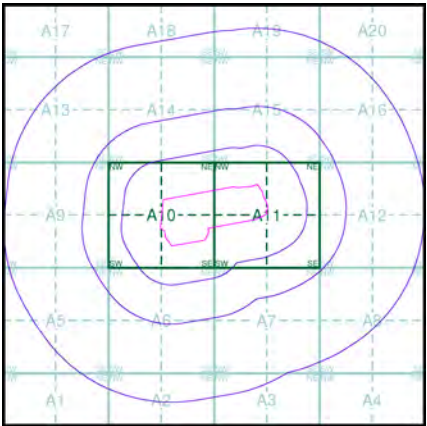
Agency and Hydrological (Boreholes)

- BGS Borehole Depth 0 - 10m
- BGS Borehole Depth 10 - 30m
- BGS Borehole Depth 30m +
- Confidential
- Other

For Borehole information please refer to the Borehole .csv file which accompanied this slice.

A copy of the BGS Borehole Ordering Form is available to download from the Support section of www.envirocheck.co.uk.

Borehole Map - Slice A



Order Details

Order Number: 278157460_1_1
Customer Ref: PN214233
National Grid Reference: 327930, 184100
Slice: A
Site Area (Ha): 16.79
Search Buffer (m): 1000

Site Details

Newport Quinn SDD RFO, Celtic Way, Celtic Lakes,
NEWPORT, NP10 8BE



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

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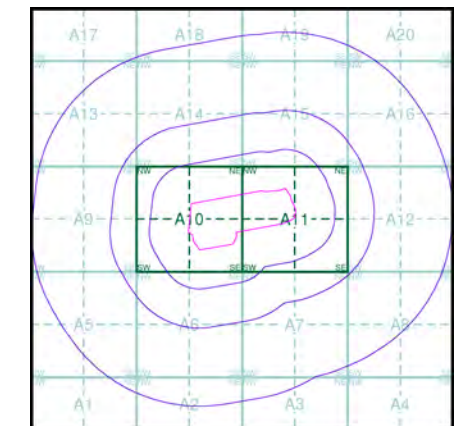
OS Water Network Data

- | | |
|--------------|-------------------------|
| Canal | Drain |
| Reservoir | Other |
| Foreshore | Lake |
| Marsh | Transfer |
| Tidal River | Lock Or Flight Of Locks |
| Inland River | Sea |

Contours (height in meters)

- Standard Contour 105 100 95
- Master Contour
- Spot Height 167.3
- MLW Mean Low Water
- MHW Mean High Water

OS Water Network Map - Slice A

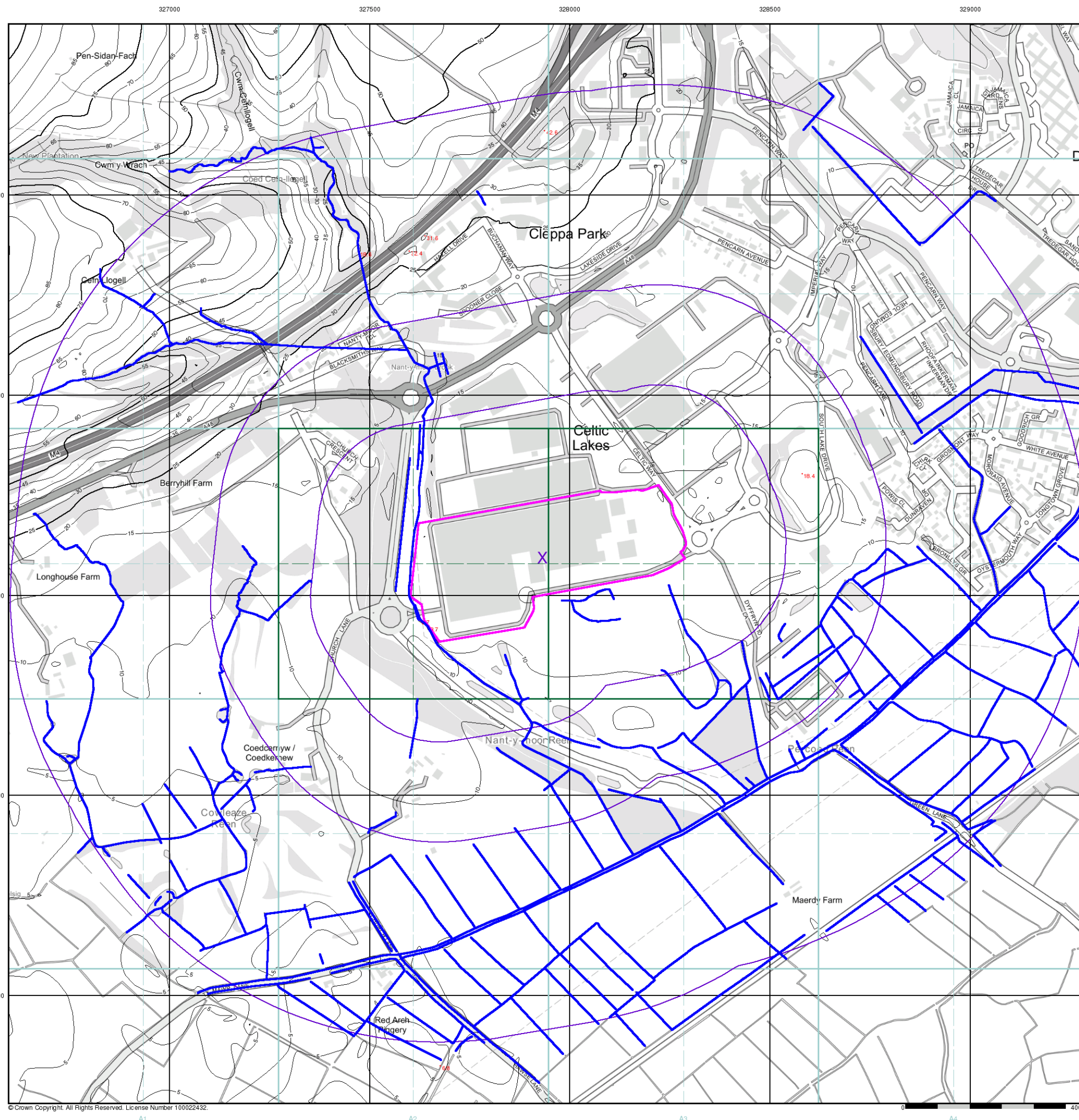


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Risk of Flooding from Surface Water

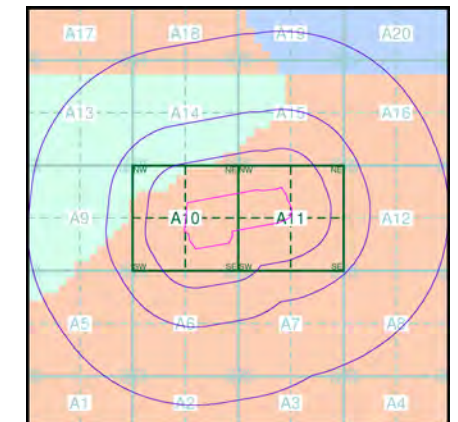
- High - 30 Year Return
- Medium - 100 Year Return
- Low - 1000 Year Return

Suitability

See the suitability map below

- National to county
- County to town
- Town to street
- Street to parcels of land
- Property

EANRW Suitability Map - Slice A

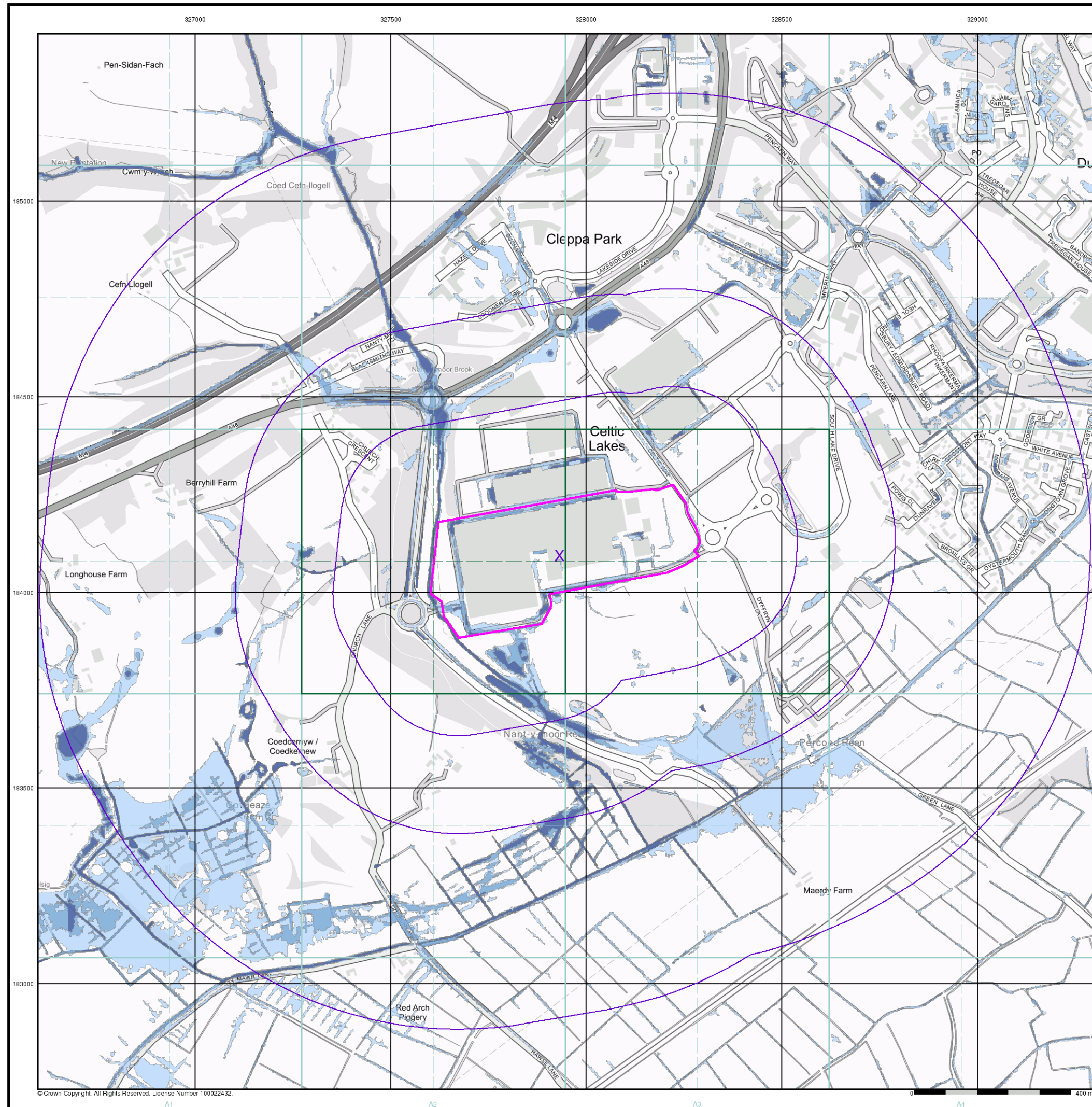


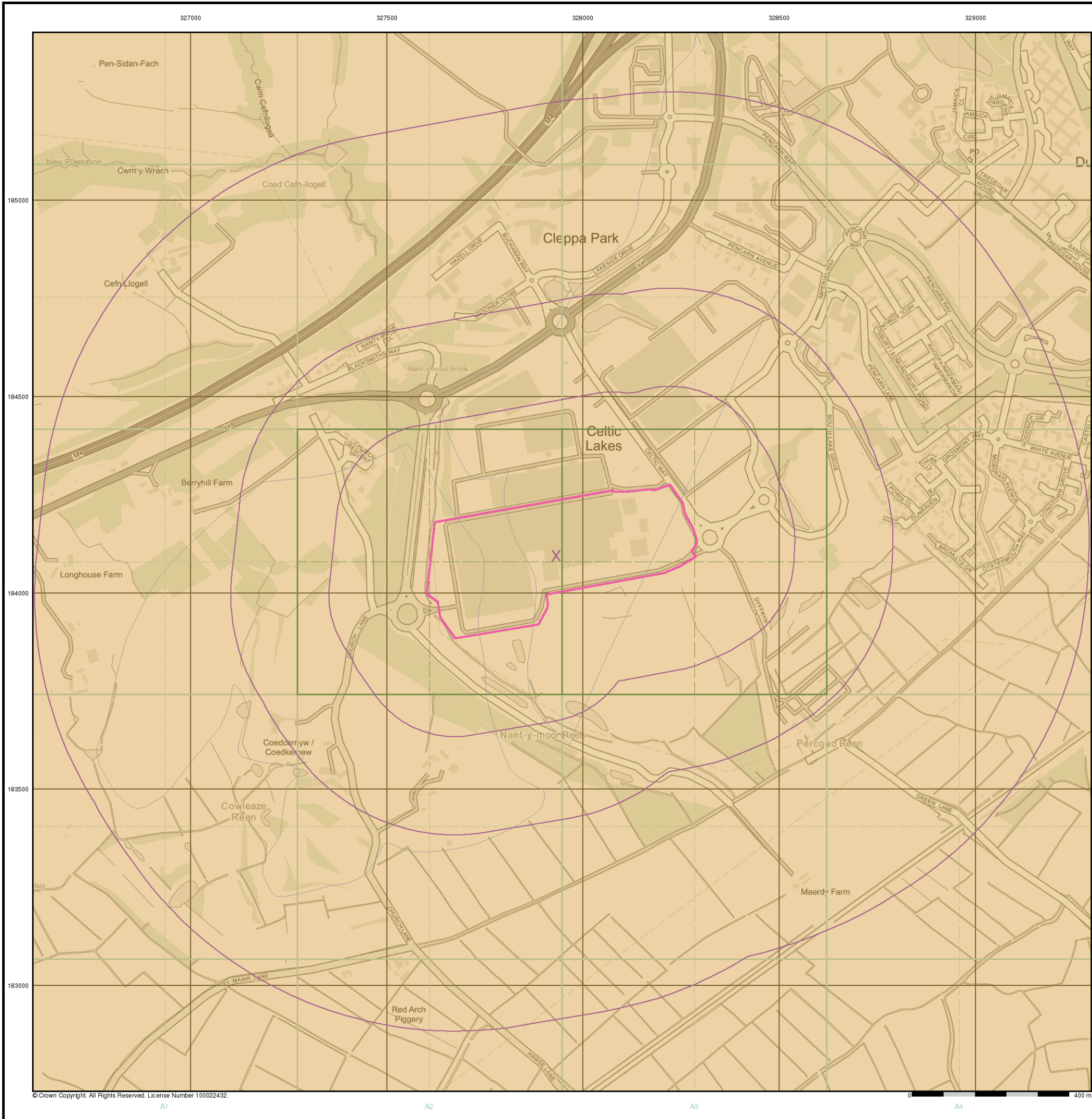
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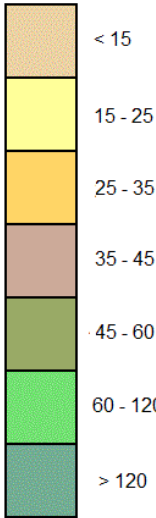


General

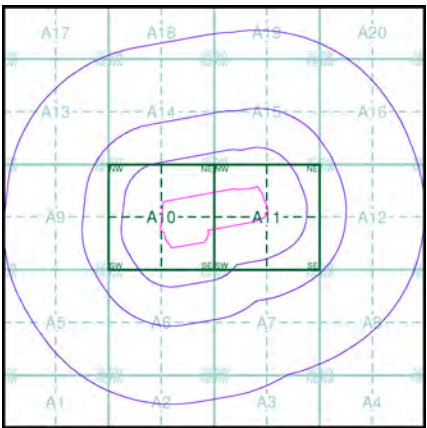
Specified Site Specified Buffer(s) Bearing Reference Point

Estimated Soil Chemistry Arsenic

Arsenic Concentrations mg/kg



Estimated Soil Chemistry Arsenic - Slice A



Order Details

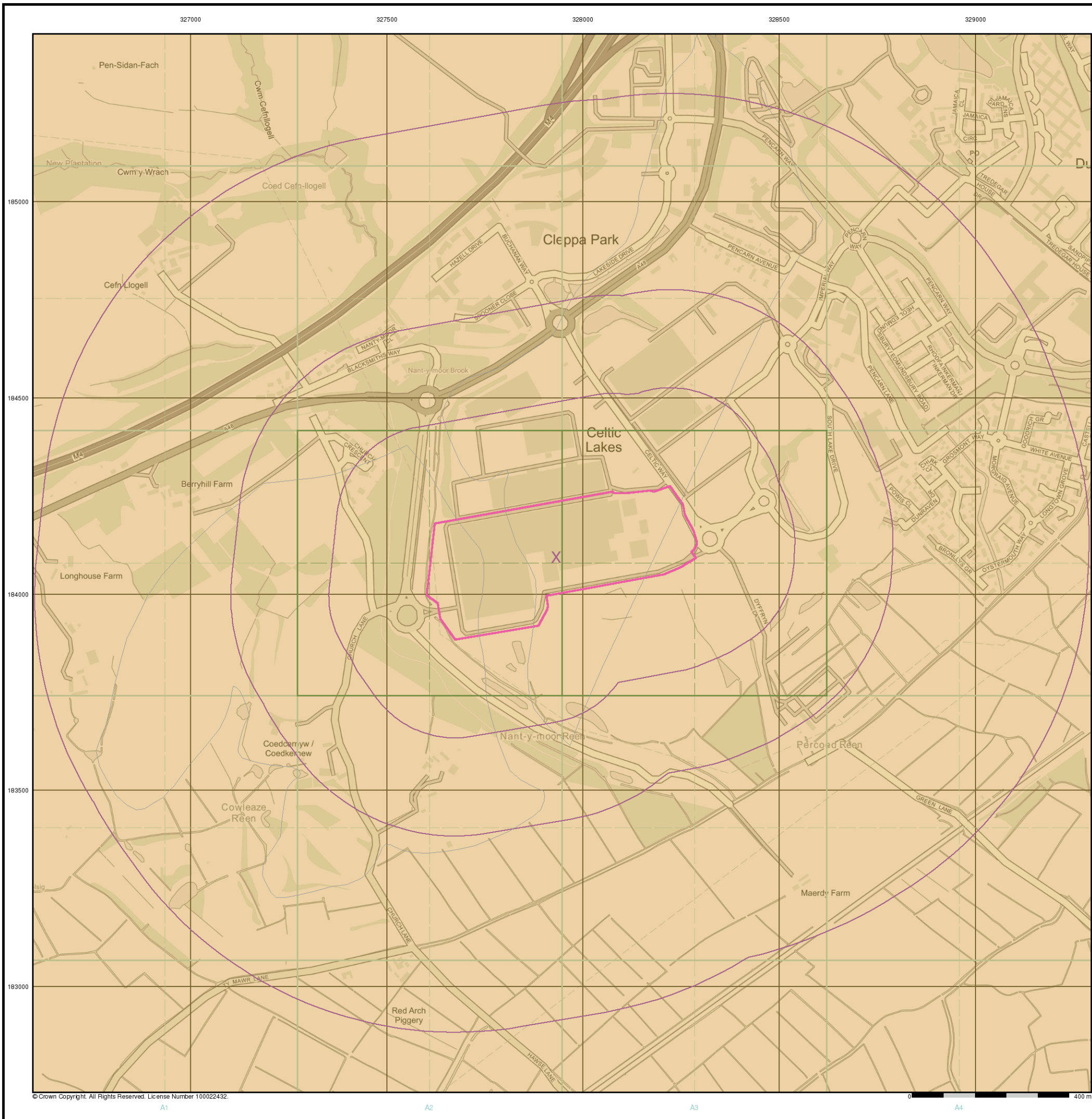
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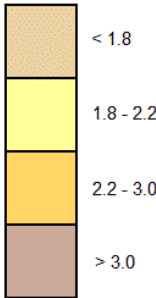


General

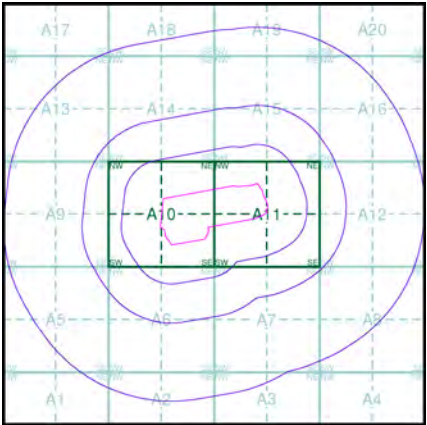
Specified Site Specified Buffer(s) Bearing Reference Point

Estimated Soil Chemistry Cadmium

Cadmium Concentrations mg/kg



Estimated Soil Chemistry Cadmium - Slice A



Order Details

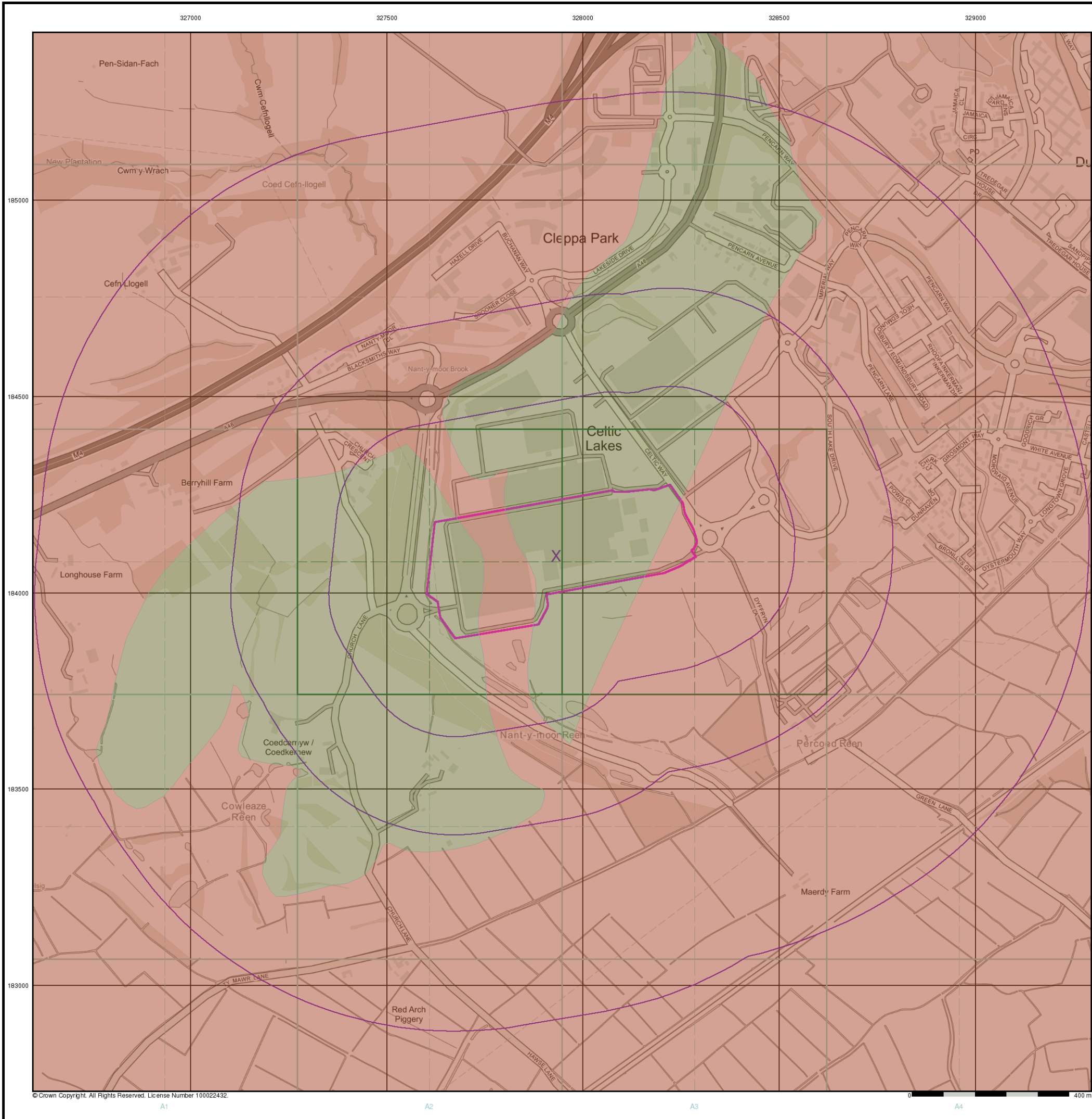
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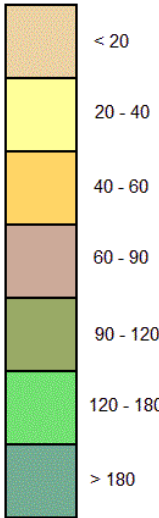


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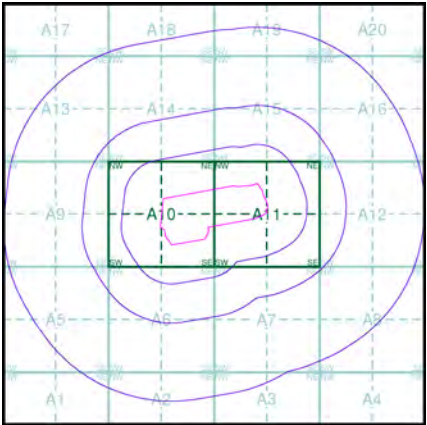
Specified Site Specified Buffer(s) Bearing Reference Point

Estimated Soil Chemistry Chromium

Chromium Concentrations mg/kg



Estimated Soil Chemistry Chromium - Slice A



Order Details

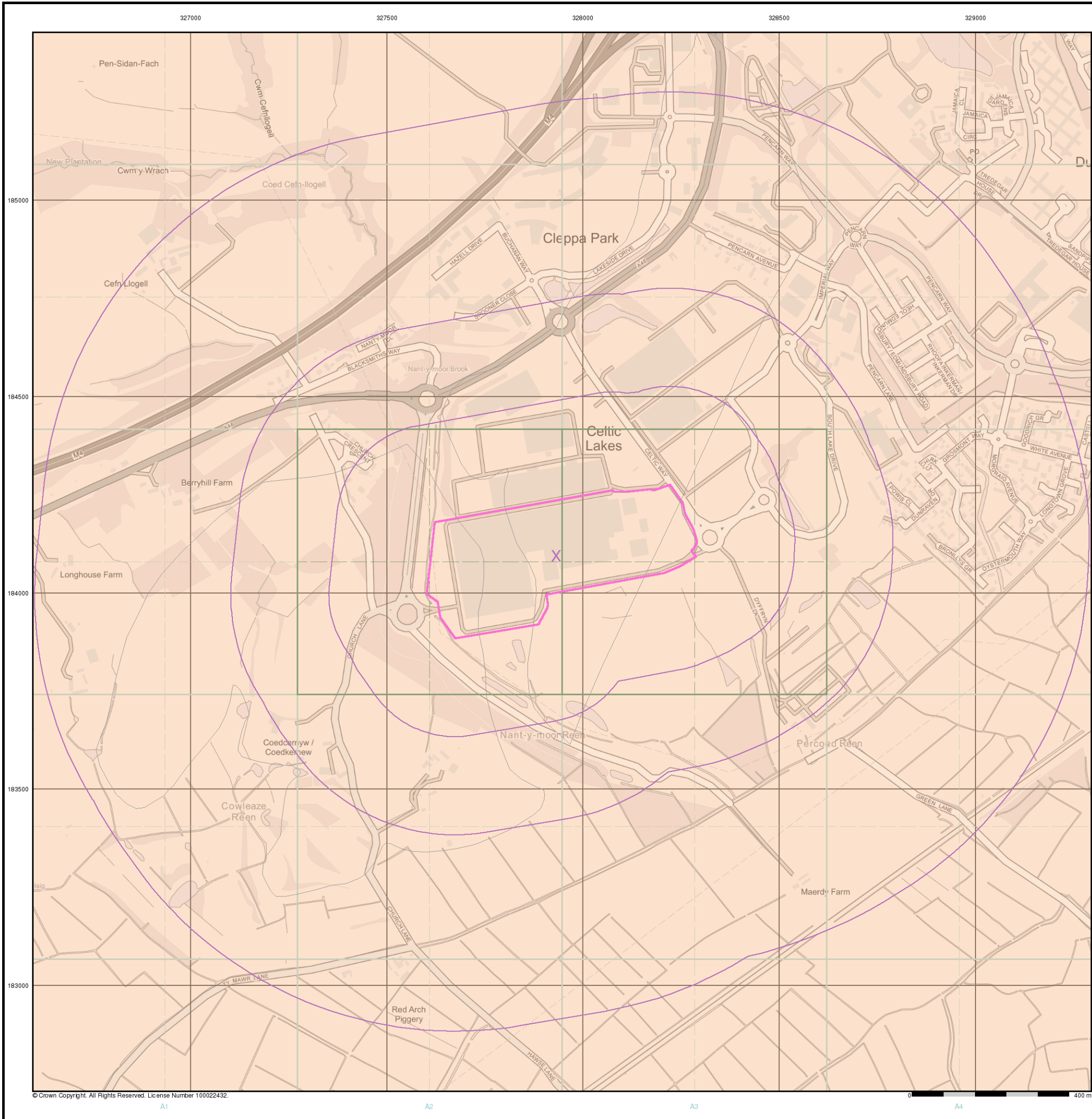
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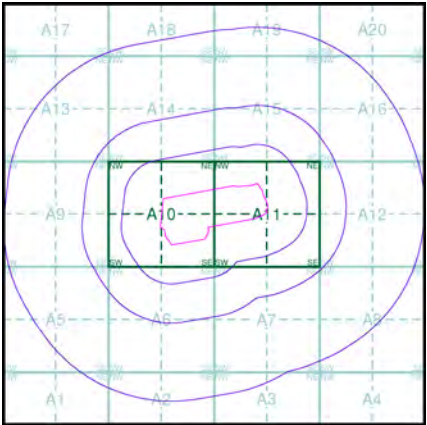
Specified Site Specified Buffer(s) Bearing Reference Point

Estimated Soil Chemistry Lead

Lead Concentrations mg/kg



Estimated Soil Chemistry Lead - Slice A



Order Details

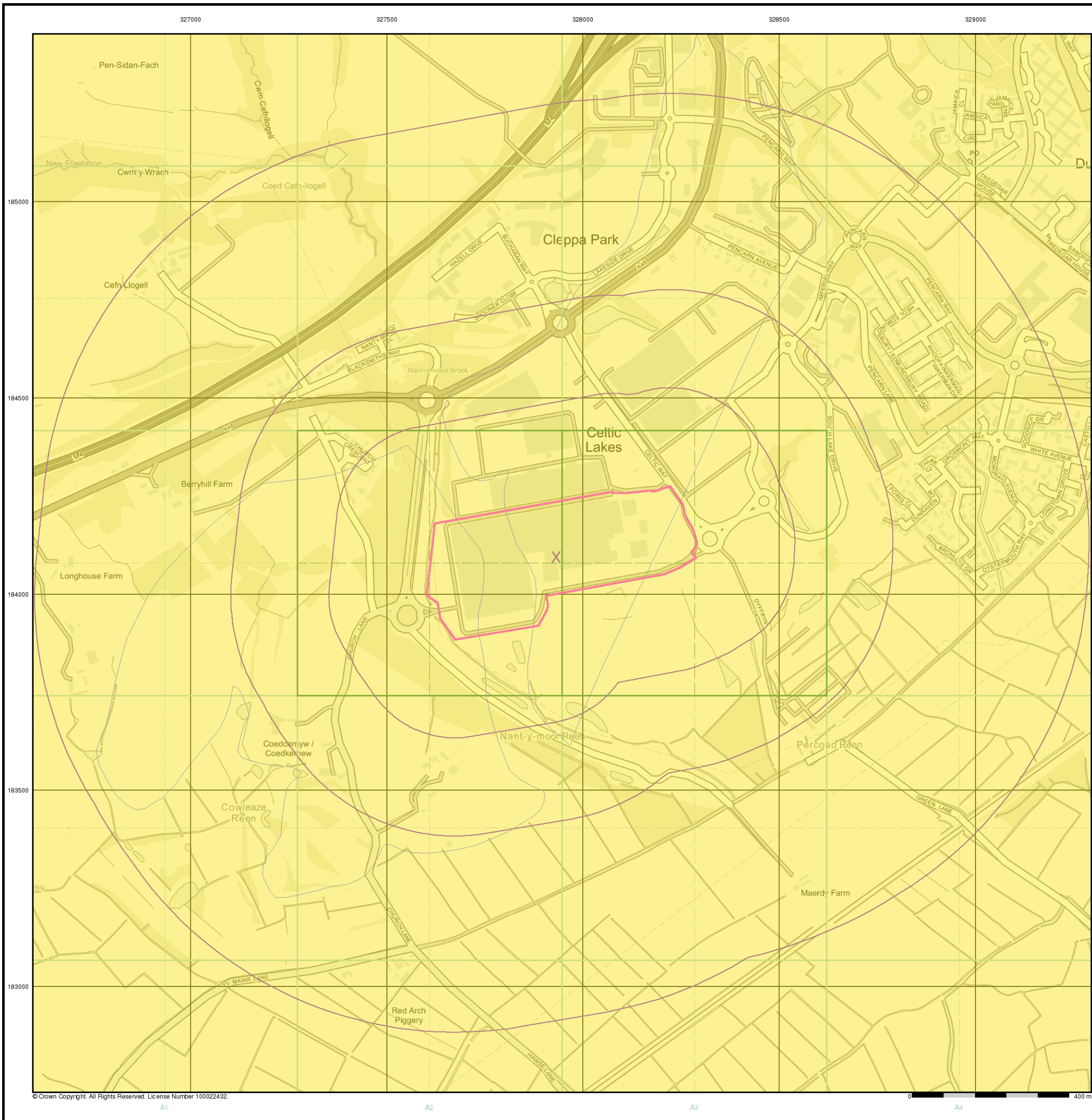
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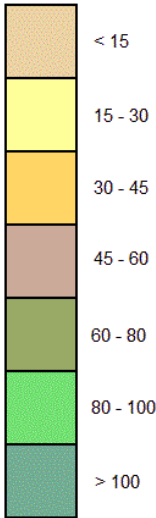


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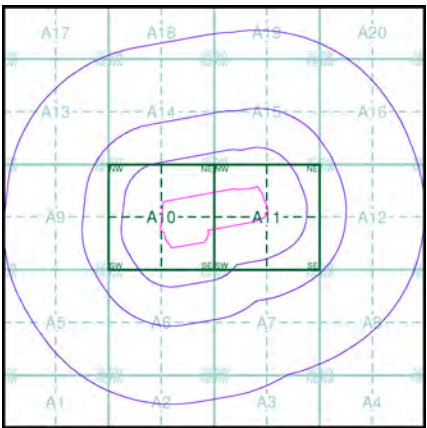
- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

Estimated Soil Chemistry Nickel

Nickel Concentrations mg/kg



Estimated Soil Chemistry Nickel - Slice A



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Appendix C

CONTAMINATED LAND RISK ASSESSMENT METHODOLOGY

LEGISLATION OVERVIEW

This report includes potential contaminant linkage and environmental risk assessment in line with the risk-based methods referred to in relevant UK legislation and guidance. Government environmental policy is based upon a "suitable for use approach," which is relevant to both the current use of land and also to any proposed future use. The contaminated land regime is the statutory regime for remediation of contaminated land that causes an unacceptable level of risk and is set out in Part 2A of the Environmental Protection Act 1990 ("EPA 1990"). The main objective of introducing the Part 2A regime is to provide an improved system for the identification and remediation of land where contamination is causing unacceptable risks to human health or the wider environment given the current use and circumstances of the land. Part IIA provides a statutory definition of contaminated land under Section 78A(2) as:

"any land which appears to the Local Authority in whose area it is situated to be in such a condition, by reason of substances in, on, or under the land, that:

- (a) Significant harm is being caused or there is a significant possibility of such harm being caused;*
- or*
- (b) Pollution of controlled waters is being, or is likely to be, caused."*

In order to assist in establishing if there is a "significant possibility of significant harm" there must be a "contaminant linkage" for potential harm to exist. That means there must be a source(s) of contamination, sensitive receptors present and a connection or pathway between the two. This combination of source-pathway-receptor is termed a "contaminant linkage or SPR linkage."

Part 2A of The Environmental Protection Act 1990 is supported by a substantial quantity of guidance and other Regulations. Key implementing legislation of the Part 2A regime includes the Contaminated Land (England) Regulations 2006 (SI 2006/1380) as amended by the overarching legislation for the contaminated land regime, which implements the provisions of Part IIA of the Environmental Protection Act 1990 (as inserted by section 57 of the Environment Act 1995), came into force on 14th July 2000 together with recent amended regulations: Contaminated Land (England) (Amendment) Regulations 2012 (SI 2012/263). Revised Contaminated Land Statutory Guidance was published by DEFRA in April 2012. Part 2A defines the duties of Local Authorities in dealing with it. Part 2A places contaminated land responsibility as a part of planning and redevelopment process rather than Local Authority direct action except in situations of very high pollution risk.

In the planning process guidance is provided by National Planning Policy Framework (NPPF) of February 2019 which requires that a site which has been developed shall not be capable of being determined "contaminated land" under Part 2A. In practice, Planning Authorities require sites being developed to have a lower level of risk post development, which is known as 'land affected by contamination'. This is to ensure that there is a suitable zone of safety below the level for Part 2A determination and prevent recently developed sites becoming reclassified as contaminated land if there are future legislative or technical changes (e.g. a substance is subsequently found to be more toxic than previously assessed this increases its hazard).

The criteria for assessing concentrations of contaminants and hence determining whether a site represents a hazard are based on a range of techniques, models and guidance. Within this context it is relevant to note that Government objectives are:

- (a) to identify and remove unacceptable risks to human health and the environment;
- (b) to seek to bring damaged land back into beneficial use;
- (c) to seek to ensure that the cost burdens faced by individuals, companies and society as a whole are proportionate, manageable and economically sustainable.

These three objectives underlie the "suitable for use" approach to risk management and remediation of contaminated land. The "suitable for use" approach focuses on the risks caused by land contamination. The approach recognises that the risks presented by any given level of contamination will vary greatly according to the use of the land and a wide range of other factors, such as the underlying geology of the site. Risks therefore should be assessed on a site-by-site basis.

The "suitable for use" approach then consists of three elements:

- (a) *ensuring that land is suitable for its current use* - in other words, identifying any land where contamination is causing unacceptable risks to human health and the environment, assessed on the basis of the current use and circumstances of the land, and returning such land to a condition where such risks no longer arise ("remediating" the land); the contaminated land regime provides the regulatory mechanisms to achieve this;
- (b) *ensuring that land is made suitable for any new use, as planning permission is given for that new use* - in other words, assessing the potential risks from contamination, on the basis of the proposed future use and circumstances, before official permission is given for the development and, where necessary to avoid unacceptable risks to human health and the environment, remediating the land before the new use commences; this is the role of the town and country planning and building control regimes; and

- (c) *limiting requirements for remediation to the work necessary to prevent unacceptable risks to human health or the environment in relation to the current use or future use of the land for which planning permission is being sought - in other words, recognising that the risks from contaminated land can be satisfactory assessed only in the context of specific uses of the land (whether current or proposed), and that any attempt to guess what might be needed at some time in the future for other uses is likely to result either in premature work (thereby running the risk of distorting social, economic and environmental priorities) or in unnecessary work (thereby wasting resources).*

The mere presence of contaminants does not therefore necessarily warrant action, and consideration must be given to the scale of risk involved for the use that the site has, and will have in the future.

OVERALL METHODOLOGY

The work presented in this report has been carried out in general accordance with recognised best practice as detailed in guidance documents such as in the on-line Environment Agency Land Contamination Risk Management (LCRM), and BS10175:2011+A2 2017. Important aspects of the risk assessment process are transparency and justification. The particular rationale behind the risk assessments presented is given in this appendix.

The first stage of a two-staged investigation and assessment of a site is the Preliminary Investigation (BS 10175:2011), often referred to as the Phase 1 Study, comprising desk study and walk-over survey, which culminates in the Preliminary Risk Assessment and development of the Preliminary Conceptual Site Model (CSM). A CSM is developed which identifies potential geotechnical and geo-environmental hazards and the qualitative degree of risk associated with them. From the geo-environmental perspective, the Hazard Identification process uses professional judgement to evaluate all the hazards in terms of potential contaminant linkages (of contaminant source-pathway-receptor). Potential contaminant linkages are potentially unacceptable risks in terms of the current contaminated land regime legal framework and require either remediation or further assessment. These are normally addressed via intrusive ground investigation and generic risk assessment.

The second stage is the Ground Investigation, Generic Risk Assessment and Geotechnical Interpretation. This represents the further assessment mentioned above. The scope of the Ground Investigation is based on the findings of the Preliminary Risk Assessment and is designed to reduce uncertainty in the geotechnical and geo-environmental hazard identification. The Ground Investigation comprises fieldwork, laboratory testing and usually also on-site monitoring. The Ground Investigation may include the Exploratory, Main and Supplementary Investigations described in BS 10175:2011+A2 2017. The results of the Ground Investigation reduces uncertainty in the geotechnical and geo-environmental risks. Depending on the findings more detailed investigations or assessments may be required.

PRELIMINARY RISK ASSESSMENT

Current practice recommends that the determination of potential liabilities that could arise from land contamination be carried out using the process of risk assessment, whereby "risk" is defined as:

- "(a) The probability, or frequency, or occurrence of a defined hazard; and*
(b) The magnitude (including the seriousness) of the consequences."

The UK's approach to the assessment of environmental risk is set out in the Environment Agency's "Land Contamination Risk Assessment". This established an iterative, systematic staged process which comprises:

- (a) Hazard identification;
- (b) Hazard assessment;
- (c) Risk estimation; and
- (d) Risk evaluation

At each stage during the development process, the above steps are repeated as more detailed information becomes available for the site.

For an environmental risk to be present, all three of the following elements must be present:

- Source/Contaminant: hazardous substance that has the potential to cause adverse impacts;
- Receptor: target that may be affected by contamination: examples include human occupants/users of site, water resources (rivers or groundwater), or structures;
- Pathway: a viable route whereby a hazardous substance may come into contact with the receptor.

The absence of one or more of each component (contaminant, pathway, receptor) would prevent a contaminant linkage being established and there would be no significant environmental risk.

The identification of potential contaminant linkages is based on a Conceptual Model of the site, which is subject to continual refinement as additional data becomes available. As part of a Preliminary Risk Assessment (Desk Study and site walk over) a Preliminary Conceptual Site Model (PCSM) is formed. Based on the PCSM, potential contaminant linkages can be assessed. If the PCSM and hazard assessment indicate that a contaminant linkage is not of significance then no further assessment or action is required for this linkage. For each significant and potential linkage a risk assessment is carried out. The linkages which potentially pose significant risks may require a variety

of responses ranging from immediate remedial action or risk management or, more commonly, further investigation and risk assessment. This next stage is termed a Phase II Main Site Investigation and should provide additional data to allow refinement of the Conceptual Site Model and assess the level of risk from each contaminant linkage.

Definition of Risk Assessment Terminology

The criteria used for risk assessment are broadly based on those presented in DETR's "A Guide to Risk Assessment and Risk Management for Environmental Protection" (2000). The Severity of the risk is classified according to the criteria in Table C.1 below:

Table C.1 Severity/Consequence of Risk	
Severe	Acute risks to human health. Catastrophic damage to buildings/property (e.g. by explosion). Direct pollution of sensitive water receptors or serious pollution of other controlled water (watercourses or groundwater) bodies.
Medium	Harm to human health from long-term exposure. Slight pollution of sensitive controlled waters (surface waters or aquifers) or pollution of other water bodies. Significant damage to buildings or structures Significant effects on sensitive ecosystems or species.
Mild	No significant harm to human health in either short or long term. No pollution of sensitive controlled waters, no more than slight pollution of non-sensitive waters. Minor damage to buildings or structures. Requirement for protective equipment during site works to mitigate health effects.
Negligible	Damage to non-sensitive ecosystems or species. No harm or pollution of water.

The probability of the risk occurring is classified according to criteria given in Table C.2 below:

Table C.2: Probability of Risk Occurring	
High likelihood	Contaminant linkage may be present, and risk is almost certain to occur in the long term, or there is evidence of harm to the receptor.
Medium/Reasonably Foreseeable	Contaminant linkage may be present, and it is probable that the risk will occur over the long term.
Low/Unlikely	Contaminant linkage may be present and there is a possibility of the risk occurring, although there is no certainty that it will do so.
Negligible/Not credible	Contaminant linkage may be present but the circumstances under which harm would occur are improbable.

An overall evaluation of the level of risk is gained from a comparison of the severity and probability, as shown in Table C.3 below:

Table C.3: Comparison of Severity and Probability					
		Severity			
		Severe	Medium	Mild	Negligible
Probability	High likelihood	Very High Risk	High Risk	Medium/Low Risk	Low Risk
	Medium/Reasonably Foreseeable	High Risk	Medium Risk	Low Risk	Near Zero
	Low/Unlikely	High/Medium Risk	Medium/Low Risk	Low Risk	Near Zero
	Negligible/Not credible	Medium/Low Risk	Low Risk	Low Risk	Near Zero

The various risk rankings provide guidance for recommended actions, whether this is:

- AR - Action Required, Remediation or mitigation or site investigation works required
- SIR - Site Investigation Required, further assessment is required.
- NAR - No Action Required.

A description of the evaluated risk is as follows:

Table C.4 – Description of the Classified Risks and Likely Action Required	
Evaluated Risk	Recommended Actions
Very High Risk	AR: There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High Risk	AR: Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the long term.
Medium Risk	SI: It is possible that harm could arise to a designated receptor from an identified hazard. However, it is relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.
Low Risk	NAR: It is possible that harm could arise to a designated receptor from an identified hazard, but there is a low likelihood of this hazard occurring and if realised, harm would at worst normally be mild.
Near Zero	NAR: There is a negligible possibility that harm could arise to a receptor. In the event of such harm being realised, it is not likely to be severe.

Appendix D



DŴR CYMRU
WELSH WATER

Nash WWTW
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Fax: +44 (0)1633 275 983
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Gwaith Trin Carthion Trefonnen
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Ffacs: +44 (0)1633 275 983
Safle gwe: www.dwrcymru.com

Quinn Group
Derrylin
County Fermanagh
Northern Ireland
BT92 9AU

10th October 2006

Paul Thomson
Tel: 01633 290846
Mobile: 07768 337921

Dear Sir or Madam:,

re: Discharge of Trade Effluent to the Public Foul Sewer

Please find enclosed a copy of our trade effluent consent reference DC/S/294. A copy of this consent has also been sent to the Company Secretary at Quinn Radiators Limited, Barlo House, Spinning Jenny Way, Leigh, Lancashire, WN7 4PE and to Quinn Radiators Limited, Imperial Park, Newport, NP10 8ZY.

Please acknowledge receipt of your copy of the consent.

Yours faithfully,

Paul Thomson,
Trade Effluent Officer.
Enc.

DWR CYMRU CYFYNGEDIG

WATER INDUSTRY ACT 1991

CONDITIONAL CONSENT TO THE DISCHARGE
OF TRADE EFFLUENT TO THE PUBLIC SEWER

To: Quinn Radiators Limited the Owner and/or Occupier of the trade premises (hereinafter called "the Occupiers") whose registered office is situate at Barlo House, Spinning Jenny Way, Leigh, Lancashire, WN7 4PE.

RECITALS

1. The 7th day of September 2006 you applied for consent under Section 119 of the Water Industry Act 1991 for consent to discharge trade effluent from the following trade premises known as Quinn Radiators Limited, and situate at Imperial Park, Newport, NP10 8ZY (hereinafter, "the said trade premises").
2. Compliance with the conditions hereunder shall be ascertained by reference to the method of analysis as from time to time employed by the Undertaker, its servants, agents or contractors, save where the said condition(s) otherwise expressly provide(s).

DWR CYMRU CYFYNGEDIG ("the Undertaker") in the exercise of its powers under Section 121 of the Water Industry Act 1991, and thinking it fit to impose conditions as hereinafter appear, GIVES ITS CONSENT to the discharge of trade effluent from the said trade premises into the Undertakers' public sewers, SUBJECT TO THE FOLLOWING CONDITIONS AND NOT OTHERWISE.

- (1) The public sewer(s) into which the trade effluent may be discharged is/are the 450 mm diameter sewer more particularly identified by means of a line(s) coloured RED drawn on the plan attached hereto and marked "B".
- (2) The discharge of trade effluent shall be made at the point marked "X" on the said plan and the said trade effluent shall enter into the public sewer shown on the said plan at the point "Y" thereon and not otherwise. Further, no connection, linkage, conduit, pipe, channel or other communication whatsoever shall be made to the sewer between the points "X" and "Y" without the prior approval in writing of the Undertaker.
- (3) The trade effluent to be discharged shall consist solely of that which was specified in the Application and derived from a vehicle wash facility.
- (4) Without prejudice to condition 3 above, the nature and/or composition of the trade effluent that may be discharged is as specified in the FIRST SCHEDULE hereto.
- (5) The trade effluent shall not include any of the substances or properties listed in the SECOND SCHEDULE hereto in concentration greater than stated therein.
- (6) The maximum quantity of trade effluent discharged on any day (being any continuous period of 24 hours) shall not exceed 10.0 cubic metres.
- (7) The highest rate at which trade effluent may be discharged shall not exceed 1.0 litres per second.
- (8) There shall be no restriction upon the hours of the day during which trade effluent may be discharged into the public sewer(s).
- (9) No uncontaminated condensing water shall be discharged.

- (10) There shall be eliminated from the trade effluent before it is discharged the matters listed below:
- (a) Effluent with a temperature in excess of 43 degrees Celsius (110 degrees Fahrenheit);
 - (b) Calcium Carbide;
 - (c) Petroleum Spirit within the meaning of Section 111 of the Water Industry Act 1991 and/or the Petroleum Act 1928, save as otherwise permitted herein;
 - (d) Other materials forming a constituent of the trade effluent, whether alone or in combination with other materials, specified hereby as that which is explosive;
 - (e) Any other substance forming a constituent of the trade effluent which is hereby specified as that which is likely to injure the sewers or to interfere with the free flow of their contents or to affect prejudicially the treatment and disposal of their contents;
 - (f) Any other substance forming a constituent of the trade effluent which is hereby specified as that which in its pure state or in combination with other materials in the contents of the sewer(s) ("the sewage") is capable of producing toxic or flammable vapours.
- (11) No trade effluent shall be discharged the pH value of which is less than 6.0 or greater than 11.0.
- (12) No trade effluent shall be discharged the nature or composition of which includes a matter, substance, property or matters, substances or properties which would constitute the trade effluent as Special Category Effluent within the meaning of Section 138 of the Water Industry Act 1991.
- (13) The Occupier shall give to the Undertaker prior written notice of any change in the process of manufacture, materials, or other circumstances howsoever arising capable of altering the nature and/or composition of the trade effluent. No new substances or properties shall be discharged until the Undertaker has agreed thereto, either with or without imposing a limit and thereafter the said substance(s) and/or property(ies) shall be deemed incorporated into the SECOND SCHEDULE.
- (14) An inspection chamber or manhole shall be provided and maintained by the Occupier in a suitable position and/or at the point(s) marked "X" on the plan annexed hereto in connection with each pipe through which the trade effluent is discharged and such inspection chamber or manhole shall be constructed and maintained in accordance with the Undertakers' reasonable requirements as from time to time notified in writing to the Occupier so as to enable a

person readily at any time to take samples of the trade effluent being discharged.

- (15) A notch gauge, continuous recorder or some other apparatus suitable and adequate to the Undertaker for measuring and automatically recording the volume and rate of trade effluent so discharged shall be provided, such apparatus to be tested and maintained in accordance with the Undertaker's reasonable requirements as from time to time notified in writing to the Occupier.
- (16) Apparatus capable of accurately determining, measuring, and recording the nature and/or composition of the trade effluent discharged shall be provided, such apparatus to be tested and maintained in accordance with the Undertaker's reasonable requirements as from time to time notified in writing to the Occupier.
- (17) The Occupier shall keep records of the volume, rate, nature and/or composition of the trade effluent discharged into the sewer(s) at all times available for inspection by any authorised officer of the Undertaker and copies of such records shall be sent to the Undertaker on demand.
- (18) (a) The Occupier shall pay to the Undertaker charges for the reception, conveyance, treatment and disposal of the trade effluent and the costs of sampling, measuring and/or analysis of the same under the Undertaker's trade effluent functions, which charges shall be determined as set out below, and all sums payable under this condition shall be payable upon demand;

(b) The charges under (a) above shall be calculated in accordance with the Undertaker's Scheme of Charges as from time to time amended;

(c) For the avoidance of doubt, the charge shall be payable by any person who is or was the Occupier of the said trade premises during the period of discharge of the trade effluent or at the time payment is due.
- (19) If the notch gauge, meter, recorder or other apparatus ceases to record or is suspected of not recording and/or measuring accurately, the quantity of trade effluent discharged into the sewer(s) during the period from the date and/or time at which the records were last accepted by the Undertaker as being correct up to the date when the notch gauge, meter, recorder or other apparatus again registers accurately shall for the purpose of any payment to be made under these conditions be based on the average daily volume of trade effluent discharged during the preceding period over which the records were last accepted by the Undertaker as being accurate or during the month immediately after the notch gauge, meter, recorder or other apparatus or means of measurement and recording has been accurate whichever is the higher.

YOUR RIGHT OF APPEAL

Section 126 of the Water Industry Act 1991 provides that:-

The owner or occupier of any trade premises may within 2 months of this Notice of Direction (or with the written permission of the Director General of Water Services at any later time) appeal to the Director against the Direction.

The Director has the power to annul the Direction and to substitute for it any other Direction whether more or less favourable to the appellant.

The address of the Director for the purposes of an appeal is "City Centre Tower, 7 Hill Street, Birmingham, B5 4UA".

FAILURE TO COMPLY WITH CONDITIONS

If in the case of any trade premises a condition is contravened, the Occupier of the premises will be guilty of an offence and liable on conviction by a Magistrates' Court to a fine not exceeding the statutory maximum or on conviction by the Crown Court to an unlimited fine.

DATED:

Sixth day of October 2006

For and on behalf of the Company



A.R. Andrews,
Environment Quality Scientist.

Dwr Cymru Cyfyngedig,
Nash Treatment Works,
West Nash Road,
Nash,
Newport,
NP18 2BZ.

FIRST SCHEDULE

The waste water to be discharged shall be that arising from the manufacture of radiators.

The water is expected to be contaminated with traces of diethanolamine and sodium nitrite that are used as corrosion inhibitors. Additional expected contaminants are iron and suspended solids from the processes of cleaning, corrosion inhibition and testing of the radiators.

Traces of proprietary chemicals used for general cleaning purposes are also likely to be present.

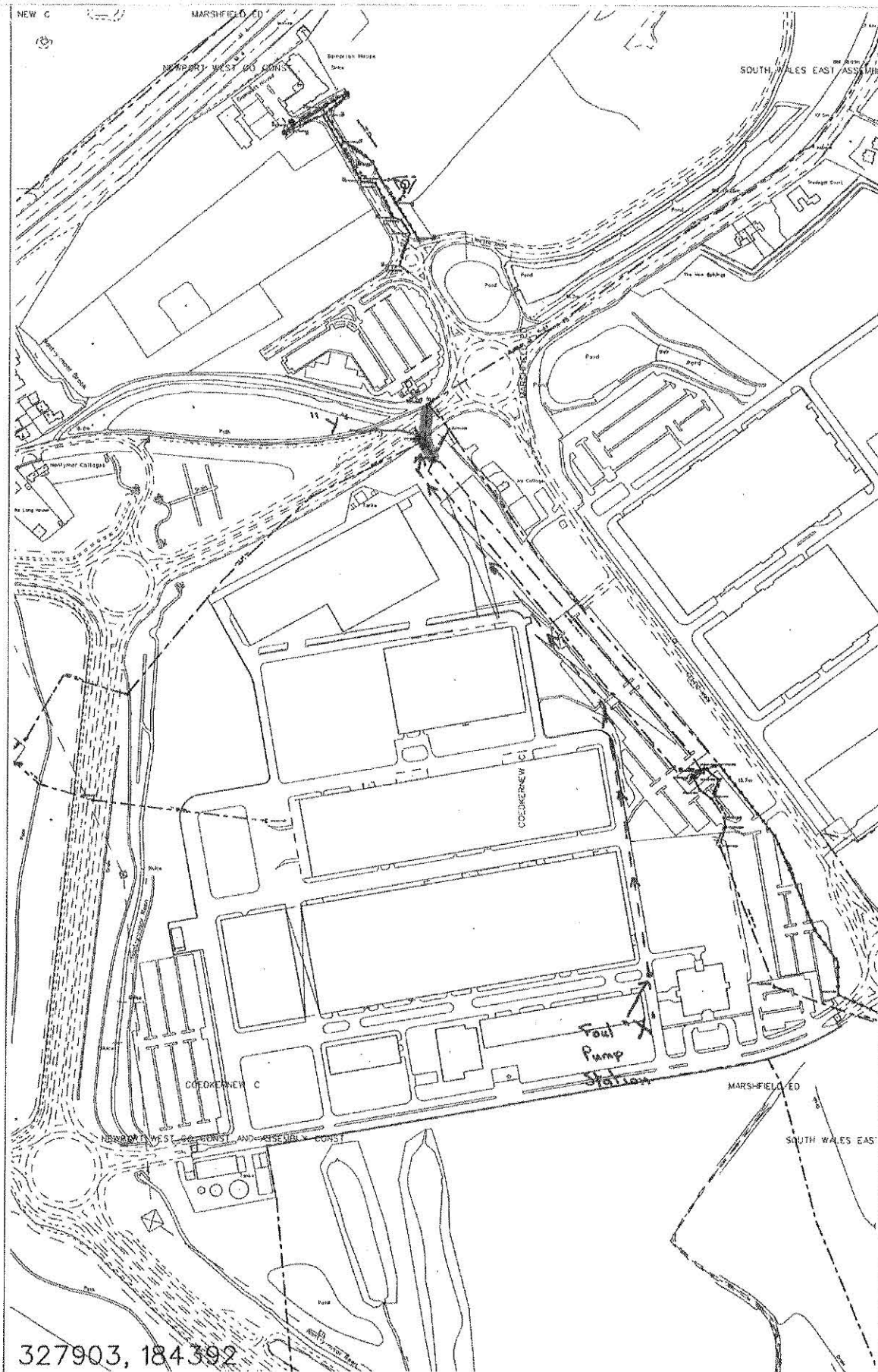
SECOND SCHEDULE

- 1 Free or emulsified Oil and Grease shall not exceed 250 milligrams per litre.
- 2 Sulphate shall not exceed 500 milligrams per litre (expressed as SO₄).
- 3 Total Suspended Solids of the trade effluent shall not exceed 1000 milligrams per litre.
- 4 The Chemical Oxygen Demand of the trade effluent after one hour quiescent settlement (settled COD) shall not exceed 1000 milligrams per litre.



Legend:

- Foul
- Surface
- Combined
- Rising Main
- Private
- Treatment Works
- Pumping Station
- Combined OverFlow
- Special Purpose Chamber
- Unknown End
- Outlet
- Lampole
- Map Edge



327903, 184392

Quinn Radiators, NP10 8ZY

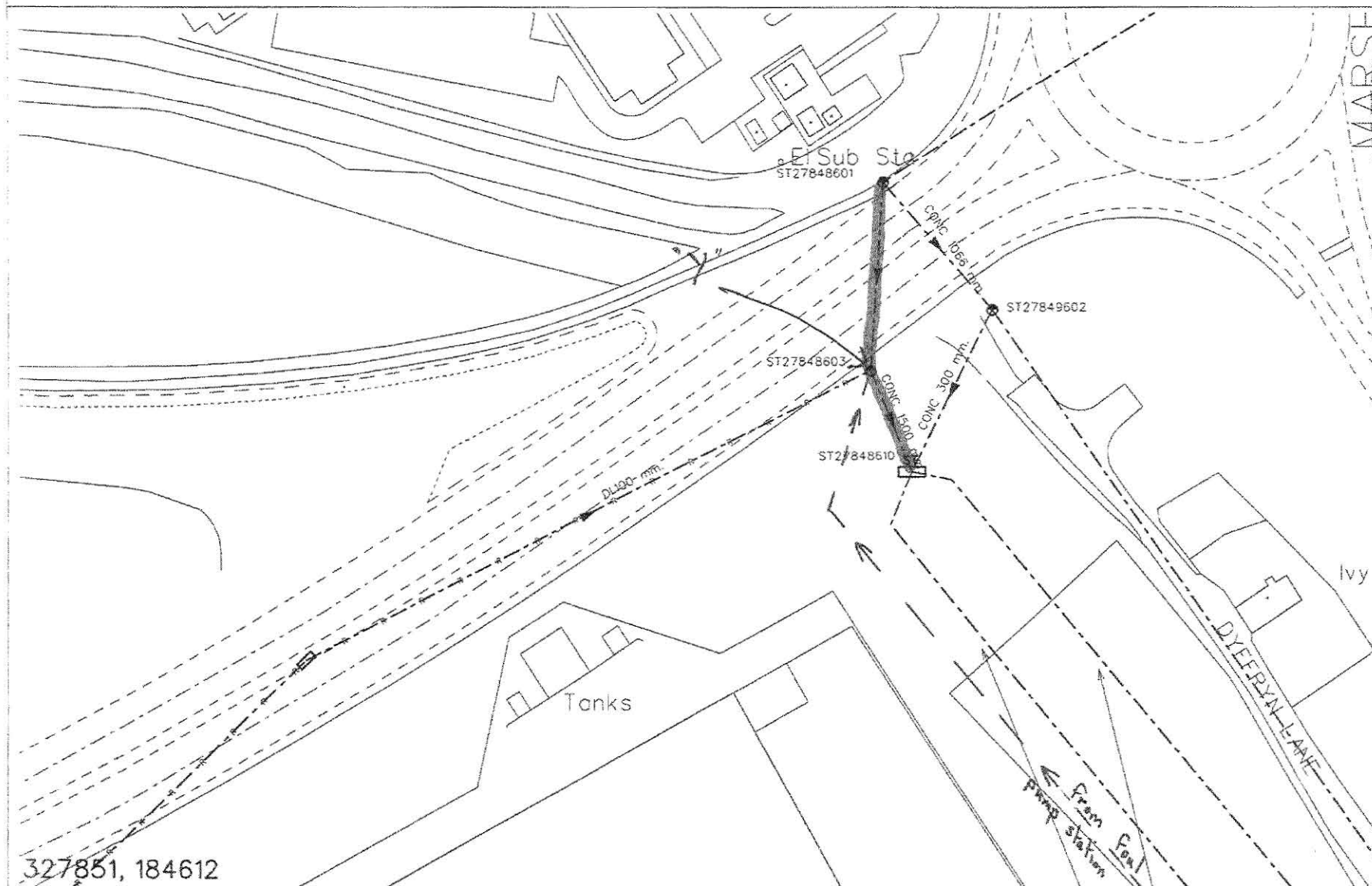
Oct 06 2006

Scale: 1:5000

Our Cymru Cyl gives this information as to the position of the underground apparatus by way of general guidance only as the street understanding that it is based on the best information available and we warrant only to the satisfaction of the Council in the event of excavation or other works made in vicinity of the apparatus and any one of making the apparatus before carrying out any excavations must satisfy on pain of penalty by understanding that the position of the apparatus is entirely without prejudice to the provision of the New Roads and Street Works Act 1991 and of the Cymru Cyl right to be compensated for any damage to the apparatus. Surface pipes are not generally shown but their presence should be indicated.

EXACT LOCATIONS OF ALL APPARATUS TO BE DETERMINED ON SITE.

Information from the Ordnance Survey's maps with the permission of the Controller of the Mapping and Information Office, Ordnance Survey.



- Legend:
- Foul
 - Surface
 - Combined
 - Rising Main
 - Pressure
 - Treatment Works
 - Pumping Station
 - Combined Overflow
 - Special Purpose Chamber
 - Unknown End
 - Outlet
 - Lamp Pole
 - Man Cage

327851, 184612

EXACT LOCATIONS OF ALL APPARATUS
TO BE DETERMINED ON SITE.

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with the permission of the Controller of Her
Majesty's Stationary Office. © Crown Copyright

Scale: 1:1000

Our Cymru Dŵr gives this information as to the position of its underground apparatus by way of general guidance only on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon in the event of excavations or other works which are the responsibility of the Company's operator and any loss of location of apparatus before carrying out any excavations rests solely with you. It must be understood that the turnkey of the information is subject to the provision of the new Roads and Street Works Act 1991 and of the Company's right to be compensated for any damage to its apparatus. Service pipes for a not generally shown but their presence should be anticipated.



Permit with introductory note

The Pollution Prevention and Control Act 1999
The Environmental Permitting (England and Wales) Regulations 2010

OPAAO
Quinn Radiators Ltd
Imperial Park
Newport
P10

SSAAO
Quinn Radiators Ltd
Imperial Park
Newport
P10

Permit issued by

Newport City Council
Law & Regulation
Civic Centre
Godfrey Road
Newport
NP20 4UR

Telephone 01633 656656
Fax 01633 266575
Esite www.newport.gov.uk
Mail env.health@newport.gov.uk

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Monitoring Sampling and Measurement of Emissions	6
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General site Arrangements	11

Chronicle

Detail	Date	Comments
Draft Permit Issued		LAPPC/037/06
Permit Issued	21/12/06	LAPPC/037/06
Variation Notice	14/01/09	LAPPC/037/06/v2
Variation Notice	25/1/13	LAPPC/037/06/v3
Variation Notice	15/12/14	LAPPC/037/06/v4

Enforcement Notice

If conditions in the attached permit are not adhered to, then the Regulator will serve an Enforcement Notice upon the process Operator under Regulation 36 of the EP Regulations. This notice will specify the contraventions and the steps to be taken to remedy the situation. It is an Offence not to comply with such an Enforcement Notice (maximum fine £20,000 in Magistrates Court or unlimited fine/or up to 2 years imprisonment on indictment).

Suspension Notice

Where the Regulator considers there is an imminent risk of serious pollution to the Environment, whether or not there has been a breach of the permit, it is under duty to serve a Suspension Notice under Regulation 37 of the EP Regulations.

A Suspension Notice may also be issued to the Operator of an installation if the Regulator is of the opinion that he/she is no longer a fit and proper person.

A Permit ceases to have effect until the Suspension Notice is removed. The Suspension Notice is withdrawn by the Regulator when steps required by that notice have been taken.

Emergency Situation

If the Regulator is of the opinion that an emergency situation exists, they may take steps to deal with any serious risk of pollution instead of issuing a Suspension Notice, and recover the costs from the process Operator. (*Regulation 57 of the EP Regulations*).

Revocation Notice

The permit may be revoked at any time by the Regulator under Regulation 22 of the EP Regulations. This will be particularly considered if Enforcement measures have been used exhaustively.

Variations to the Permit

The Regulator may vary the permit in the future, by serving a variation notice on the Operator. Should the Operator want any of the conditions of the Permit to be changed, a formal application must be submitted to the Regulator (the relevant forms are available from the Regulator). The Chronicle that is part of this document will include summary details of this Permit, variations issued up to that point in time and state whether a consolidated version of the Permit has been issued.

Transfer of the Permit or Part of the Permit

Before the Permit can be wholly or partially transferred to another Operator, an application to transfer the Permit has to be made jointly by the existing and proposed Operators. A transfer will not be approved if the Regulator is not satisfied that the proposed Permit holder will be the person having control over the operation of the installation, or will not comply with the conditions of the transferred Permit. In addition, if the Permit authorises the Operator to carry out a specified waste management activity, the transfer will not be approved if the Regulator does not consider the proposed Permit holder to be a 'fit and proper person' as required by the EP Regulations.

Surrender of the Permit

Where an operator intends to cease the operation of an installation (in whole or in part) the Regulator should be informed in writing. Such notification must include the information specified in Regulation 24 of the EP Regulations.

Public Registers

Information relating to Permits, including the application, is available on public registers in accordance with the EP Regulations. Certain information may be withheld from the public registers where it is commercially confidential, or if it is in the interest of national security to do so.

Responsibility under Workplace Health and Safety Legislation

The permit is given in relation to the requirements of the EP Regulations. It must not be taken to replace any responsibilities an Operator may have under the workplace health and safety legislation.

Appeal against Permit Conditions

Any person who is aggrieved by the conditions attached to a Permit can appeal to the Secretary of State for Environment, Food and Rural Affairs. Appeals must be received by the Secretary of State no later than 6 months from the date of the decision (the date of the Permit).

Appeals relating to installations in England and Wales should be received by the Secretary of State for Environment, Food and Rural Affairs. The address is as follows:

The Planning Inspectorate
Room 0 Buildings
Mathys Park
Cardi
0010 000

The appeal must be in the form of a written notice or letter stating that the person wishes to appeal and listing the condition(s) which is/are being appealed against. The following five items must be included:

- a) A statement of the grounds of appeal;
- b) A copy of any relevant application;
- c) A copy of any relevant Permit;
- d) A copy of any relevant correspondence between the person making the appeal and the Council;
- e) A statement indicating whether the appellant wishes the appeal to be dealt with.
 - (i) by a hearing attended by both parties and conducted by an inspector appointed by the Secretary of State; or
 - (ii) by both parties sending the Secretary of State written statements of their case (and having the opportunity to comment upon one another's statements).

At the same time, the notice of appeal and documents (a) and (e) must be sent to the Council, and the person making the appeal should inform the appropriate Secretary of State that this had been done.

An appeal will not suspend the effect of the conditions appealed against; the conditions must still be complied with.

In determining an appeal against one or more conditions, the Act allows the Secretary of State in addition to quash any of the other conditions not subject to the appeal and to direct the local authority to either vary any of these conditions or to add new conditions.

Talking to us

Please quote the Permit Number if you contact the Regulator about this permit. To give a notification, the Operator should telephone 01633 656656 or any other number notified in writing by the Regulator for that purpose.

DD DO

NEWPORT CITY COUNCIL
Pollution Prevention and Control Act 1999
Permit Reference APP 0000



Permit Reference Number APP 0000

Pollution Prevention and Control Act 1999

The Environmental Permitting Regulations 2010 – Regulation 1

PO 0000 (the "Regulator") in exercise of its powers under Regulation 13 of The Environmental Permitting Regulations 2010, hereby Permit:

Quinn Radiators Ltd
Imperial Park
Newport
P10 000

to operate an installation at

Quinn Radiators Ltd
Imperial Park
Newport
P10 000

in which an activity is being carried out as listed in Schedule 1 to the above-mentioned Regulations and as detailed in Table 1 – Process description, attached.

The Permit is to the extent authorised by and subject to the Conditions contained in this Permit.

Signed on behalf of PO 0000 000000

Jonathan Green
Environmental Health Manager

Dated 15th day of December 2014

Permit issued by

Newport City Council
Law & Regulation
Civic Centre
Godfrey Road
Newport
NP20 4UR

Telephone 01633 656656
Fax 01633 266575
Website www.newport.gov.uk
Mail env.health@newport.gov.uk

Operating Conditions

Process Description and General Information

The operator is permitted to carry out the activities and/or the associated activities specified in table 1.

Table 1

Activity under Schedule 1 of the Regulations	Schedule 1 Activity Reference	Description of Specified Activity
Chapter 6 Other Activities	Section 6.4 - Coating Activities, Printing and Textile Treatments – Part B	<p>a) Unless falling within Part A(1) or A(2) of this Section or paragraph (c) of Part A(2) of Section 2.1, any process (other than for the repainting or re-spraying of or of parts of aircraft or road or railway vehicles) for applying to a substrate, or drying or curing after such application, printing ink or paint or any other coating material as, or in the course of, a manufacturing activity, where the process may result in the release into the air of particulate matter or of any volatile organic compound and is likely to involve the use in any period of 12 months of –</p> <p>(i) 20 tonnes or more of printing ink, paint or other coating material which is applied in solid form;</p> <p>(ii) 20 tonnes or more of any metal coating which is sprayed on in molten form;</p> <p>(iii) 25 tonnes or more of organic solvents in respect of any cold set web offset printing activity or any sheet fed offset litho printing activity; or</p> <p>(iv) 5 tonnes or more of organic solvents in respect of any activity not mentioned in sub-paragraph (iii).</p>

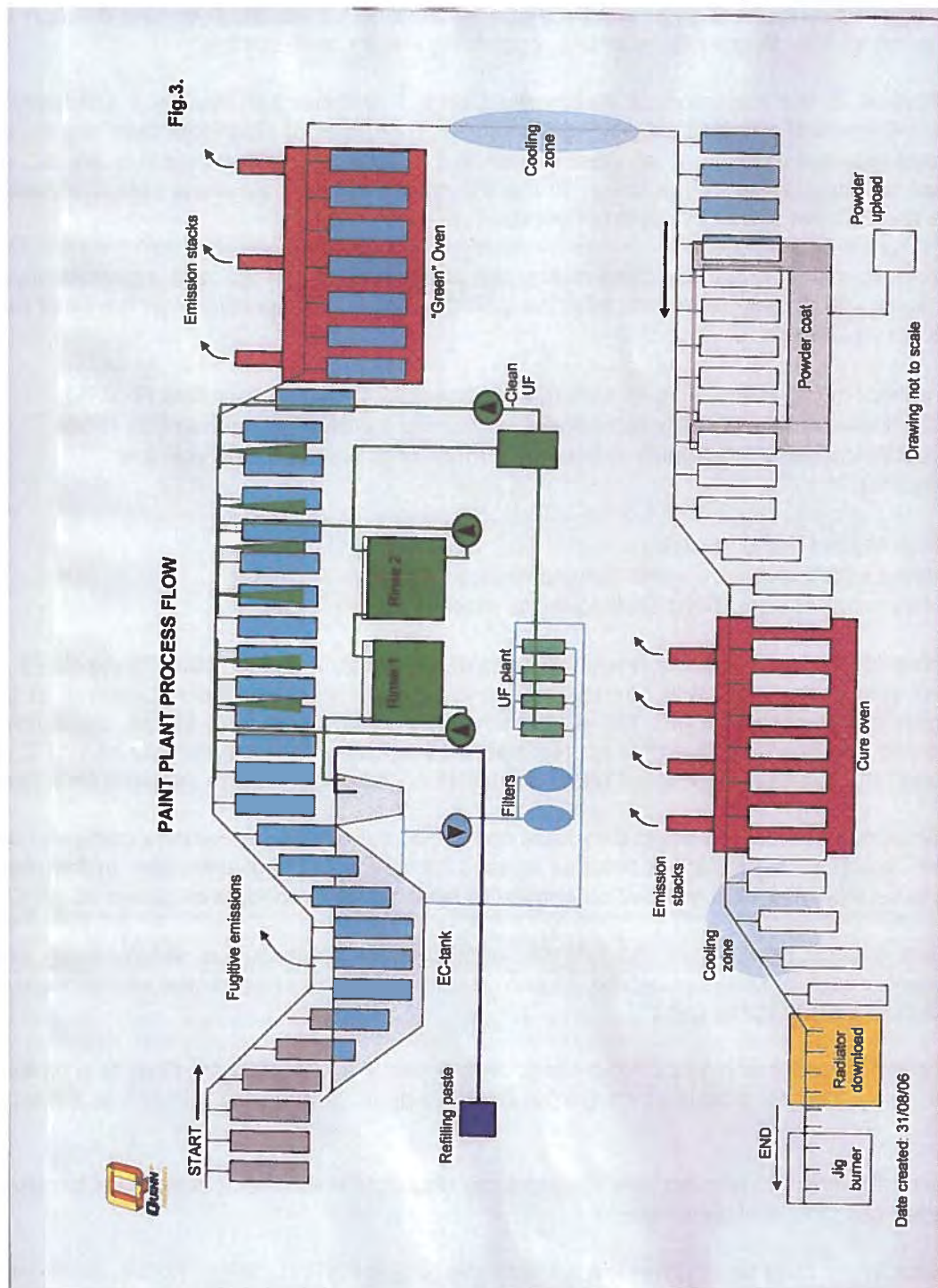
Purpose of the Process

The process at Quinn Radiators, Newport involves painting metal radiators for supply to the domestic radiator market. The process consists of application of a Prime coat (E Coating), powder coating and curing to produce the finished radiator. The plant has the capacity to produce approximately 14400 units per day based on full production of 4 million radiators a year.

The plant is divided into a number of processing steps together with emission points for release of oven exhaust into the atmosphere.

Process Description

A basic process flow diagram is shown on the following page.



The painting of domestic radiators is achieved by hanging the radiators on hooks from an overhead conveyor line which traverses the painting stages as detailed below. This conveyor line is continuous and returns to the up-load area once finished radiators are down-loaded to the packaging area.

The first part of the process is applying a Prime coat where the radiator is immersed in a dip tank. The paint is applied evenly on the radiators surface by passing an electrical current through them. This process is called "Electrophoretic" painting, commonly known as E-coating.

Electrophoresis is the migration of electrically charged colloidal particles in a conductive medium under the influence of an electrical potential (voltage). Examples of electrophoresis are the movement of resin and pigment particles in an electric field. If it is assumed that the paint is anodic, a negative charge will be imparted to the particles. Under the influence of an electrical potential these particles will move towards the anode by electrophoresis.

A paint bath is initially manually filled during the commissioning stage and automatically dosed as required during production to ensure effective coating. The basic ingredients in the paint bath can be broken down as follows:

- *Pigment* giving the coating its colour and corrosion inhibiting properties (1-10%);
- *Resin* which is the primary component in creating a protective coating (10-15%);
- *De-Mineralised Water* which is used as a medium to suspend the resin and paste (80-90%);

Other components (1-5%) include:

- *Amine* which creates a water-soluble electro-depositable coating
- Coalescing solvent, *Butyl Cellosolve*, to improve film uniformity.

After E-coating, the radiators are rinsed by nozzles with a fluid called "ultra-filtrate (U/F)". This is a constituent part of the paint that has been separated out. The rinse fluid is captured in three rinse tanks which are re-circulated into the paint bath. After rinsing with ultra-filtrate, the applied coat is "green" cured in a gas fired oven for approximately 20 minutes at a temperature of 120°C. Radiators pass through the oven on a continual basis, each radiator passing through the oven for a fixed period.

The radiators must be cooled when they have come out of the oven before they can enter the powder application. Excess heat from this process is used for space heating elsewhere in the plant. This is done because a powder coat can not be applied to surfaces at temperatures above 35-40°C.

The cooled radiator now enters the fully enclosed powder booth and is automatically coated with powder paint (designer radiators on the "Green" line have a facility for manual intervention) by means of electrostatic powder spray guns.

The final painting process is to cure the top (powder) coating. This is again done in a continuous gas fired oven, each radiator passing through the oven for approximately 30 minutes at a temperature of 180°C.

After leaving the finish cure oven, the radiators are cooled to a safe temperature for handling and are down loaded onto the packaging line.

Once the radiators have been down loaded onto the packaging line the jigs (which were used to hang the radiator to the paint line conveyor) are conveyed back to the radiator upload point where an operator removes them from the line. The jigs are then sorted and sent to, 2 off line pyrolysis ovens where the ideal combustion environment is achieved (10-15% O₂, and 5-8% CO₂ with combustion temperature between 950-1000degC). This will break down the paint and avoid burning any material. The jigs are subsequently jet washed in a controlled location. Any waste materials generated through this process are disposed of in an appropriate manner.

Foreseeable Emissions

The key part of the process is the curing of the paint coats applied to the radiators. Cleaning paint off the metal jigs at high temperature will also produce some emissions. In addition, the use, handling and storage of paint materials and solvents, may also give rise to emissions of volatile organic compounds (VOCs) and odours. Therefore, the principal foreseeable emissions arising from the process comprise fossil fuel combustion products, volatilised VOCs, mobilised paint particulates and the potential emissions that may arise from paint material and solvents.

Emission Limits and Other Provisions

1.

Source	Substance	Emission limit provisions	Type of monitoring	Monitoring frequency
All process/activities except Oxidation Plant (Pyrolysis Oven)	VOC	VOC expressed as total carbon excluding particulate matter 50mg/Nm ³ as 30 minute mean for contained sources	Extractive	Annual
	Particulate Matter	50mg/Nm ³ as 30 minute mean for contained sources		
The emission limits for VOC in above table do not apply where the coating applied contains less than 200 grams of VOC per kilogram of solid.				

2. The reference conditions for emission limits in this permit shall be expressed: 273.15K, 101.3kPa, without correction for water vapour content, unless otherwise stated.
3. All releases to air, other than condensed water vapour, shall be free from persistent visible emissions.
4. All emissions to air shall be free from droplets.
5. There shall be no offensive odour beyond the process boundary, as perceived by an authorised officer of Newport City Council.
6. Emissions from combustion processes shall in normal operation be free from visible smoke and in any case shall not exceed the equivalent of Ringlemann shade 1 as described in British Standard BS 2742:1969.
7. In the case of abnormal emissions, malfunction or breakdown leading to abnormal emissions the operator must;
 - investigate immediately and undertake corrective action; and
 - adjust the process or activity to minimise those emissions; and
 - promptly record the events and actions taken.
8. Newport City Council must be informed without delay;
 - if there is an emission that is likely to have an effect on the local community
 - in the event of the failure of key abatement plant.
9. All appropriate precautions shall be taken to minimise emissions during start-up and shutdown.

Monitoring, Sampling and Measurement of Emissions

10. Visual and olfactory assessments of emissions shall be made frequently and at least once each day whilst the process is in operation. The time, location and results of these assessments shall be recorded.
11. The results of the non-continuous emission testing shall be forwarded to Newport City Council within 8 weeks of the completion of the sampling.
12. The operator shall keep records of inspections, test and monitoring, including all non-continuous monitoring, inspections and visual assessments. In such cases:
 - Current records shall be kept on site and made available to an authorised officer of Newport City Council to examine.
 - Records shall be kept by the operator for at least two years.
13. The operator shall notify Newport City Council at least 7 days before any periodic monitoring exercise to determine compliance with emission limits. The operator shall state a provisional time and date of the monitoring, pollutants to be tested and the methods to be used.
14. Adverse results from any monitoring activity shall be investigated by the operator as soon as the monitoring data has been obtained/received. The operator shall:
 - Identify the cause and take corrective action
 - Record as much detail as possible regarding the cause and extent of the problem, and the action taken by the operator to rectify the situation
 - Re-test to demonstrate compliance as soon as possible; and
 - Notify Newport City Council
15. All new continuous monitoring equipment shall be designed for less than 5% downtime over any 3 month period.
16. All continuous monitoring readings shall be on display to appropriately trained operating staff.
17. Instruments shall be fitted with audible and visual alarms, situated appropriately to warn the operator of arrestment plant failure or malfunction.
18. The activation of alarms shall be automatically recorded.
19. All continuous monitors shall be operated, maintained and calibrated in accordance with the manufacturers' instructions. The relevant maintenance and calibration shall be recorded, and such records made available to an authorised officer of Newport City Council.
20. Non-continuous emissions monitoring of particulate matter shall be carried out according to the main procedural requirements of BS ISO 9096:2003.
21. The operator shall ensure that adequate facilities for sampling are provided on vents or ducts.
22. The introduction of dilution air to achieve emission limits shall not be permitted.
23. A determination of the organic solvent consumption, the total mass of organic solvents inputs minus any solvents sent for reuse/recovery offsite, shall be made and submitted to Newport City Council annually.

Control Techniques

24. All potentially dusty or odorous materials shall be stored in suitable closed containers.
25. Coatings containing VOC shall be stored in closed containers.

26. All measures shall be taken to minimise VOC emissions during mixing, i.e. the use of covered or closed vessels
27. Emissions from the emptying of mixing vessels and the transfer of materials shall be adequately contained. This may be achieved by the use of closed mobile containers.
28. Cleaning operations involving organic solvents shall be periodically reviewed, normally at least every two years, to identify opportunities for reducing VOC emissions. Newport City Council shall be provided with a report on the conclusions of the review.
29. Where equipment is cleaned off-line cleaning shall be carried out using enclosed cleaning systems, wherever possible. If this is not possible emissions shall be contained and vented to abatement plant.
30. Residual coating materials contained in parts of the application equipment shall be removed prior to cleaning.
31. All reasonable practicable efforts shall be made to minimise the amount of residual organic solvent bearing material left in drums and other containers after use. All organic solvent contaminated waste shall be stored in closed containers.
32. Prior to disposal, empty drums and containers contaminated with organic solvent shall be closed to minimise emissions from residues during storage prior to disposal and labelled, so that all who handle them are aware of their content and hazardous properties.
33. Empty powder packaging and dusty wastes shall be stored in closed containers and handled in a manner that minimises emissions.
34. Stacks and ductwork shall be cleaned to prevent accumulation of materials, as part of the routine maintenance programme
35. Cleaning of arrestment plant, coating application plant and extract ductwork shall be carried out as to minimise emissions of particulates into the air.
36. Suitable organic solvent containment and spillage equipment shall be readily available in all organic solvent handling areas.
37. All spillages shall be cleared as soon as possible. Solids shall be cleared using vacuum cleaning, wet methods, or other appropriate techniques. Dry sweeping of dusty spillages shall not be permitted.
38. A high standard of housekeeping shall be maintained.
39. Exhaust gases discharged through a stack or vent shall achieve an exit velocity which is greater than 15m/sec during normal operation conditions to achieve adequate dispersion.
40. Stacks or vents shall not be fitted with any restriction at the final opening such as a plate, cap or cowl, with the exception of a cone which may be necessary to increase the exit velocity of the emissions.

Management

41. Spares and consumables, in particular those subject to wear and tear, shall be held on site, or should be available at short notice from guaranteed local suppliers, so that plant breakdowns can be rectified rapidly.

42. In the case of non-compliance causing immediate danger to human health the activity shall be suspended and all of the following shall be taken into account:
 - The toxicity of the substance being released.
 - The amount released.
 - The location of the installation.
 - The sensitivity of the receptor.
43. Training of all staff with responsibility for operating the process shall include:
 - Awareness of their responsibilities under the permit, in particular how to deal with conditions likely to give rise to dust emissions
 - Minimising emissions on start-up and shut down
 - Action to minimise emissions during abnormal conditions
44. The operator shall maintain a statement of training requirements for each operational post and keep a record of the training received by each person whose actions may have an impact on the environment. These documents shall be made available to an Authorised officer of Newport City Council on request.
45. The process operator shall provide a list of key abatement plant and shall have a written plan for dealing with its failure, in order to minimise any adverse effects.
46. A written maintenance programme shall be provided to the regulator with respect to pollution control equipment and a record of such maintenance shall be made available to an Authorised officer of Newport City Council on request.

Notification

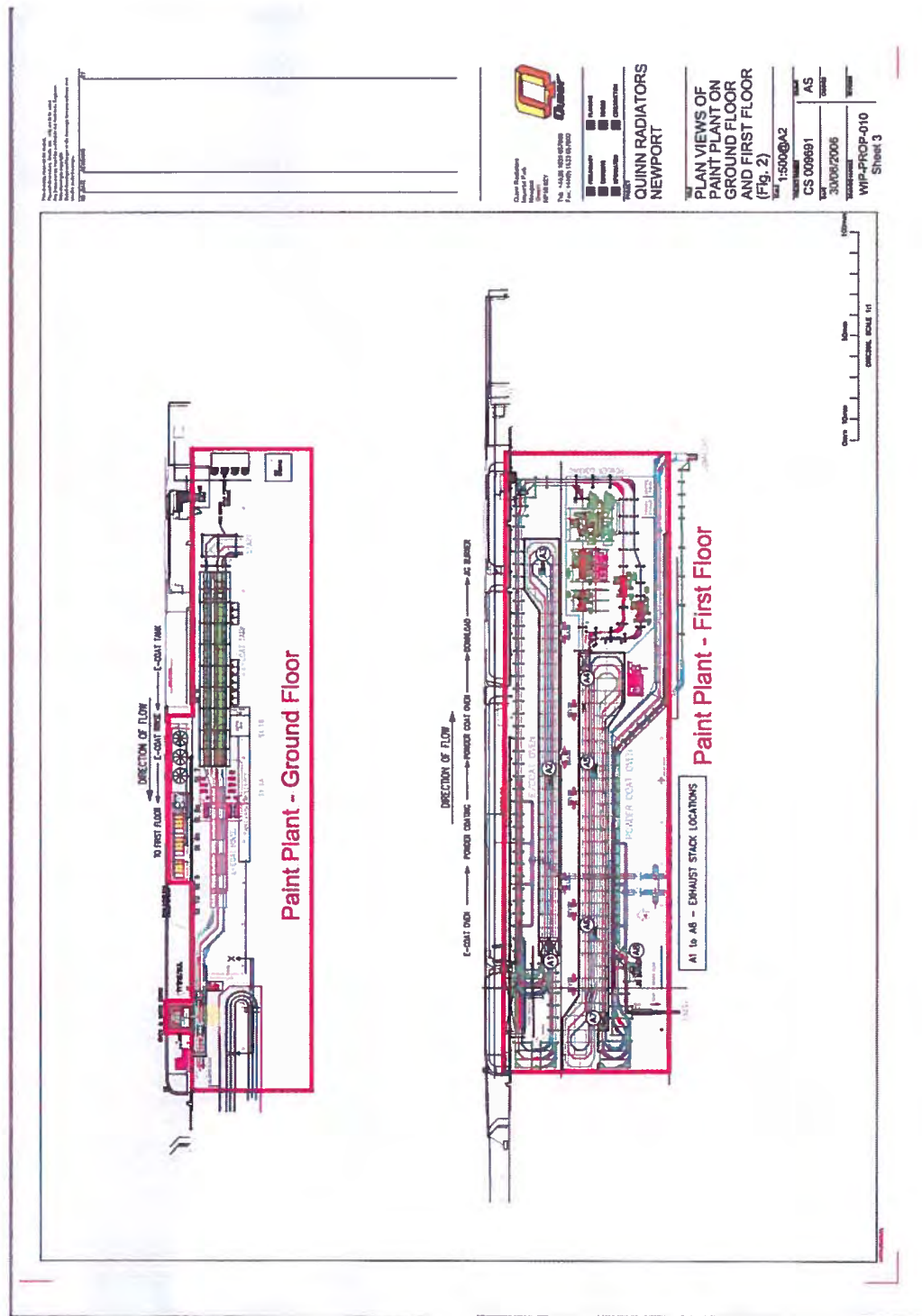
47. The operator shall notify Newport City Council without delay of:
 - The detection of any malfunction, breakdown or failure of plant or techniques which has caused, is causing or has the potential to cause significant pollution; and
 - any incident, which has caused, is causing or has the potential to cause significant pollution.
48. The operator shall give written notification as soon as possible or at least within 14 days of any of the following:
 - Permanent cessation of all or part of the operation or the permitted installation.
 - Cessation of all or part of the operation or permitted installation for a period likely to exceed one year; and
 - resumption of all or part of the operation or permitted installation after a cessation has been notified.
49. The operator shall notify the following matters to Newport City Council in writing within 14 days of either occurrence:
 - Any change to the operation with the capacity to alter the nature of the final products or intermediate products arising from the operation.
 - Any change in the Operator's trading name, registered name or registered office address.
 - Any change to particulars of the Operator's ultimate holding company (including details of an ultimate holding company where an operator has become a subsidiary).
 - Any steps taken with a view to the Operator going into administration, entering into a company voluntary arrangement, or being wound up.
50. If the operator proposes to make a change in operation of the installation, he must, at least 14 days before making the change, notify Newport City Council in writing. The notification must contain a description of the proposed change in operation. It is not necessary to make such a notification if an application to vary this permit has been made and the application contains a description of the proposed change. In this condition 'change in operation' means a change in

the nature or functioning, or an extension, of the installation, which may have consequences for the environment.

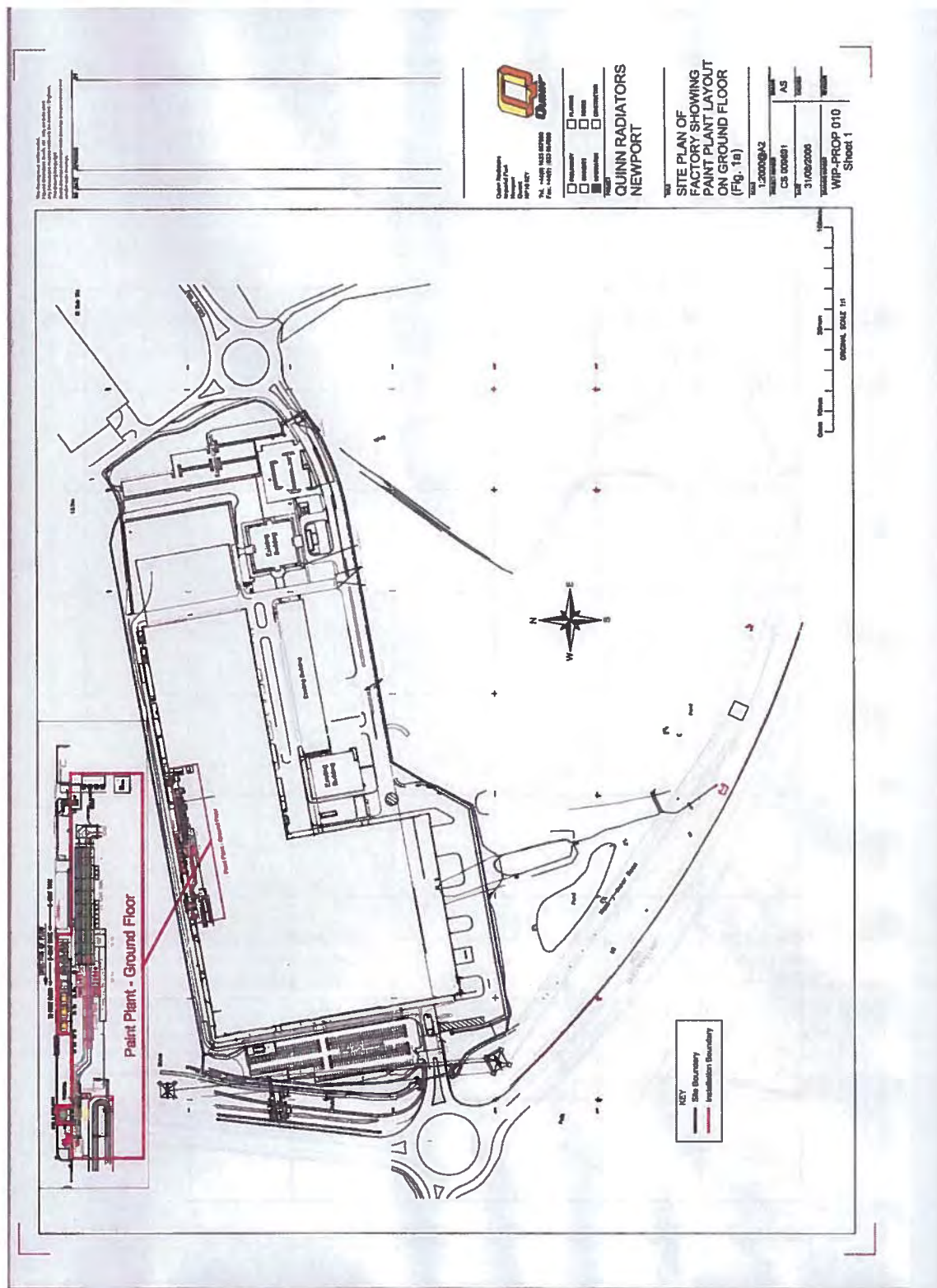
51. The operator must respond to any Information Notice served for the purposes of complying with the obligation to report emissions and off-site waste transfers pursuant to the directly applicable EU duty in accordance with Article 5 of EC Regulation No 166/2006 concerning the establishment of a European Pollutant Release and Transfer Register. As a permit condition, the failure to respond in accordance with such annual E-PRTR Information Notice will hereby constitute a breach of this permit.

**The Pollution Prevention and Control Act 1999
Permit Reference: LAPPC/037/06/v4**

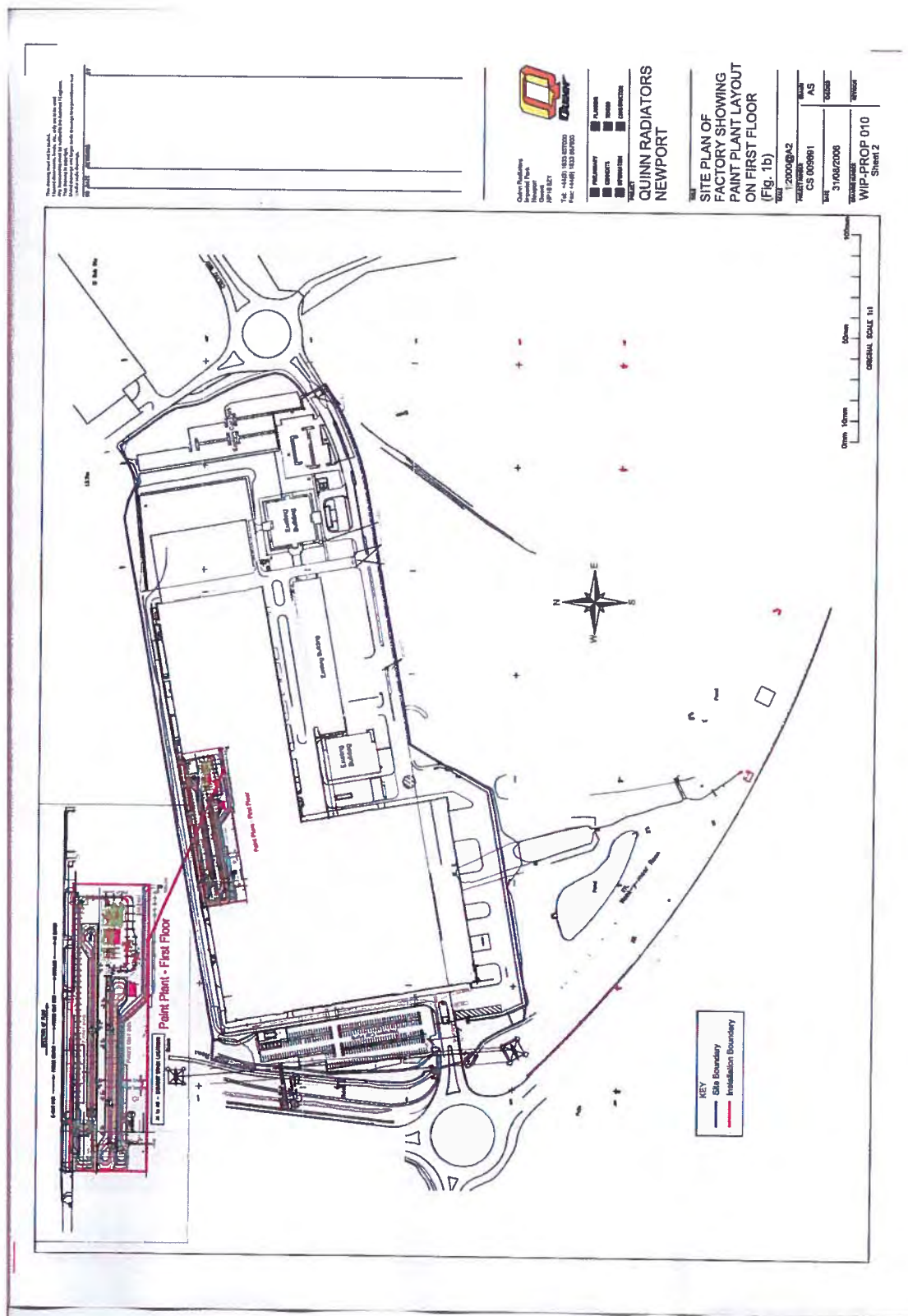
Appendix 1 – Site Plan



Appendix 2 – Overall Site General Arrangement



The Pollution Prevention and Control Act 1999
Permit Reference: LAPPC/037/06/v4



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Your Ref/Eich Cyf
Tel/Ffôn
Direct Dial/Rhif Union
B\

Abbie Thomas
AT/25/10/16/QRL
01633 656656
01633 10071
99463 Newport (Gwent) 3
Abbie.thomas@newport.gov.uk

Regeneration and Regulator Service

Yr Aelod Cymreig a Rheoleiddio



Telford Depot/ Depo Telford
Telford Street/ Stryd Telford
Newport/ Casnewydd
NP19 0ES

Mr Graham Laing
QRL
Imperial Park
Newport
NP10 8ZY

25th October 2016

Dear Mr Laing,

THE POLLUTION PREVENTION CONTROL ACT 1999
THE ENVIRONMENTAL PROTECTION ACT 1986
PART 1 OF THE ACT: LAPPC/037/06/v4 – RATED

I write with reference to my inspection of your Permitted process at the above site on the 21st October 2016.

At the time of the inspection the overall level of compliance with the conditions of the permit were found to be good, however we did discuss the following points which require your attention:

- i. You have provided the most recent spray booth servicing report dated August 2016. Can you please confirm if the action point 2 'Booth 5 should have immediate investigation into poor air speed throughput' has been completed?

I can confirm that your score was 27 and are therefore a Low risk process. Your next annual subsistence fee will be based on this risk assessment.

May I thank you for your co-operation during the visit,

Yours sincerely

A Thomas

Abbie Thomas
Environmental Health Officer

Bilfinger GVA
3 Brindleyplace
Birmingham



B1 2JB

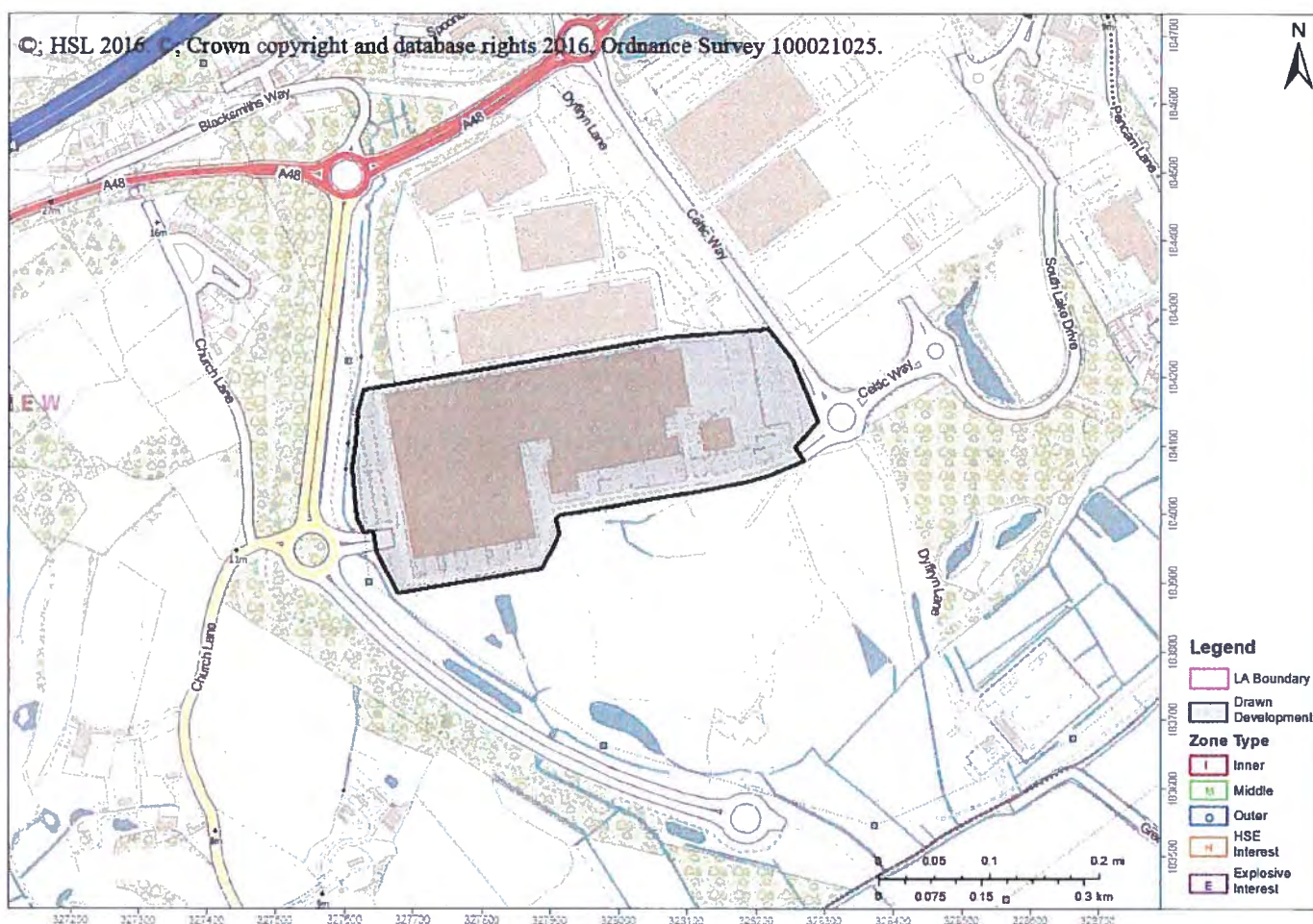
Advice : HSL-161209134840-429 Does Not Cross Any Consultation Zones

Your Ref: Imperial Park, Newport

Development Name:

Local Authority Reference:

Comments:



The proposed development site which you have identified does not currently lie within the consultation distance (CD) of a major hazard site or major accident hazard pipeline; therefore at present HSE does not need to be consulted on any developments on this site. However, should there be a delay submitting a planning application for the proposed development on this site, you may wish to approach HSE again to ensure that there have been no changes to CDs in this area in the intervening period.

Unidentified Pipelines

There is at least one unidentified pipeline in this Local Authority Area. You may wish to check with the pipeline operator where known or the Local Authority before proceeding. The details HSE have on record for these pipelines is as follows:

- 14312_ Dow Corning Ltd Chlorosilane line between Dow Corning & Cabot site

This advice report has been generated using information supplied by Tamar Egan at Bilfinger GVA on 09 December 2016.

COUNTY BOROUGH OF NEWPORT

TOWN AND COUNTRY PLANNING ACT 1990
PLANNING (LISTED BUILDINGS AND CONSERVATION AREAS) ACT 1990

Notice of Decision

Application number. 96/0663/OE

WYN THOMAS PLC FAO P VINING/T GENT
21
PARK PLACE
CARDIFF
CF1 3DQ

Application Type: **OUTLINE (ACCOMPANIED BY AN ENVIRONMENTAL STATEMENT)**

In pursuance of its powers under the above Act, the Council of the County Borough of Newport notifies you that the application submitted by you, for

PROPOSAL: CONSTRUCTION OF AN INTEGRATED PLANT FOR THE MANUFACTURE OF TELEVISION MONITORS, COLOUR PICTURE AND COLOUR DISPLAY TUBES, OTHER ELECTRONICS EQUIPMENT (LG ELECTRONICS INC.), A WAFER FABRICATION AND ASSEMBLY PLANT (LG SEMICON CO. LTD) INCLUDING ANCILLARY BUILDINGS AND USES AND ASSOCIATED BUILDING AND ENGINEERING AND OTHER OPERATIONS AND LANDSCAPING (CLASS B2 OF THE TOWN AND COUNTRY PLANNING (USE CLASSES) ORDER 1987) (INVOLVING THE DIVERSION OF PUBLIC FOOTPATH NUMBERS 7 AND 8 AND THE STOPPING UP OF PUBLIC HIGHWAYS, CELTIC WAY AND DYFFRYN LANE)

SITE/LOCATION : LAND AT & ADJ IMPERIAL PARK A48 (SOUTH OF) COEDKERNEW NEWPORT SOUTH WALES

which was registered by the County Borough Council on 18th July 1996, has been

GRANTED WITH CONDITIONS

The conditions are as follows .

01

No work shall commence on the construction of any buildings until a master plan for the comprehensive development of the site has been submitted to and approved by the Local Planning Authority, and the development shall be carried out fully in accordance with the approved plan. The master plan shall include an outline of:

- (i) the phasing of the development,
- (ii) The phasing of infrastructure provision,
- (iii) the basic road network;
- (iv) the basic surface water drainage system and its phasing;
- (v) structural planting and its phasing.

Reason: To ensure the comprehensive development of the site

02

Approval of the details of the siting, design and external appearance of any buildings, the means of access thereto and the landscaping of the site (herein after called The reserved matters) shall be obtained from the Local Planning authority in writing before any development is commenced on the area for which the reserved matters are submitted. The development shall be carried out fully in accordance with the approved details.

Reason: To safeguard the rights of control of the Local Planning Authority in respect of the reserved matters and to comply with the provisions of Article 1(2) of the Town and Country Planning (General Development Procedure) Order 1995.

03

Application for approval of the reserved matters shall be made to the Local Planning authority before the expiration of eight years from date of this permission.

Reason: To conform with the requirements of Section 92 of the Town and Country Planning Act 1990.

04

The development hereby permitted shall be begun either before the expiration of five years from the date of this permission, or before the expiration of two years from the date of the last of the reserved matters to be approved, whichever is the later

Reason: To conform with the requirements of Section 92 of the Town and Country Planning Act 1990.

05

The landscaping details referred to in condition 02 above shall include.

proposed finished levels or contours; all means of enclosure (within the site and around the site perimeter), car parking layouts; other vehicle and pedestrian access and circulation areas; hard surfacing materials; minor artefacts and structures including any refuse or other storage units, signs, floodlighting and street/car park lighting, proposed and existing functional services above and below ground including drainage power, communications cables and pipelines, indicating lines, manholes and supports. The details of soft landscaping works shall include planting plans; written specifications (including cultivation and other operations associated with tree, plant and grass establishment); schedules of plants, noting species, plant sizes and proposed numbers/densities where appropriate and a programme of implementation and maintenance. The details of soft landscaping works shall also include a scheme for the replanting of trees and hedgerows to be removed as a result of the development and the scheme shall include a survey showing the existing trees and hedgerows affected and a scheme of re-planting. The scheme of re-planting shall include planting plans, written specifications including cultivation and other operations associated with the establishment of the hedgerows and trees; schedules of plants, noting species, plant sizes and numbers/densities where appropriate and full details of a programme of implementation and maintenance. The choice of species to be re-planted shall predominantly be of varieties which are indigenous to the Gwent Levels and in particular to the St Brides SSSI. The implementation and maintenance of all landscaping works shall be carried out in accordance with the details approved by the Local Planning Authority.

Reason: To ensure that the development is landscaped in a satisfactory manner and to ensure that important landscape features which would be lost as a result of the development are replaced, in the interests of protecting the visual character of the Gwent levels and to encourage the re-establishment of important flora and fauna, in the interests of the protecting the St Brides SSSI.

06

The landscaping scheme agreed for any phase of the development shall be carried out in its entirety prior to the end of the first full planting season following the completion of that phase. For the purposes of this condition, a full planting season shall mean the period from October to April.

Reason: To ensure that landscaping is provided for each phase of the development, in the interests of visual amenity.

07

No work shall commence for the culverting, infilling or replacement of any ditches and reens within the area of the site until a scheme of such works has been submitted to and approved by the Local Planning Authority. Such a scheme shall include details of the timing and technical details of the means of carrying out such works. The works shall be carried out in accordance with the approved details.

Reason: To ensure that land drainage capacity and important land drainage features are replaced in the interests of efficient land drainage, flood prevention and to ensure that the conditions of the Site of Special Scientific Interest are successfully reproduced.

08

Where any ditches or reens are to be infilled or culverted, in accordance with any scheme agreed under condition 07, appropriate marginal, floating and emergent vegetative material shall be translocated from the reen to be infilled or culverted to the newly-created reen/ditch in accordance with a procedure and timescale agreed in writing by the Local Planning Authority.

Reason: To encourage the re-establishment of important species of flora and fauna displaced by the infilling of reens, in the interests of protecting the St. Brides SSSI.

The development shall not commence until comprehensive baseline surveys have been carried out (at locations to be first agreed in writing by the Local Planning Authority), of (a) Flora and Fauna and, (b); of Water Quality covering a full range of determinants including nutrients, heavy metals, pH, basic salts, ammonia, BOD, Dissolved Oxygen and total organic carbon), and the results of each of the surveys have been submitted to and approved by the Local Planning Authority as baselines for the purposes of monitoring the environmental impacts of the development.

Reason: To ensure that there is baseline data is available for the purposes of monitoring the impacts of the development on site area and the wider area of the St Brides SSSI.

10

The development shall not commence until such time as details of a programme of environmental monitoring of the potential impacts of the development upon both the site area and the St Brides SSSI generally, have been submitted to and approved in writing by the Local Planning Authority. The details to be submitted shall include details of the method and means of monitoring and shall include a timetable of the monitoring activities to be carried out. Also, the scheme shall include details of remedial action which shall be carried out to counteract any adverse impacts of the development upon the interests of the St. Brides SSSI. The monitoring scheme shall commence as soon as the development is begun and shall continue throughout the carrying out of the development and for such further period following the completion of the development as may be referred to in the approved details. The scheme shall be carried out as approved.

Reason: To ensure that the environmental impacts of the development are closely monitored during its construction and operational phases, in the interests of protecting the St. Brides SSSI

11

Development shall not commence in relation to any particular phase of the development, until details of the surface water drainage system for that phase including means of discharge into the drainage network, have been submitted to and approved by the Local Planning Authority. The system shall be implemented as approved.

Reason: To ensure that surface water and land drainage capacity lost through the infilling of reens is replaced and to safeguard the efficient drainage of the site and the surrounding area, in the interests of flood prevention, prevention of pollution of watercourses and the protection of the St. Brides SSSI

12

Unless otherwise agreed in writing by the Local Planning Authority, the surface water drainage system shall not incorporate any sealed storm water system.

Reason: To help ensure that average water levels of drainage ditches and reens downstream of the development are maintained

13

Prior to the occupation of any building, details of a programme of maintenance and environmental management of that phase of the development and all water courses, (reens, drainage ditches and other surface water storage/regulation features, including amenity, balancing and settlement ponds and storage lagoons, remaining or newly-created as a result of the development), and vegetation, have been submitted to and approved in writing by the Local Planning Authority. Such a scheme shall include a schedule of works and a detailed timetable for the carrying out of the works and the scheme shall be carried out as approved. The details of the programme of environmental monitoring shall include detailed provisions for the carrying out of measures for effective maintenance.

Reason: In the interests of protecting the St. Brides SSSI

14

No development shall take place within 7 metres of any ditch or reen, (existing, diverted, or newly created as a result of the development) and a Buffer Zone of that distance shall be preserved between land drainage ditches, reens and any other water body newly-created for the development, and any physical development. The Buffer Zone shall, at all times, be kept free of any spoil, stored materials plant, machinery and any other structures. There shall be no trafficking of vehicles or plant within the Buffer Zone

Reason: To ensure that access can be retained for maintenance purposes and reduce the risk of pollution, of the drainage network, in the interests of efficient land drainage, flood prevention and protection of the St Brides SSSI.

15

No development shall commence until an Environmental Code of Practice relating to construction works, has been submitted to and approved in writing by the Local Planning Authority. Such a Code of Practice shall contain details of all methods and modes of carrying out construction works and shall include provisions for the protection of reens, ditches and any other water bodies within the site or outside of it, (both existing and newly created) from pollution. The development shall be carried out in accordance with the Code of Practice approved by the Local Planning Authority (or in accordance with any variations which may be agreed in writing by the Local Planning Authority)

Reason: To ensure that the land drainage system is safeguarded from pollution, in the interests of protecting the St Brides SSSI.

16

The development shall not commence until an Environmental Liaison Officer has been appointed by the developer (with the approval of the Local Planning Authority) for the purposes of monitoring the carrying out of the development. The developer shall ensure that access to the site is afforded at all reasonable times to the Environmental Liaison Officer for the purpose of monitoring the carrying out of the development.

Reason: To ensure that the land drainage system is safeguarded from pollution, in the interests of protecting the St Brides SSSI.

17

No development shall commence in relation to any phase of the development, until dust suppression measures and suitable plant and wheel wash facilities, (including details of drainage facilities) have been provided in relation to that phase, in accordance with details to be submitted to and approved by the Local Planning Authority and the details as approved shall be implemented and shall remain in operation for the whole duration of the carrying out of the development of that phase.

Reason: In the interests of the amenities of residents who live near to the site

The development shall not commence until a scheme for the recording of background noise levels (to establish a baseline for the purposes of monitoring noise levels emitted by the proposed development), has been submitted to and agreed in writing by the Local Planning Authority. Such a scheme shall include a baseline frequency spectrum and details of the recording procedures and details of specific recording and monitoring points. The scheme shall be carried out in accordance with the details as approved and the development shall only commence when a baseline has been agreed in writing by the Local Planning Authority.

Reason: To ensure that an agreed baseline is established for the purposes of monitoring noise output of the development, in the interests of protecting the amenities of residents who live near to the development.

19

No work shall commence on the construction of any building until predicted noise levels (expressed as an 'A' weighted equivalent continuous sound pressure level), relating to the baseline monitoring points referred to in condition 18, have been agreed in writing by the Local Planning Authority.

Reason: In the interests of residential amenity.

20

No work shall commence on the construction of any building (unless agreed otherwise in writing by the Local Planning Authority) until a scheme has been agreed by the Local Planning Authority which specifies the provisions to be made for the control of spectral levels of noise emanating from the development.

Reason: In the interests of residential amenity.

21

The level of noise emitted from any building or plant as measured from any boundary of the site (or other positions to be agreed in writing by the Local Planning Authority) shall not exceed 5dB(A) above existing background levels unless otherwise agreed in writing by the Local Planning Authority.

Reason: In the interests of residential amenity.

22

Construction work shall not begin until a scheme to mitigate noise from construction works has been submitted to and approved by the Local Planning Authority and the scheme shall be implemented in accordance with the scheme as approved and shall continue throughout the carrying out of the development.

Reason: To ensure that the amenities of residents within and near to the site are not unduly disturbed during the carrying out of the development.

23

Unless otherwise agreed by the Local Planning Authority; (i) no construction work involving piling shall be carried out on the site other than between the hours of 8.00am and 5.00pm Mondays to Fridays and no construction work involving piling shall be carried out on Saturdays, Sundays, Bank Holidays or any other public holidays; (ii) any external construction work which does not involve piling shall not be carried out other than between the hours of 8.00am and 7.00pm Monday to Friday and between the hours of 8.00am and 1.00pm on Saturdays. Prior approval will be required for any external construction work to take place on Sundays, Bank Holidays or any other public holiday.

Reason: To ensure that residential amenities are not unreasonably disturbed during the carrying out of the development.

24

No development shall take place until the developer has secured the commencement of a programme of archaeological work in accordance with a written scheme of investigation which has been submitted to and approved by the Local Planning Authority. Such a scheme of investigation shall be based upon a brief provided by the Local Planning Authority.

Reason: In the interests of protecting archaeological deposits which may lie on or beneath the site.

25

Any facilities for the storage of oils, fuels or chemicals shall be sited on impervious bases and surrounded by impervious bund walls. The volume of the bunded compound shall be at least equivalent to the capacity of the tank/storage body plus an additional 10 per cent of that capacity. All filling points, vents, gauges and sight glasses shall be located within the bund and the drainage system of the bund shall be sealed with no discharge to any water course, land or underground strata. Associated pipe work shall be located above ground and protected from accidental damage. All filling points and tank overflow pipe outlets shall be designed so as to discharge downwards into the bund.

Reason: To prevent pollution and to protect the St Brides SSSI

26

No building shall be occupied until space for parking, loading and unloading of vehicles has been provided for that phase of the development within the curtilage of the site in accordance with the Council's parking standards and such space shall be kept available at all times for such purposes.

Reason: To ensure the efficient functioning of the site and to avoid the need for vehicles to be parked on the highway

27

No work shall commence on the construction of any building until details of water supply and works for the disposal of sewage have been submitted to and approved in writing by the Local Planning Authority.

Reason: To ensure that adequate infrastructure provision (in respect of water supplies and sewage disposal facilities), is made to serve the development.

28

None of the buildings shall be occupied until the works for the supply of water and disposal of sewage have been provided on the site to serve the development, in accordance with the approved details.

Reason: To ensure that adequate infrastructure provision (in respect of water supplies and sewage disposal facilities), is made to serve the development.

29

No work shall commence on the construction of any building until such time as the land in that phase of the development has been prepared in accordance with details first submitted to and approved in writing by the local planning authority

Reason: To ensure a satisfactory form of development that takes into account the necessary site preparation and earth works for the purposes of land drainage and flood defence.

NOTE TO APPLICANT

01

The scheme of structural planting referred to in Condition 01 shall include landscaping strips around the western and south western and southern boundaries of the site which shall be of a minimum depth of 20 metres, accommodating substantial, heavy standard tree planting, shrub planting and, in areas of the site to be stipulated by the Local Planning Authority, perimeter bunding shall be constructed between the site boundary and the landscaping strips. The scheme shall also include substantial heavy standard tree planting and shrub planting around the eastern and northern boundaries of the site and tree and shrub planting throughout all internal access roads and car parking and servicing areas. All landscape planting must be integrated with the functional and nature conservation requirements of all remaining and newly-created reens, ditches, ponds, lakes, lagoons and any other surface water courses within the site and adjacent to it

02

The applicant is advised to consult with the Countryside Council for Wales with regard to the implementation of the conditions of this approval and to comply with the requirements set out in the CCW publication, ' Nature Conservation and Physical Developments on the Gwent Levels'.

03

All run off generated by construction processes, including ground de-watering processes shall be diverted through a suitable drainage system and via settlement ponds prior to discharge into the land drainage system, in the interests of preventing pollution of the reen system and the applicant shall ensure that provisions are made for this within the Code of Practice.

04

The developer is advised that inspection manholes which shall be indicated in plans to be submitted under Condition 05 of this approval must be provided as part of the foul and surface drainage systems and in locations which ensure ease of access for the purposes of maintaining the surface water and foul drainage systems.

05

The developer is advised to undertake a site investigation to determine the nature and extent of land contamination within the site boundary and, where necessary to undertake remedial action to counteract the potentially adverse effects of land contamination prior to the commencement of the development. The developer is advised to liaise with the Environmental Agency with regard to undertaking any necessary action which is required in the interests of preventing contaminants from entering the land drainage and ground water systems

06

With regard to Condition 022 of this approval, the applicant is strongly advised to pursue the Prior Approval procedure under Section 61 of the Control Of Pollution Act as a means of complying with that condition and to liaise with the County Borough Council's Environment and Public Protection Division to make the necessary arrangements for this procedure.

07

This decision relates to drawing 3710/100/R submitted by Wyn Thomas Plc

(78)

This application was accompanied by an Environmental Statement under the provisions of the Town and Country Planning (Assessment of Environmental Effects) Regulations 1988 (as amended).

Signed on behalf of the Council.

Planning Services Division
Civic Centre
Newport
Gwent NP9 4UR

W L Mitchell
Head of Planning Services

Application No 96/0663/OE

Decision Date: 24th September, 1996

IMPORTANT! PLEASE READ THE NOTES ON THE REVERSE OF THIS FORM

Notice of Decision

TOWN AND COUNTRY PLANNING ACT 1990



To

CAPITA SYMONDS
EASTGATE HOUSE
35-43, NEWPORT ROAD
CARDIFF
SOUTH WALES
CF24 0SB

Application number 05/0207

Application Type FULL

Proposal CHANGE OF USE TO RADIATOR MANUFACTURING PLANT TOGETHER WITH ALTERATIONS AND EXTENSION

Site/location FORMER LG ELECTRONICS SITE (AND LAND AT) IMPERIAL PARK COEDKERNEW NEWPORT

In pursuance of its powers under the above Act, the Council of the City of Newport notifies you of its decision in respect of your application, registered by them on 15/02/2005. The application has been

GRANTED WITH CONDITIONS

STANDARD CONDITIONS

The development must begin not later than the expiration of five years from the date of this permission.
Reason: To conform with the requirements of Section 91 of the Town and Country Planning Act 1990

ADDITIONAL CONDITIONS

- 01 The development shall be carried out fully in accordance with an approved Method Statement regarding the Environmental Code of Practice relating to construction works. The Code of Practice shall be submitted to and approved by the Local Planning Authority before development commences. The development shall be carried out in accordance with the Code of Practice (or in accordance with any variation which may be agreed in writing by the Local Planning Authority).
Reason: To ensure the construction works are carried out without an adverse effect on the St Brides SSSI
- 02 No development shall be carried out until a suitable contingency plan for the protection and/or recording of any archaeological remains has been agreed in writing by the Local Planning Authority.
Reason: To record such artifacts and historical remains as may exist on or under the site
- 03 The developer shall afford access at all times to an archaeologist nominated by the Local Planning Authority and shall allow him to observe the excavations and record items or finds.
Reason: To record such artifacts and historical remains as may exist on or under the site
- 04 No development approved by this permission shall be commenced until the application site has been subjected to a detailed scheme for the investigation and recording of contamination, and a report has been submitted to, and approved by the Local Planning Authority.
Reason: To prevent pollution of the water environment
- 05 No development approved by this permission shall be commenced until detailed proposals, in line with current best practice for the removal, containment or otherwise rendering harmless such contamination (the "contamination proposals"), have been submitted to and approved by the Local Planning Authority. The contamination proposals shall be undertaken as approved.
Reason: To prevent pollution of the water environment
- 06 No roads or footpaths shall be constructed on the land until details of the layout, widths, gradients and means of construction details of means of access from existing roads have been approved by the Council. The development shall only be carried out in accordance with such details.
Reason: To ensure that any road or footpath shall be designed, sited and constructed to the satisfaction of the Local Planning Authority so far as to provide a proper means of access
- 07 No development shall commence until details of the surface water drainage system for the site including means of discharge into the drainage network, have been submitted to and approved by the Local Planning Authority. The scheme shall be implemented as approved.
Reason: To ensure the protection of the SSSI
- 08 Before the development is commenced, approval of the Local Planning Authority is required for a scheme of replanting, landscaping and tree planting for the site (indicating inter alia the number, species, heights on planting and positions of all trees and shrubs). Such a scheme, as approved shall be carried out in its entirety by a date not later than the end of the full planting season immediately following the completion of the development. Thereafter, the trees and shrubs shall be adequately maintained for a period of five years from the date of planting and any which die or are damaged shall be replaced and maintained until satisfactorily established. For the purpose of this condition a full planting season shall mean the period from October to April.
Reason: To safeguard the rights of control of the Local Planning Authority in these respects and to ensure that the site is landscaped in a satisfactory manner, in the interests of visual amenity

Notice of Decision



- 09 The development shall not commence until the developer has appointed an Environmental Liaison Officer (with the approval of the Local Planning Authority) for the purposes of monitoring the carrying out of the development and ensuring that the Code of Practice is adhered to at all times. The developer shall afford access to the site at all reasonable times to the Environmental Liaison Officer for the purpose of monitoring the carrying out of the development.
Reason: To ensure that the land drainage system is safeguarded from pollution, in the interests of protecting the St Brides SSSI
- 10 The development shall not commence until dust suppression measures and suitable plant and wheelwash facilities (including details of drainage facilities) have been provided in accordance with details to be submitted to and approved by the Local Planning Authority and the details as approved shall be implemented and shall remain in operation for the whole duration of the carrying out of the development.
Reason: In the interests of the amenities of residents who live near to the site
- 11 No material to be placed within 10 metres of the top of any watercourse or ditch.
Reason: To protect the water environment
- 12 No oil, diesel, petrol or chemicals shall be stored on the site unless details of the method of their storage have first been submitted to and agreed in writing by the Local Planning Authority. Such details will need to include the method by which pollution of the local environment will be avoided.
Reason: To protect the water environment
- 13 There shall be no discharge of foul or contaminated drainage from the site into either groundwater or any surface waters, whether direct or via soakaways during either the construction or operational phases of development.
Reason: To prevent pollution of the water environment
- 14 A full noise and vibration assessment, including any necessary mitigation, shall be submitted to and approved by the Local Planning Authority prior to development commencing. The mitigation shall be undertaken strictly in accordance with the approved scheme.
Reason: To protect the amenity of the area
- 15 Construction work shall not commence until a scheme to mitigate noise and vibration from construction works has been submitted and approved by the Local Planning Authority and the scheme shall be implemented in accordance with the scheme as approved and shall continue throughout the carrying out of the development.
Reason: In the interest of residential amenity
- 16 Approved discharge of surface water from the site shall be restricted to greenfield run-off rates in accordance with details that have been submitted to and approved in writing by the Local Planning Authority prior to work commencing.
Reason: To prevent flooding
- 17 The mitigation measures specified in Table 2 of the Otter Mitigation Report, Quinn Barlow Radiator Site, July 2005 shall be implemented strictly in accordance with that document unless otherwise agreed in writing by the Local Planning Authority.
Reason: To ensure that the mitigation works are undertaken in a satisfactory manner and that there are no adverse effects on otters during the construction period
- 18 A programme for the implementation of the proposed habitat enhancement works shall be submitted to and approved by the Local Planning Authority prior to the development commencing. The works shall be strictly undertaken in accordance with the approved programme.
Reason: To ensure the works are undertaken in a timely manner and to avoid adverse impacts on otters during the construction period
- 19 An assessment of the impact of the details, submitted in compliance with Condition 01, on the bat population of the area, shall be undertaken together with any necessary mitigation measures. The assessment and the mitigation measures shall be submitted to and approved by the Local Planning Authority and fully implemented prior to development commencing.
Reason: To ensure that the works do not have an adverse effect on the bat population of the area
- 20 The level of noise emitted from any building or plant as measured from any boundary of the site (or other positions to be agreed in writing by the Local Planning Authority) shall not exceed 5dB(A) above existing background levels unless otherwise agreed in writing by the Local Planning Authority.
Reason: In the interest of residential development

Notice of Decision



NOTE TO APPLICANT

The development should be carried out fully in accordance with the proposals shown in the application and in the plans and particulars accompanying such application as varied and amended by this permission

This decision notice is in respect of **Planning Permission** and does not convey any decision which may be required under The Building Regulations

The Development Plan for the area is Adopted Gwent Structure Plan Policies E2, E3 and E5 are relevant to the consideration of this application

The following emerging planning policies were considered relevant to the consideration of the application - Policies CE6, CE8, CE9, CE26, CE41 and ED5 of the Deposit Unitary Development Plan (Second Proposed Changes)

This decision relates to plan Nos 0805/1201-7, 1301-4, 2101, 2201-8, and 2301-4, Environmental Impact Assessment (February 2005), Amphibian Survey (March to May 2005), and Otter Mitigation Report (July 2005)

Signed on behalf of the Council

Head of Planning and Economic Regeneration

Newport City Council

Civic Centre
Newport
South Wales
NP20 4UR

Application No 05/0207

Decision Date 08.06 2005

IMPORTANT! PLEASE READ THE NOTES ON THE REVERSE OF THIS FORM

Notice of Decision

TOWN AND COUNTRY PLANNING ACT 1990

QUINN RADIATORS LTD
FAO MR D JONES
IMPERIAL PARK
COEDKERNEW
NEWPORT
SOUTH WALES
NP10 8ZY



Application No 06/1567

Application Type Full

Proposal ERECTION OF EXTENSION TO EXISTING BUILDING FOR AN AUTOMATED HIGH BAY WAREHOUSE (AMENDMENT TO PLANNING PERMISSION 06/0860/F)

Site/Location QUINN RADIATORS CELTIC WAY CELTIC LAKES NEWPORT SOUTH WALES NP10 8FS

Decision Date 31/01/2007

In pursuance of its powers under the above Act the Council of the City of Newport notifies you of its decision in respect of your application, registered by them on 10/11/2006. The application has been -

Granted with Conditions

STANDARD CONDITIONS

The development must begin not later than the expiration of **FIVE YEARS** from the date of this permission
Reason: To conform with the requirements of Section 91 of the Town and Country Planning Act 1990

ADDITIONAL CONDITIONS

(1) The development shall be carried out fully in accordance with an approved Method Statement regarding the Environmental Code of Practice relating to construction works. The Code of Practice shall be submitted to and approved by the Local Planning Authority before development commences. The development shall be carried out in accordance with the Code of Practice (or in accordance with any variation which may be agreed in writing by the Local Planning Authority)

Reason: To ensure the construction works are carried out without an adverse affect on the St Brides SSSI

(2) The external surfaces of the extension hereby approved shall be fully in accordance with the details shown on the approved drawings
Reason: To ensure that the development is completed in a manner compatible with its surroundings

(3) The development hereby approved shall be used in association with the manufacturing of radiators at this site by the Quinns Group and at no time be subdivided or used by any other company without the prior written permission of the Local Planning Authority
Reason: Permission has been granted in view of the personal circumstances of the applicant

NOTE TO APPLICANT

The development shall be carried out fully in accordance with the proposals shown in the application and in the plans and particulars accompanying such application as varied and amended by this permission

This decision notice is issued in respect of **Planning Permission** only and does not convey any decision which may be required under any other legislation or provisions, such as consent under the Building Regulations

(1) This decision relates to plan Nos WIP-PROP-009 SHEET 1C,2B, 3C 4C and 5C , 009 SHEET1 and 2, 011 SHEET 1 and 2 SITE PLAN

(2) The development plan covering Newport is the Newport Unitary Development Plan 1996-2011 (Adopted May 2006). Policies CE6, CE8, CE9, CE26, CE41, ED5 and ED1 were relevant to this application

(3) The applicant is advised that the 'Q' logo shown on the approved plans will require a separate application for Advertisement Consent

Signed on behalf of the Council

Newport City Council
Environment and the Economy
Civic Centre
NEWPORT
South Wales
NP20 4UR

Stewart Wild
Head of Planning and Economic Regeneration

Mr. Scott Daniel
Quinn Radiators
Imperial Park
Newport
Gwent
NP10 8FS

Our ref: SEA/EM3/AC735718
Your ref:

Date: 25th January 2010

Dear Mr. Daniel

Water Resources Act 1991

On 26th November 2009 at 12:10 the Environment Agency attended an incident on the Pencoed Reen in Newport. It was evident that contaminated water was entering the watercourse via a culvert. Two Environment Officers met with Quinn Radiators Employees who admitted responsibility for the incident.

This incident constitutes an offence under section 85 (1) of the Water Resources Act 1991, whereby it is an offence to cause or knowingly permit any poisonous, noxious or polluting matter or any solid waste matter to enter any controlled waters.

A person who contravenes these sections shall be guilty of an offence and liable –

- a) on summary conviction, to imprisonment for a term not exceeding three months or to a fine not exceeding £20,000 or to both:
- b) on conviction on indictment, to imprisonment for a term not exceeding two years or to a fine or to both.

At present we do not intend to prosecute you for the above offences, however you are warned that this may change if further relevant information¹ comes to light. Please note that this current decision not to prosecute you; Cannot bind any other prosecuting authority; Does not limit the right of the Environment Agency to issue enforcement notices, clear-up or remediation notices, or to seek recovery of costs or damages according to law.

You are also warned that the issue of this letter will be taken into account when considering the appropriate enforcement action for any future breaches by you.

¹ Relevant information includes (this is not exhaustive) :
that earlier offences were committed
that the environmental impact is greater than presently understood
that the offences are continuing or have been repeated
that you have committed offences of which I am presently unaware

if you have any questions relating to the above please contact Alex Carter on the details below.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'A Leakey', with a long horizontal stroke extending to the right.

Tony Leakey
Team Leader, Environment Management

Llinell uniongyrchol/Direct dial 02920 245119
Ffacs uniongyrchol/Direct fax 02920 362197
Direct e-mail: alex.carter@environment-agency.gov.uk

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creating a better place

WARNING LETTER

The Company Secretary
Quinn Radiators Limited
Imperial Business Park
Newport
NP10 8ZY

Our ref: SEA/EM8/00538546

Your ref:

Date: 16th November 2007

Dear Sir/Madam

Water Resources Act 1991

I am writing regarding the pollution at Quinn Radiators on or before 16th October 2007. The Agency has fully considered the circumstances of the incident and is satisfied that an offence has been committed under the provisions under the **WATER RESOURCES ACT 1991:Section 85**

A person contravenes this section if he causes or knowingly permits any poisonous, noxious or polluting matter or any solid waste to enter any controlled waters."

"A person who contravenes this is section shall be guilty of an offence and liable;

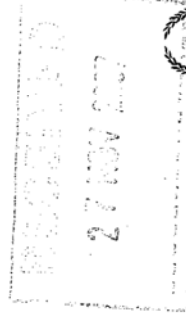
- (a) on summary conviction, to imprisonment for a term not exceeding three months or to a fine not exceeding £20,000 or to both:
- (b) on a conviction on indictment, to imprisonment for a term not exceeding two years or to a fine or to both."

We do not intend to prosecute you for the above offence on this occasion, however, our decision could change if any further relevant information comes to light, including, but not restricted to, information that:

- you have committed earlier offences
- the environmental impacts of this offence are greater than we presently understand them
- the offences are continuing or have been repeated
- you have committed other offences of which we are presently unaware.

You are **warned** that we will take this into account if we consider you are involved in any future breaches.

Plas Yr Afon, St. Mellons Business Park, Fortran Road, St. Mellons, Cardiff, CF3 0EY.
Customer services line: 08708 506 506
Email: enquiries@environment-agency.gov.uk
www.environment-agency.gov.uk





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Ground Stability Non-Residential Report



LAND TO THE WEST OF QRL GROUP UNIT,
IMPERIAL PARK, CELTIC WAY, NEWPORT, NP10 8FS

Date of enquiry: 10 August 2020
Date enquiry received: 10 August 2020
Issue date: 10 August 2020

Our reference: 61002900886001
Your reference: TW.Westbrook.Newport

Ground Stability Non-Residential Report

This report is based on and limited to the records held by the Coal Authority and the records and geological interpretation of the British Geological Survey (BGS) at the time the report was produced.

Client name

NLIS

Enquiry address

LAND TO THE WEST OF QRL GROUP UNIT,
IMPERIAL PARK, CELTIC WAY, NEWPORT, NP10 8FS


How to contact us

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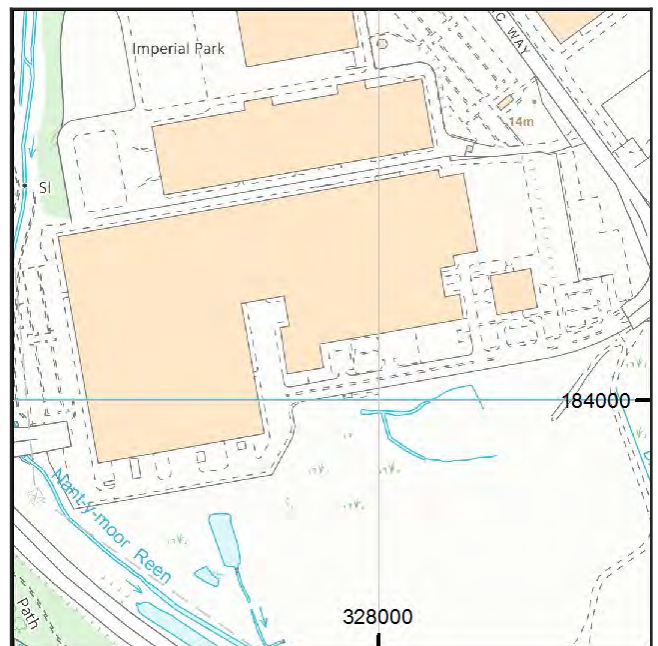
200 Lichfield Lane
Mansfield
Nottinghamshire
NG18 4RG

www.groundstability.com

 /company/the-coal-authority

 /thecoalauthority

 /coalauthority



Approximate position of property



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Coal Authority Summary

Has the search report highlighted evidence or potential of		
1	Past underground coal mining	No
2	Present underground coal mining	No
3	Future underground coal mining	No
4	Mine entries	No
5	Coal mining geology	No
6	Past opencast coal mining	No
7	Present opencast coal mining	No
8	Future opencast coal mining	No
9	Coal mining subsidence	No
10	Mine gas	No
11	Hazards related to coal mining	No
12	Withdrawal of support	No
13	Working facilities order	No
14	Payments to owners of former copyhold land	No

BGS Summary

Has the search report highlighted evidence or potential of		
1	Shrinkable clay	Yes
2	Running sand	Yes
3	Deposits which could compress	Yes
4	Deposits which could collapse	No
5	Natural landslide activity	Yes
6	Soluble rocks	No

Detailed findings from the Coal Authority

1. Past underground coal mining

The property is not within a surface area that could be affected by any past recorded underground coal mining.

2. Present underground coal mining

The property is not within a surface area that could be affected by present underground mining.

3. Future underground coal mining

The property is not in an area where the Coal Authority has received an application for, and is currently considering whether to grant a licence to remove or work coal by underground methods.

The property is not in an area where a licence has been granted to remove or otherwise work coal using underground methods.

The property is not in an area likely to be affected from any planned future underground coal mining.

No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

4. Mine entries

There are no recorded coal mine entries known to the Coal Authority within, or within 20 metres, of the boundary of the property.

5. Coal mining geology

The Coal Authority is not aware of any damage due to geological faults or other lines of weakness that have been affected by coal mining.

6. Past opencast coal mining

The property is not within the boundary of an opencast site from which coal has been removed by opencast methods.

7. Present opencast coal mining

The property does not lie within 200 metres of the boundary of an opencast site from which coal is being removed by opencast methods.

8. Future opencast coal mining

There are no licence requests outstanding to remove coal by opencast methods within 800 metres of the boundary.

The property is not within 800 metres of the boundary of an opencast site for which a licence to remove coal by opencast methods has been granted.

9. Coal mining subsidence

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31 October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

10. Mine gas

The Coal Authority has no record of a mine gas emission requiring action.

11. Hazards related to coal mining

The property has not been subject to remedial works, by or on behalf of the Coal Authority, under its Emergency Surface Hazard Call Out procedures.

12. Withdrawal of support

The property is not in an area where a notice to withdraw support has been given.

The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.

13. Working facilities order

The property is not in an area where an order has been made, under the provisions of the Mines (Working Facilities and Support) Acts 1923 and 1966 or any statutory modification or amendment thereof.

14. Payments to owners of former copyhold land

The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

Detailed findings from BGS

1. Shrinkable clay

The property is in an area underlain by clay. Clay can swell or shrink if the moisture content changes.

However, the clay deposits in this area are considered to be mainly of "low plasticity". This means it is unlikely that they will cause ground movement.

2. Running sand

The property is in an area underlain by sand. Some sands, if voids are present, may flow if they come into contact with water.

However, the sand deposits in this area are unlikely to cause ground movement unless changes in water levels occur.

3. Deposits which could compress

The property is in an area underlain by natural compressible deposits. When this material is overloaded, or dries out, it can become unstable causing ground movement.

Because of these compressible deposits, ground movement could occur. Avoid large differential loadings of ground. Do not drain or dewater ground near the property without technical advice.

4. Deposits which could collapse

The property is not in an area underlain by deposits which could collapse and cause ground movement.

5. Natural landslide activity

The property is in an area where the local geology and steepness of slope could increase the likelihood of landslide activity.

It is however unlikely to occur unless substantial changes are made to the ground or the surrounding vegetation, this includes excessively wet weather.

6. Soluble rocks

The property is not in an area underlain by soluble rocks.

Comments on the BGS information

These features should not necessarily give cause for concern.

Whether or not a property is affected by ground movement can depend on a number of factors such as its age, type of construction, and on its surroundings and such matters as drainage and nearby trees.

Since 1992 buildings should have been designed and constructed according to buildings regulations to ensure natural ground movement will not cause damage to a building.

However, you should consider the possible consequences before you:

- carry out any building or excavation work
- alter the ground surface or drainage of surface or ground water
- plant or remove large shrubs or trees

Ground movement can cause uneven damage or subsidence to a property.

Developers should always carry out an appropriate risk assessment before starting any work on, or around, a property.

If you own the property and it is damaged by ground movement: You should contact your insurance company and anyone else who has an interest in the property, for example, the mortgage lender.

If you are considering buying the property and BGS has identified that ground movement could occur you should tell your professional advisers.

Additional remarks

This report has been prepared in accordance with the Law Society's Guidance Notes 2018, the User Guide 2018 and the Coal Authority and the British Geological Survey's Terms and Conditions applicable at the time the report was produced. The information provided by the Coal Authority has been compiled in response to the Law Society's CON29M Coal Mining enquiries and is protected by copyright owned by the Law Society of 113 Chancery Lane, London WC2A 1PL.

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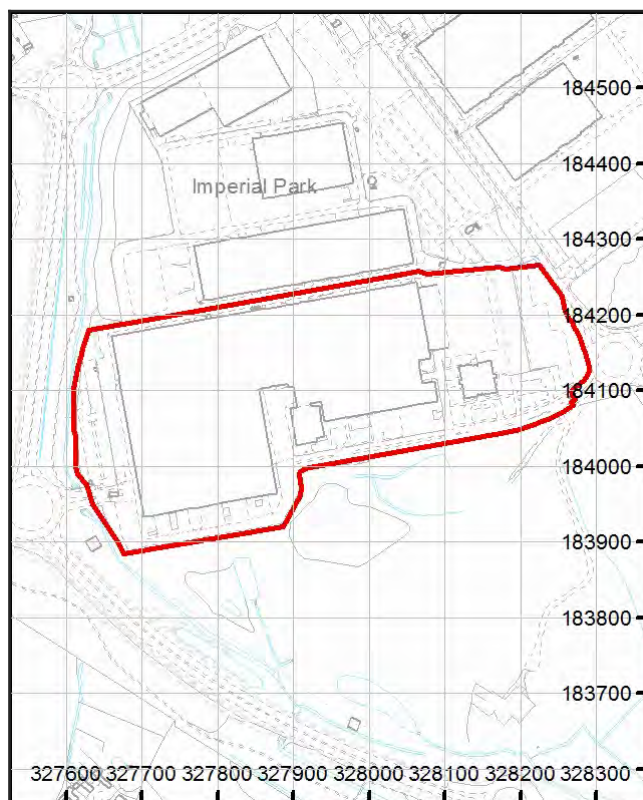
Terms and conditions

Our full terms and conditions can be found on our website – www.groundstability.com.

Enquiry boundary

Key

Approximate position of enquiry boundary shown




How to contact us

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General information

This report has been prepared by the Coal Authority using the information held by the Authority, together with information supplied by the British Geological Survey (BGS).

1. The Coal Authority and the British Geological Survey (BGS) are referred to in the report as the suppliers.
2. This report is confidential and has been prepared specifically for the property and for use by the owner only. It should not be relied upon by any other property or by any other third party.
3. The report is based on and limited to:
 - a. the specific features identified in the report
 - b. each suppliers interpretation of the records it holds relating to the particular features for which the report states that the supplier is responsible at the time the report is prepared
4. The records used do not represent an exhaustive or comprehensive list of all the records that may exist or may be available for the property. No physical inspection of the property has or will be carried out in the preparation of this report.
5. Information from the Coal Authority is based on records in its possession relating to coal mining activity. There may be information held by others on historical coal mining, and information on other types of mining, which is not searched for as part of this report.
6. Information from BGS relates solely to the 6 natural ground stability hazards as described in this report. It does not cover any other geological hazards or man-made hazards (such as contaminated land). BGS may hold data on other geological hazards and features that may affect the property which are not searched for as part of this report. Consequently the report should not be taken as a guarantee that there are no other geological hazards or other issues affecting the property. For a more detailed interpretation please visit the BGS's website www.bgs.as.uk
7. Information from BGS is prepared using the BGS GeoSure database which is based on 1:10,000 scale geological mapping reduced to 1:50,000 scale.

8. The information from suppliers may be derived from records from a number of disparate sources which vary in age, quantity and quality. Such records may include material donated to the suppliers from third parties, which may not have been subject to any verifications or other quality control process.
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11. If this report is for a residential property, insurance is included. This report includes a policy and key facts summary which outline the significant features, benefits and limitations of the cover provided. Full terms and conditions are shown in the policy document.
12. The report gives an indication of whether ground movement could occur at the property. This does not necessarily mean that the property is or will be affected by ground instability. Such an assessment can only be made by inspection of the property by a qualified professional, such as a surveyor or engineer. This report does not therefore –
 - include any information or warranty relating to the actual state, or the structural or other condition, of the property
 - determine the saleability or value, or the safety, of the property
 - indicate the suitability of the property for any particular purpose (including, without limitation, its suitability for development (within the meaning of section 55 of the Town and Country Planning Act 1990 as amended) or any building, excavation or landscaping work)
 - act as a substitute for any physical inspection, specialist interpretations and/or professional advice



ERM

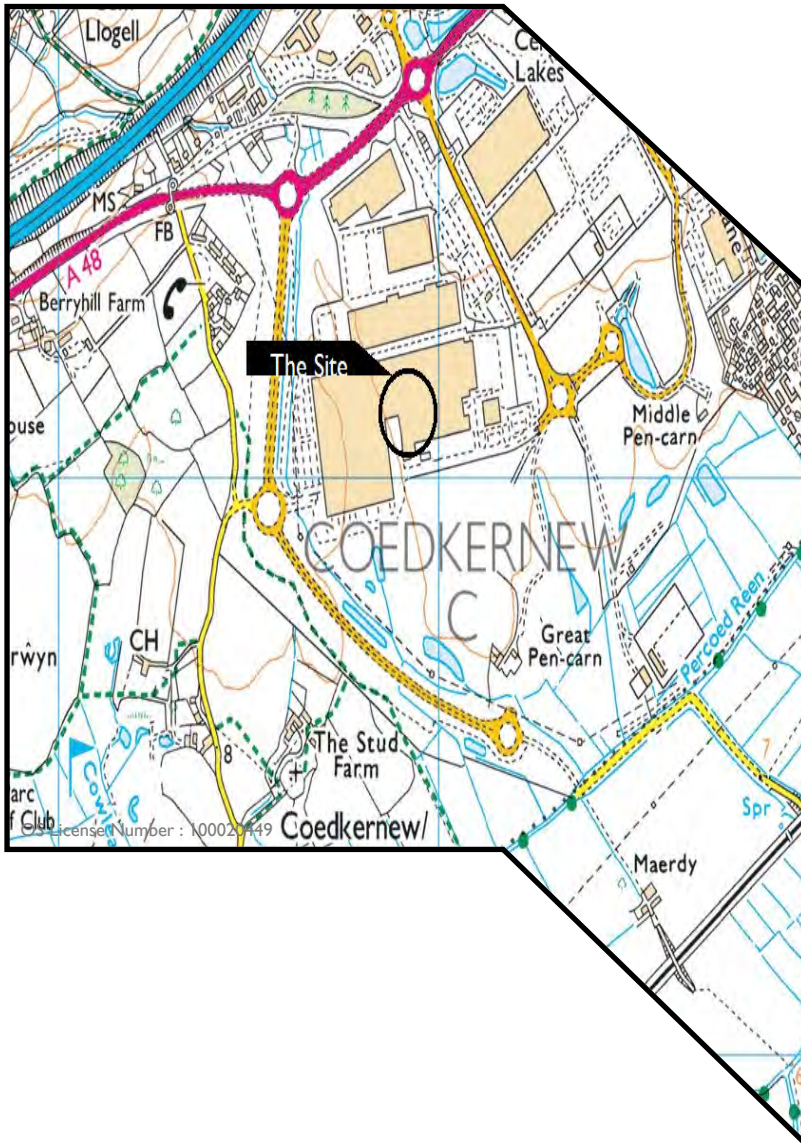
ANNEX B

GEOTECHNICS FACTUAL AND
INTERPRETATIVE REPORT FOR
PINNACLE ENGINEERING LIMITED.
FORMER QUINN RADIATOR FACILITY
SITE (PN214233 – REP004), JULY 2021

Site Investigation



www.geotechnics.co.uk



Newport, Wales, NP10
8FS

Factual and Interpretative Report

for
Pinnacle Consulting Engineers
Limited

Project Number PN214233

July 2021

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1.0 INTRODUCTION

A geotechnical and geoenvironmental investigation was undertaken by Geotechnics Limited at the site of a former radiator manufacturing facility on the outskirts of Newport and comprises five rectangular structures, two circular structures and associated hardstanding and minor areas of landscaping. The investigation was carried out to the instructions of Pinnacle Consulting Engineers Limited (Pinnacle), the Client. This report describes the work undertaken and presents the data obtained.

2.0 OBJECT AND SCOPE OF THE INVESTIGATION

The object of the investigation was to obtain information on the current ground and groundwater conditions within the limitations posed by exploratory hole numbers, locations, depths, methods adopted and the scope of approved in situ and laboratory testing. The Brief for the project is included in Appendix 1. The investigation comprised cable percussive, rotary and dynamic sample boreholes, *in-situ* and laboratory testing and reporting. A geotechnical and geoenvironmental interpretation and evaluation of the data obtained was also commissioned.

3.0 PRESENTATION

A description of the site and a summary of the procedures followed during the investigation process are presented in Sections 4 to 6. The factual data so obtained are presented in Appendices 3 to 11 of this report. A desk study has been undertaken by Geotechnics Limited (reference: PN214233 Newport Quinn Desk Study, May 2021) which summarises the site, its history, geology and ground conditions and provides a preliminary risk assessment and geotechnical risk assessment for the site, with the findings in Section 7. An interpretation of the data obtained is presented in Section 8 and an evaluation of its significance in relation to proposals available at the time of preparation of this report is presented in

Section 9 (Geotechnics) and Section 10 (Geoenvironmental). Attention is drawn to the General Notes and Investigation Procedures presented in Appendix 17 to aid an understanding of the procedures followed and the context in which the report should be read.

4.0 THE SITE

4.1 Location

The site is located approximately 5km south-west of the centre of Newport and approximately 1km south of junction 28 on the M4 motorway. The approximate Ordnance Survey National Grid Reference for the centre of the site is ST 278 841 and an extract from the relevant 1:25,000 Scale O.S. Map is included as Appendix 2.

4.2 Description

The site is approximately rectangular in shape and covers an area of approximately 16.59 ha. The site comprises a disused radiator manufacturing site with associated areas of hardstanding for roads and parking and areas of soft landscaping comprising mostly short field grass, bushes and mature and semi-mature trees around the perimeter. The majority of structures remain *in-situ* with internal manufacturing infrastructure largely removed.

The site has an elevation of approximately 10 mOD and slopes gently from northwest to south east.

There are no water features located on-site, but a pond is located approximately 70 m south and a drainage ditch is located approximately 20m to the west.

Several storage vessels were observed including oil and propane bottles, former paint storage tanks, liquid oxygen and liquid argon tanks and gas bottles.

Numerous service access chambers were observed including storm and foul drains.

5.0 PROCEDURE

5.1 Commissioning

The work was awarded following submission of a proposal for ground investigation of the site in accordance with the Client's requirements (see Appendix I).

5.2 General

The procedures followed in this site investigation are based on BS 5930:2015+ A1:2020 – *Code of Practice for Site Investigations* and BS 10175:2011+A2:2017 – *Investigation of Potentially Contaminated Sites*. The soils and rocks encountered have been described in accordance with BS5930:2015+ A1:2020 and BS EN ISO 14688-1:2018 and BS EN ISO 14689:2018. The Cable Percussive Borehole, Rotary Borehole and Dynamic Sample Borehole positions are shown on the Exploratory Hole Location Plan in Appendix 7.

The Exploratory Hole locations were specified by Geotechnics, and were located to provide specific information based on four criteria:

- Potential petroleum hydrocarbons in shallow Made Ground (Internal areas):
 - WS-BH109
 - WS-BH110
 - WS-BH111
- Potential petroleum hydrocarbon Migration (External area):
 - WS-BH104
 - WS-BH105
 - WS-BH106
 - CP-BH101
 - CP-BH102
- Potential sources of contaminants close to observed above ground storage tanks
 - WS-BH101
 - WS-BH102
 - WS-BH103
 - WS-BH108
- General site coverage and geotechnical characterisation
 - RC-BH101
 - RC-BH102
 - RC-BH103
 - RC-BH104
 - RC-BH105
 - CP-BH101
 - CP-BH102
 - CP-BH103
 - CP-BH104

- CP-BH105

The co-ordinates and levels shown on the Exploratory Hole Records were measured using a GPS survey device. Positions within the buildings were surveyed using taped measurements from GPS located positions. The depths quoted on the exploratory hole records are in metres below ground level.

Prior to the investigation, a survey was carried out by Midland Survey Limited utilising Ground Penetrating Radar (GPR) techniques to check for the presence of buried services at the proposed exploratory hole locations.

At each exploratory hole location an inspection pit was excavated using hand tools to a depth of 1.20m below ground level to check for the presence of underground services. Prior to and on completion of the excavation, the location was scanned using a cable avoidance tool (CAT). At those locations where concrete was present at ground level, 350mm diameter coring was used to advance the exploratory hole through the concrete and facilitate the excavation of the inspection pit. Details of the concrete coring is included on the appropriate exploratory hole records.

5.3 Boreholes

Four (4 No.) 200mm diameter boreholes (numbered CP-BH101 to CP-BH103 and WS-BH109) were sunk by Cable Percussion Tool techniques to depths of 5.50m (CP-BH101), 8.44m (CP-BH102), 3.45m (CP-BH103) and 9.95m (WS-BH109) below ground level. A fifth borehole (CP-BH105) was terminated on a buried obstruction within the inspection pit at a depth of 0.65m below ground level. Proposed borehole CP-BH104 was cancelled due to time constraints. The work was carried out between 24th May and 1st June 2021.

Representative disturbed (D and B) and driven open-tube thin-walled (UT) samples of the soils encountered were obtained at regular intervals. Standard Penetration Tests (SPTs) were undertaken at the depths indicated on the borehole records in accordance with BS EN ISO 22476-3:2005+A1:2011 to obtain a measure of the engineering properties of the proved strata. In addition, Environmental Soil samples (ES) were recovered at the depths indicated on the Borehole Records, presented in Appendix 3.

On encountering groundwater, boring operations were suspended for 20 minutes in order to record

any rise in water level. Full details of groundwater observations during site work are included on the Borehole Records.

On completion, standpipes were installed in each of the completed boreholes (see Section 5.6). Borehole CP-BH105 was backfilled with bentonite and the surface was reinstated.

5.4 Rotary Boreholes

Five (5 No.) boreholes (numbered RC-BH101 to RC-BH105), up to 100mm in diameter, were sunk utilising a combination of dynamic sampling, rotary open-hole and rotary coring techniques to depths ranging between 7.50m and 15.00m below ground level. The work was carried out between 27th May and 8th June 2021.

The dynamic sample sections of the boreholes were carried out using a compressed air percussive apparatus fitted to the rotary drilling rig which drives lined steel tubes into the ground in 1.00m lengths. Samples are retrieved in the plastic liners. The retrieved liners were split and the recovered soils described before being sub-sampled into ES, D and B samples as shown on the Borehole Records, presented in Appendix 4.

In places, rotary open-hole drilling was used to advance the boreholes through the Made Ground or to allow installation of the rotary casing. The strata descriptions in the open-hole sections of the Borehole Records are based on chipping returns in the flushing medium placed. The rate of penetration is also used as an indicator of the type of material being drilled, particularly where there is loss of flush returns. Definitive classification in terms of geology or degree of disturbance is not possible from these sources.

Rotary coring commenced at depths ranging between 3.80m and 4.80m below ground level. The drilling equipment used in the rotary sections of the boreholes on this particular contract utilised air-mist as the flushing medium. Rock cores were extruded horizontally in transparent liners and placed into suitable core boxes. Photographs of the individual core boxes are included in Appendix 5.

Standard Penetration Tests (SPTs) were undertaken at the depths indicated on the borehole records in accordance with BS EN ISO 22476-3:2005+A1:2011 to obtain a measure of the engineering properties of the proved strata.

Groundwater observations are included on the Borehole Records where appropriate and any rise in water level was recorded over 20 minutes whilst drilling operations were suspended. It should be noted that the addition of water to the borehole as part of the drilling process may have masked the presence of groundwater in the borehole. Where water was added it has been noted on the Borehole Records.

On completion, standpipes were installed in each of the Boreholes (see Section 5.6).

5.5 Dynamic Sample Boreholes

Ten (10 No.) Dynamic Sample Boreholes (numbered WS-BH101 to WS-BH108, WS-BH110 and WS-BH111) were undertaken at the site to depths ranging between 1.60m and 4.45m below ground level. The work was carried out between 24th and 27th May 2021. Proposed Dynamic Sample Borehole WS-BH109 was carried out using Cable Percussion techniques (see Section 5.3 above) due to drilling rig availability.

The Dynamic Samples were taken using the super-heavy Dynamic Probe apparatus which drives lined steel tubes into the ground in 1.00m lengths. The retrieved liners were split and the recovered soils described before being sub-sampled into ES, D and B samples as shown on the Borehole Records, presented in Appendix 6. The holes were not cased and progress depended on the nature of the strata penetrated.

Standard Penetration Tests (SPTs) were undertaken at the depths indicated on the borehole records in accordance with BS EN ISO 22476-3:2005+A1:2011 to obtain a measure of the engineering properties of the proved strata.

Groundwater observations are included on the Borehole Records where appropriate and any rise in water level was recorded over 20 minutes whilst drilling operations were suspended.

On completion, standpipes were installed in Boreholes WS-BH102 to WS-BH106, WS-BH110 and WS-BH111 (see Section 5.6). The other boreholes were backfilled with bentonite.

5.6 Instrumentation and Monitoring

Long-term monitoring of the gas and groundwater levels was made possible by the installation of

standpipes as follows:

Exploratory Hole	Standpipe Slotted Pipe and (Filter Zone) (m)
CP-BH101	4.00 to 5.50 (4.00 to 5.50)
CP-BH102	4.00 to 8.00 (4.00 to 8.44)
CP-BH103	1.00 to 3.00 (1.00 to 3.45)
RC-BH101	1.00 to 3.00 (1.00 to 3.00)
RC-BH102	3.00 to 12.00 (3.00 to 12.00)
RC-BH103	2.00 to 8.30 (2.00 to 8.30)
RC-BH104	3.00 to 15.00 (3.00 to 15.10)
RC-BH105	1.00 to 4.00 (1.00 to 4.00)
WS-BH102	1.00 to 2.28 (1.00 to 2.28)
WS-BH103	1.00 to 2.50 (1.00 to 2.50)
WS-BH104	0.50 to 2.00 (0.50 to 2.25)
WS-BH105	0.50 to 1.00 (0.50 to 1.00)
WS-BH106	0.50 to 1.50 (0.50 to 1.50)
WS-BH109	0.50 to 2.50 (0.50 to 2.50)
WS-BH110	2.00 to 4.00 (2.00 to 4.45)
WS-BH111	2.00 to 3.00 (2.00 to 3.45)

Monitoring of the gas and groundwater levels at the site were undertaken on the 17th June 2021.

On 17th June 2021, groundwater samples were obtained (where possible) following a purging of approximately three volumes of water in the standpipe.

In addition to the groundwater levels, the following parameters were measured and recorded in each standpipe using a GFM 435 Gas Analyser:-

- Concentrations (% Vol) of CH₄, O₂, CO₂, along with % LEL and ppm of H₂S, CO
- Flow Rate
- Differential Pressure
- Barometric Pressure
- Air Temperature

The results of the monitoring are presented in Appendix 8.

6.0 LABORATORY TESTING

6.1 Geotechnical

The laboratory testing schedule was formulated by Geotechnics Limited in order to relate to the proposed development. Unless otherwise stated, the tests were carried out in Geotechnics Limited's UKAS accredited Laboratory (Testing No. 1365) and were undertaken in accordance with the appropriate

Standards as indicated below and on the Laboratory Test Certificate in Appendix 9. Any descriptions, opinions and interpretations are outside the scope of UKAS accreditation.

The tests undertaken can be summarised as follows:-

ISRM Testing Methods

50 No. Point Load Determination

The following testing was carried out at the laboratories of Apex Testing Solutions Limited (UKAS Accredited Laboratory, Number 7771):

BS EN ISO 17892-1:2014

8 No. Water Content Determination

BS 1377:1990

Test No. Test Description

Part 2

4.3 & 5.3 8 No. Liquid and Plastic Limit Determination

9.2 & 9.3 5 No. Mechanical Analysis – Wet Sieving

9.4 2 No. Mechanical Analysis - Sedimentation

Part 4

3.3 4 No. Dry Density/Moisture Content relationship determination. Compaction Test - British Standard (2.5 kg Hammer)

The following testing was carried out at the laboratories of GEO Site & Testing Services Limited (UKAS Accredited Laboratory, Number 2788):

BS 1377:1990

Test No. Test Description

Part 2

9.2 & 9.3 2 No. Mechanical Analysis – Wet Sieving

Part 4

7 3 No. California Bearing Ratio (CBR) Measurement - recompacted

Part 5

3 3 No. One-Dimensional Consolidation Test

Part 7

8 5 No. Shear Strength Measurement -
 100mm diameter (Single Stage)
 Quick Undrained Triaxial
 Compression Test

The following testing was carried out at the laboratories of MATtest Limited (UKAS Accredited Laboratory, Number 2643):

ISRM Testing Methods

4 No. Unconfined Compressive
 Strength Determination

The results of these tests are also presented in Appendix 9.

The following testing was carried out at the laboratories of Soil Environment Services Limited (UKAS Accredited Laboratory, Number 10768):

2 No. Thermal Resistivity 6-point Dry Out
Curves

The results of these tests are also presented in Appendix 9.

The following testing was carried out at the laboratories of Derwentside Environmental Testing Services Limited (UKAS Accredited Laboratory, Number 2139):

BRE Special Digest I Suite

7.No. Suites comprising:-
 Soluble Sulphate
 Acid Soluble Sulphate
 Total Sulphur
 Soluble Magnesium
 Ammonium
 Nitrate
 Chloride
 pH

The results of these tests are presented with the contamination test results in Appendix 10.

6.2 Contamination

Selected samples of soil and groundwater were tested at the laboratories of Derwentside Environmental Testing Services Limited (DETS) for a number of determinands in order to check on potential site contamination. The determinands were selected by Geotechnics Limited and are detailed below and on the results sheets in Appendices 10 (soil chemical

laboratory data) and 11 (groundwater laboratory analytical data) together with the test result as well as the test method, accreditation and detection limit.

Soil

Soil samples were tested for the following determinands:-

Arsenic
Barium
Boron (Water Soluble)
Beryllium
Cadmium
Chromium
Chromium (Hexavalent - Calculated)
Copper
Lead
Mercury
Nickel
Selenium
Vanadium
Zinc

Ammonia as NH₄
Chloride
Cyanide (total)
Fluoride
pH
Sulphate
Sulphate (Water Soluble)

Sulphur

Organic Carbon
Phenols (Monohydric)
Polyaromatic Hydrocarbons (Speciated)
PCB (Speciated)
Petroleum Hydrocarbons (Speciated)
Semi-Volatile Organic Compounds (SVOC)
Volatile Organic Compounds (VOC)

Asbestos Screen

In addition, Waste Acceptance Criteria (WAC) analyses were carried out on selected samples including tests on solid waste and on eluates. The determinands tested for are detailed on the results sheets in Appendix 10.

Tests on solid waste

Acid Neutralising Capacity (ANC)
Loss on ignition
Total organic carbon
Mineral Oils
BTEX (Total)
PAH (Total)
PCB's
pH

Tests on Eluates (10:1)

Antimony
Arsenic
Barium
Cadmium
Chromium
Copper
Lead
Mercury
Molybdenum
Nickel
Selenium
Zinc
Phenol
Sulphate as SO₄
Chloride
Fluoride
Total Dissolved Solids
Dissolved Organic Carbon

Groundwater

Groundwater samples taken from the standpipes were tested for the following determinands:-

Arsenic
Barium
Boron
Beryllium
Cadmium
Calcium
Chromium
Copper
Lead
Mercury
Manganese
Nickel
Selenium
Vanadium
Zinc

pH
Dissolved Organic Carbon
Ammonical Nitrogen as N

Polyaromatic Hydrocarbons (Speciated)
Phenols (Monohydric)
Petroleum Hydrocarbons (Speciated)

The results are presented in Appendix II.

7.0 DESK STUDY

7.1 General

A desk study for the site has been undertaken by Geotechnics and the results presented and discussed in report "Preliminary Risk Assessment – Newport Quinn SDD RPF, Newport, Wales", Report Number PN214233 dated May 2021. A summary of the findings

is given in the following sections.

7.2 Geology

The majority of the site is underlain by Quaternary River Terrace Deposits comprising mostly sand and gravel deposits. A small area is underlain by Alluvium associated with a re-routed river channel. A thickness of Made Ground would be expected above the natural superficial deposits, associated with the existing development.

Bedrock geology is shown to be the Devonian St. Maughans Formation comprising interbedded mudstones and sandstones. The far southeast is shown to be underlain by Triassic Mercia Mudstone deposits.

7.3 Site History

The site was undeveloped until 1974 when electricity pylons are shown as being present. By 1999 the site is shown as being developed to a similar configuration as is present at the time of this study comprising five rectangular structures and two circular structures. Further extensions and roadways are present in 2009 and 2006 respectively.

7.4 Hydrology

The nearest off-site water feature is Nant-y-moor Reen, located 3 m to the west. From an examination of historical Ordnance survey maps the Reen was originally located on-site orientated approximately north-south flowing through the central area of the site, but the course appears to have been diverted when the site was developed in approximately 1999. There are two ponds located adjacent to the southern boundary which may slightly encroach across the southern site boundary.

7.5 Hydrogeology

The site is mostly underlain by Drift deposits comprising River Terrace Deposits which are classified as a Secondary A aquifer. There are small areas of Drift Alluvium associated with the former course of Nant-y-moor Reen which are also classified as a Secondary A aquifer. Bedrock deposits comprise Maughans Formation which are also classified as a Secondary A aquifer.

7.6 Unexploded Ordnance

The Zetica Bomb Risk Map website indicates the site

has a low risk for unexploded ordnance.

7.7 Environmental Issues

As part of the desk study, it was discovered that Natural Resources Wales had issued two warning letters to the former operators of the site in 2007 and 2010 relating to discharge of contaminants to surface water. It is considered that these letters related to petroleum hydrocarbons due to a poorly maintained oil/water separator associated with a vehicle washing area.

During the site walkover, inside structures located in the southwest of the site, suspected petroleum hydrocarbons were observed in drainage / access trenches. From discussions with site staff, the source of the potential petroleum hydrocarbons was reported to be due to poorly managed removal of plant and leakage of fluids during removal.

8.0 INTERPRETATION

8.1 Ground Conditions

On the basis of the expected geology discussed in Section 7.0 and the findings of the exploratory holes it has been possible to classify the various strata proved in the investigation into the following divisions:-

- Made Ground
- Clay
- Mudstone/Siltstone

8.1.1 Made Ground

Made Ground was encountered below the surface at each of the exploratory hole locations. This typically comprised a surface layer of concrete or asphalt/tarmac underlain by sand and gravel with some silt, cobbles, clinker, slag and brick fragments. In WS-BH110 the Made Ground included a layer of stiff slightly sandy slightly gravelly clay between 1.40m and 2.40m below ground level.

The depth to the base of the Made Ground at the exploratory hole locations ranged from 0.65m (CP-BH101) to 4.10m below ground level (RC-BH105). A number of the exploratory holes (CP-BH105, WS-BH101, WS-BH102, WS-BH107 and WS-BH108) were terminated in the Made Ground on encountering obstructions.

Standard Penetration Tests (SPT) carried out in the

Made Ground produced results ranging from N=5 to several tests that were terminated at 50 blows. Such results indicate the variability in relative density of these materials from loose to very dense. The cohesive Made Ground in WS-BH110 produced SPT results of N=21 and N=30, these results being indicative of high strength clay.

8.1.2 Clay

Below the Made Ground (where penetrated), the exploratory holes typically encountered clay deposits, the exception being at WS-BH111 where superficial deposits were absent. These clay deposits were reddish brown or grey mottled brown in colour and contained a proportion of sand and gravel. The clay deposits were typically firm and in some places stiff. However, in CP-BH102, RC-BH103 and WS-BH103 layers of soft/very soft clay with some pockets of organic matter (CP-BH102). In places (WS-BH105 and WS-BH106) a 0.40m thick band of silt was encountered within the clay deposits, the silt being soft or firm and again containing pockets of decomposed organic matter.

Standard Penetration Tests carried out in these clay deposits produced results ranging from N=6 to some tests that were terminated at 50 blows. The latter results are probably due to striking obstructions but the remainder of the results are indicative of clays with strengths ranging from low strength to very high strength.

Laboratory triaxial compression tests on five (5 No.) undisturbed samples of the clay produced results for the undrained shear strength ranging from 25kN/m² (low strength) to 135kN/m² (high strength), again showing the variability within these clay deposits.

Laboratory oedometer consolidation tests on three (3 No.) undisturbed samples of the clay deposits produced results for the coefficient of volume compressibility (m_v) ranging from 0.20 to 0.33m²/MN for the 100-200kN/m² pressure range. Such values are indicative of medium to high compressibility materials.

Laboratory Liquid and Plastic Limit tests typically show Plasticity Indices in the range 11 to 23. Such results fall into the 'Low' or 'Medium' classification for Volume Change Potential, based on NHBC Chapter 4.2. However, the sample tested from WS-BH103 from a depth of 2.40m below ground level produced a Plastic Index result of 51 which falls into the 'High' classification for Volume Change Potential.

8.1.3 Mudstone/Siltstone

Bedrock was encountered at depths ranging between 2.80m (CP-BH103) and 9.40m (WS-BH109) below ground level. This bedrock typically comprised extremely weak or very weak brownish red mudstone, occasionally interbedded with very weak grey siltstone. The bedrock was proved to a maximum depth of 15.10m below ground level.

Unconfined compressive strength tests carried out on four (4 No.) specimens of the bedrock in the laboratory produced results ranging from 0.271MPa to 4.16MPa. The lower result falls below the lowest strength term for rock and is more indicative of a stiff, high strength clay. The remaining results are indicative of very weak rock.

Point Load Strength tests carried out in the laboratory on numerous specimens of the bedrock produced results for the Point Load Index (Is_{50}) ranging from 0.011MN/m² to 1.270MN/m². The results are typically indicative of rocks having strengths ranging from extremely weak to weak.

8.2 Groundwater

Groundwater was encountered within Made Ground deposits in three exploratory holes, WS-BH104, WS-BH105 and RC-BH105 with strikes in WS-BH104 and WS-BH105 at 0.9 mbgl. In WS-BH105 the strike rose to 0.55 mbgl after 20 minutes. Groundwater in RC-BH105 was struck at 2.2 mbgl and did not rise. Groundwater was not encountered in Made Ground during progression in any other exploratory hole.

Groundwater was encountered within the Quaternary River Terrace Gravel Deposits in two exploratory holes, RC-BH103 and CP-BH102 with strikes at 2.63 mbgl rising to 2.00 mbgl and 5.60 mbgl with no rise, respectively.

Groundwater was encountered in the Devonian Maughans Formation at 9.00 mbgl rising to 4.53 mbgl in RC-BH104. In other exploratory holes, water observations with exploratory hole progression showed that some exploratory holes remained dry and in others, groundwater levels encountered in the Quaternary River Terrace Gravel deposits above remained approximately consistent during drilling into the Devonian Maughans Formation.

Groundwater gauging undertaken on the 16th June 2021 showed that groundwater was present in all monitoring wells, with the exception of WS-BH102 which was dry. Groundwater levels varied between

0.71 mbgl and 3.00 mbgl.

9.0 EVALUATION

9.1 Proposals

It is understood that proposals for the site include demolition and clearance of the existing buildings/hardstanding followed by the construction of a new data centre comprising two buildings with associated areas of access roadways, hardstanding and car parking. It is also understood that the proposed development will include areas of soft landscaping and three ponds.

The data centre buildings are expected to be of steel framed construction with lightweight cladding. The maximum anticipated structural loading at foundation level is understood to be 450kN and the maximum anticipated ground floor loading is 25kN/m². The building and ground floor slab are not expected to be particularly sensitive to settlement. It is understood that some minor retaining structures (1.20m high) will be required for the unloading docks.

The proposed finished floor levels for both buildings are understood to be 11.50m above OD. However, at the time of preparation of this report the Engineer was reviewing levels for the westernmost building. As a result of these proposed levels, a degree of cut and fill will be required, the primary cut area being towards the north-eastern corner of the site and primary fill area being towards the central part of the southern boundary.

9.2 Foundation Design Principles

In formulating proposals for foundation and floor slab design, the two primary controlling factors are soil strength and foundation settlement. In general it is the latter which is the primary determinand of what is perceived to be satisfactory performance. For clay soils, allowable bearing capacity is based on undrained shear strength, although a Factor of Safety of 3 is commonly adopted in order to ensure that the loading is on the sensibly linear component of the stress/strain curve for the soil.

With time, the clays will strengthen under the higher loadings as any excess pore water pressures dissipate. Hence, the worst case is at the time of initial loading and, for gradually applied or static loading, bearing capacity should progressively increase. For eccentric loading, where peak load is at an extremity of the foundation, this can be higher than the allowable load,

provided that the mean equivalent stress is within the allowable value.

For granular or essentially free draining soils the frictional characteristics and density will dominate bearing capacity and this is generally much higher than for clay soils. For normal spread foundations conventional design is typically based on the stress which would give rise to 25mm settlement. Actual settlements will depend upon the type, period, load intensity and width of the loaded area and the thickness and compressibility of the soils below.

A further issue for foundations is the degree of variability in the foundation soils. The adoption of a lower bearing pressure than strength criteria would indicate implicitly results in a larger foundation which is likely to behave more in line with average conditions and hence, for a given load, to result in less differential settlement.

9.3 Earthworks

The proposed finished ground and floor levels will require a degree of cut and fill to be carried out. Four (4 No.) samples of soil from exploratory holes in the 'cut' areas were tested in the laboratory. Three (3 No.) of the samples were of granular material and were tested for particle size distribution and moisture content/dry density relationship. The fourth sample was of cohesive material and was tested for moisture content, Atterberg Limits and moisture content/dry density relationship.

The particle size distributions of the granular materials were all seen to be well-graded and the percentage fines (smaller than 63µm) was low, ranging from 3% to 12%. The cohesive sample fell on the boundary between low and intermediate plasticity with a significant amount (42%) of granular material being retained on the 425µm sieve. For all samples tested, the natural moisture contents were close to (-1.4% to +2.8%) the optimum moisture contents determined from the compaction test curves.

The soil samples tested suggest that the 'cut' soils, although variable in nature could be suitable for re-use in 'fill' areas. However, controls will need to be in place to ensure adequate screening of the soils to ensure separation of different classes of materials. Care will also be needed to ensure that moisture contents remain close to optimum in order to ensure that materials are placed at or close to maximum dry density.

It should be noted that some soft medium/high

compressibility clays were encountered at depth in some of the exploratory holes. Raising ground levels above such materials will increase the overburden pressure on them and this is likely to result in some long-term consolidation settlement. Based on proposals available at the time of preparation of this report, a maximum 'fill' thickness of around 1.0m is anticipated. This would produce an increase in overburden pressure of the order of approximately 20kN/m². It is estimated that such an increase in stress on a 2m thick layer of the soft clay (e.g. CP-BH102) could result in consolidation settlements in the soft clay alone of the order of 20mm. It would therefore be advisable to leave final surfacing for as long as possible after the cut/fill operation to minimise any distress to the finished surface.

9.4 Foundation Solutions

The approach to design and selection of suitable foundation options for this site is based on a hierarchy of complexity and expense. If the simplest and cheapest solution case can be shown to be appropriate, then further discussion is considered superfluous. Where such simple and proven techniques are not expected to be suitable, then other options are examined in more detail. The following options have been considered:

- Traditional pad foundations at shallow depth.
- Traditional pad foundations, but using trench fill to transfer loads to soils at greater depths.
- Raft foundation to reduce the intensity of loading.
- Ground improvement prior to foundation construction.
- Piled solution, including selection of suitable pile types and preliminary calculation of carrying capacity.

9.4.1 Pad Foundations

The Made Ground does not form a suitable founding stratum due to its variable nature and thickness. With Made Ground present to depths of up to 4.10m, the use of traditional pad foundations is precluded.

9.4.2 Trench Fill Foundations

Consideration has been given to the use of concrete trench fill foundations taken through the Made Ground into the underlying clay. The underlying clay is typically firm and in some places stiff. However, some layers of soft/very soft clay were encountered

and these would result in long-term consolidation settlements of any foundations constructed above them. It has already been estimated that consolidation settlements from placed 'fill' materials could be of the order of 20mm. With the addition of structural loadings, it is estimated that this could increase to the order of 30mm, such order of settlement normally being considered unacceptable. In addition, with the depth to the firm clay strata being up to 4.10m (RC-BH105), the use of trench fill foundations is unlikely to be economically viable. Furthermore, deep open excavations are likely to suffer from instability and trench fill foundations are therefore likely to be precluded.

9.4.3 Raft Foundations

Consideration has been given to the use of a reinforced concrete raft foundations to reduce the intensity of loading on the Made Ground and underlying clay. However, with the variable thickness of Made Ground and the presence of some soft/very soft clay, there is a risk that unacceptable differential settlements could occur resulting in tilting of the rafts. Furthermore, due to the length of the proposed buildings, it is considered unlikely that raft foundations with adequate stiffness to mitigate the effects of potential settlements could be economically designed/constructed. The use of raft foundations therefore also appears to be precluded.

9.4.4 Ground Improvement

Consideration has been given to the use of the 'vibro' ground improvement process by which stone columns would be formed through the Made Ground and underlying clay to increase the load bearing capacity.

However, the success of the 'vibro' technique is generally considered to be marginal where very soft clays are present due to the limited lateral restraint provided to the stone columns by the clay. This can result in stone migrating into the adjacent clay when loaded, thus leading to settlement of the foundations. Very soft clay was encountered in borehole CP-BH102 and soft clays/silts were encountered elsewhere below the site. The successful use of the 'vibro' process on this site would therefore appear to be marginal.

9.4.5 Piled Foundations

With the variable nature and thickness of Made Ground and with the presence of some soft/very soft medium/high compressibility clays below this site, the most suitable foundation solution would appear to be

the adoption of piled foundations. Piles of either the driven or CFA bored type would be suited to the ground conditions. It is recommended that the specialist piling contractors are asked for advice on the suitability of their individual piling systems to these ground conditions. They should also be asked for their estimates of the pile size, length, load capacity relationship. For guidance purposes only, it is estimated that a 300mm diameter bored pile socketed 1.00m into the mudstone bedrock should be capable of supporting a safe working load of the order of 250kN. Higher working loads could be achieved by increasing the pile diameter or socket length.

As discussed in Section 9.3 above, the earthworks operation is expected to cause long-term consolidation settlement of the Made Ground and clay strata in some 'filled' parts of the site. Allowance should therefore be made in the pile design for negative skin friction on the upper part of the pile shaft in those areas of the site where 'fill' is to be placed.

It should be noted that this investigation has not included any investigation of the foundations to the existing buildings. Given the findings of the exploratory holes, it is anticipated that some of the existing buildings may also be supported on piled foundations. If that is the case, it may be possible to re-use these piles to provide support for the proposed buildings. Further investigation would be required, preferably following demolition and clearance of the existing buildings.

9.4.6 Seasonal Ground Movements

Tests on samples of clay from the boreholes have shown the clay to typically be of 'low' or 'medium' volume change potential. However, one of the samples tested was found to be in the 'high' classification for volume change potential. Clays can shrink and swell due to seasonal variations in moisture content or due to variations in moisture content caused by tree root systems. It is therefore recommended that foundations are designed to limit the effects of any seasonal ground movements, especially where any trees are present or have been removed within influencing distance of foundations. For piled foundations this could include sleeving the upper part of the pile shafts and providing compressible materials below any pile caps, ground beams or suspended floor slabs. Guidance on suitable precautions is provided in NHBC Chapter 4.2 'Building near trees'.

9.5 Ground Floor Slab

With the depth of Made Ground and presence of some soft/very soft clays beneath, the adoption of a normal ground floor slab construction is precluded due to the risk of unacceptable settlements developing. It is therefore recommended that a fully suspended ground floor slab construction is adopted with all loads carried on the main structural foundations.

9.6 Retaining Walls

It is understood that some minor retaining structures (1.20m high) will be required for the unloading docks. On the building line, it is anticipated that these walls will be supported on the main structural foundations. It is therefore recommended that similar foundations are used to support the retaining walls as they run away from the buildings, in order to provide uniform support and minimise the risk of differential movements occurring. Testing on samples from the site has shown the granular Made Ground likely to be retained to be well-graded with a low fines (<63µm) content. *British Standard BS8002:2015 Code of Practice for Earth Retaining Structures* provides suggested values for characteristic weight density (γ_k) and methods of estimating the critical state angle of shearing resistance ($\phi'_{cv,k}$). Based on the findings of the exploratory holes and laboratory test results, the following values are suggested for retaining wall design purposes:

$$\begin{aligned}\gamma_k &= 18 \text{ kN/m}^2 \\ \phi'_{cv,k} &= 36^\circ\end{aligned}$$

9.7 Concrete

Testing on samples from the site has shown the characteristic water soluble sulphate concentration to lie within Design Sulphate Class DS-I of BRE Special Digest 1 'Concrete in Aggressive Ground' (2003). The characteristic pH value is 6.98, the site is considered 'brownfield' and groundwater is considered to be mobile. Testing has not indicated the presence of pyrites. The ACEC Class for the site is therefore AC-I and only concrete meeting the requirements of this classification should be used for sub-surface work on this site.

9.8 Excavatability

The soils encountered in the boreholes would generally be considered 'easy digging' for normal backhoe excavation plant. However, it should be noted that some buried obstructions were

encountered within the boreholes and substructure remains will likely be present following demolition and clearance of the existing buildings. Allowance should therefore be made for removing such concrete or other buried obstructions using hydraulic breakers where necessary.

Shallow excavations (less than 1.20m) will likely remain relatively stable in the short-term although some local spalling may occur. Where such excavations are left open for longer periods, it is recommended that the sides are battered back to slopes no steeper than 1 (vertical) to 2 (horizontal). Alternatively, and for deeper excavations, support should be provided using close boarding or trench sheets with appropriately spaced walings and props.

The exploratory holes have shown the presence of perched groundwater within the Made Ground and monitoring has shown this to produce standing water levels at relatively shallow depths. As a result, groundwater inflows are likely to be encountered in excavations with accumulations occurring where such excavations are left open. The rate of water inflow will be dependent on the percentage of fine material present within the soils and this appears to vary across the site. Where the rate of inflow is relatively low, it is anticipated that the inflows can be dealt with by simple filtered pumping from sumps. Where higher rates of inflow are encountered, more specialist dewatering methods, such as well-point dewatering may be necessary.

9.9 Pavement Design

The conditions prevailing at the time of construction will affect the CBR of the subgrade soil and its strength. Research has shown the importance of the equilibrium moisture content of the subgrade. The relationship between soil suction and the moisture content shows that a soil that becomes wet during construction will retain water and will therefore be weaker under the pavement in the equilibrium condition than a foundation that has remained dry, particularly for soils of low to medium plasticity.

Equilibrium CBR values for various materials for poor and good construction conditions are given in a report by the TRRL (Report 1132) and in Interim Advice Note 73/06 "Design Guidance for Road Pavement Foundations (Draft HD25)" produced by the Highways Agency. The Made Ground materials likely to be exposed at formation level typically comprise sand and gravel with some silt, cobbles, clinker, slag and brick fragments. For sands and gravels an equilibrium CBR in excess of 20% is

indicated.

CBR values measured in the laboratory on three (3 No.) recompacted samples of soil from the site ranged from 40% to 50%. Without the benefit of in situ CBR test results on the actual formation surface, it is recommended that a cautious approach to pavement design is taken using a design CBR value of 20%. All formations should be assumed to be frost susceptible.

9.10 Further Investigation

The investigation fieldwork was carried out with the former Quinn Radiator factory buildings still present and as a result, large parts of the site were inaccessible for the drilling rigs. It is therefore recommended that a further phase of investigation is carried out following demolition and clearance of the existing buildings and hardstanding. The investigation should provide coverage of those areas of the site where information is currently sparse as well as more detailed information on the foundations to the former factory buildings, if re-use of these is to be considered.

10.0 ENVIRONMENTAL ASSESSMENT

10.1 Legal Framework

This report follows the principles and methodology outlined in [Land Contamination Risk Management \(LCRM\)](#) and BS10175:2011+A2:2017 which are currently determined as UK best practice. The primary issues of concern are Risks to Human Health, for which the regulator is generally the Local Authority and Risks to Controlled Waters for which the appropriate consultee is Natural Resources Wales. Reference should also be made to the Environmental Notes in Appendix 16 to place the discussion in context.

10.2 Proposed Site Use

It is proposed to develop the site as a data storage centre. Hence, for the purposes of this report, the contamination risk assessment in respect of human health is considered in the context of a proposed site use of commercial / industrial.

10.3 Conceptual Model

The Conceptual Model (CM) is a representation of the current understanding of the site and the

surrounding environment. This includes an understanding of the geology, groundwater, surface water bodies and potential contamination processes acting on substances present and migration pathways. It also takes into account all identified potential pollutant linkages using a source-pathway-receptor approach, based on the proposed use of the site. Where any element of the source-pathway-receptor linkage is absent, there is considered to be no or negligible risk.

The following potential site specific Source-Pathway-Receptor Linkages were identified in the Desk Study Geotechnics PN214233 Newport Quinn SDD RFP Desk Study, May 2021. These formed the basis of the site specific Conceptual Model and the proposed investigation and analytical testing in line with current guidance:

- Contaminated soil / groundwater → Ingestion, inhalation and dermal contact → Humans using the site during construction
- Contaminated soil / groundwater → Ingestion, inhalation and dermal contact → Humans using the site following development
- Contaminated soil / groundwater → Downward / lateral migration → Secondary aquifer / surface water
- Contaminated soil / groundwater → Direct contact → Buildings and structures

The potential presence of a linkage should not be taken to indicate its actual presence or significance which can only be confirmed through site investigation and analysis. This preliminary model is of necessity generalised and local variations may exist which have not been taken into account by the model.

A diagrammatic and tabulated representation of the CM created from these potential linkages was presented in section 8 of the Desk Study.

10.4 Soil Testing

The analytical results obtained during this investigation are presented in Appendix 10.

Based on a combination of observations made during the site reconnaissance visit, the history of the site and observations made during field work, the site has been divided into 2 Zones. A description of these

zones is presented below:

- Zone 1: Southwest – Made Ground and Natural Ground
- Zone 2: Remainder of the site

Zone 1

Potential petroleum hydrocarbons were observed in drainage / service trenches following badly managed removal of plant. There is the potential for infiltration of petroleum hydrocarbons into shallow Made Ground, including any perched groundwater or light non-aqueous phase liquids (LNAPL) present at the interface between granular Made Ground and underlying cohesive deposits. Any petroleum hydrocarbons, if present, may also have the potential to impact the underlying natural soils and groundwater in the underlying Aquifers. This Zone comprises the following exploratory holes: WS-BH110, CP-BH102, WS-BH111, WS-BH109 and RC-BH103

Zone 2

No significant areas warranting specific attention were identified across the remainder of the site, with only relatively low hazard potential sources identified including paint storage tanks and other storage vessels. Any exceedances of generic screening values in soil and groundwater will be assessed as required.

Due to the relatively low number of samples (< 10 No.), statistical analysis is deemed unsuitable for each of the zones under current guidance and results will be compared directly with current guideline values.

The soil results show the following for each Zone is discussed below, and a summary can be found in Appendix 12.

Discussion of Zone 1 Soil Samples

- Metals: No heavy metals exceeded any generic assessment criteria (GAC) for a commercial end-use. The only exception to this is calculated concentrations of hexavalent chromium based on equilibrium of chrome (III) and chrome (VI) in an oxidising environment where speciation is sensitive to pH. In areas of higher pH, assumed to be due to pH buffering from the dissolution of lime, the GAC for chrome (VI) (35 mg/kg) is slightly exceeded in three samples of Made Ground. These samples do show relatively high concentrations of total chromium (between 280 mg/kg and 1,600 mg/kg) and these relatively high concentrations may be due to be observed

presence of slag in some Made Ground deposits. Slag can also be a source of lime, contributing to elevating the pH in these soils.

- Organics: No organic contaminants exceeded the relevant GAC. All VOCs and SVOCs were not detected above the laboratory limit of detection.
- Other inorganics: No other inorganic contaminant exceeded the relevant GAC
- Mineralogical Contaminants: All samples were negative for the presence of asbestos.
- Evidence for Potential LNAPL: During progression of exploratory holes and groundwater sampling there was no visual or olfactory evidence for the presence of LNAPL either associated with perched groundwater in Made Ground, within deeper groundwater in natural deposits. No potential LNAPL was encountered at the interface between granular Made Ground deposits or sorbed to soils. Laboratory analysis of soils has also shown that very low concentrations of TPH are present in a minority of samples, with most Made Ground and all natural ground samples showing TPH concentrations less than the laboratory limit of detection.

Discussion of Zone 2 Soil Samples

- Metals: No heavy metals exceeded any generic assessment criteria (GAC) for a commercial end-use.
- Organics: No organic contaminants exceeded the relevant GAC. All VOCs and SVOCs were not detected above the laboratory limit of detection.
- Other inorganics: No other inorganic contaminant exceeded the relevant GAC
- Mineralogical Contaminants: All samples were negative for the presence of asbestos.

10.5 Soil Phytotoxic Risks

Concentrations of the phytotoxic metals copper, nickel, lead, cadmium, mercury and zinc nickel have been recorded in Made Ground in excess of the guideline values for the protection of plants as

presented in the [Defra Sewage Sludge Code of Practice](#). The results of the phytotoxic screening are presented in the tables below.

Determinand	No of samples	GAC (mg/kg)	Results Exceeding GAC (mg/kg)	Exceeds GAC (Y/N)
Arsenic	19	All pH - 50	-	N
Copper	19	pH>7 - 200	-	N
Cadmium	19	All pH - 3	Made ground - 4.3 and 6.1	Y
Chromium	19	All pH - 400	Made Ground - 1,600 and 480	Y
Nickel	6	pH>7 - 110	-	N
Mercury	6	All pH - 1	-	N
Lead		All pH - 300	-	N
Zinc	6	pH>7 - 300	-	Y
Selenium	6	All pH - 3	Made Ground - 7.3 Natural - 4	Y

Within the Made Ground, and in the case of one sample from Natural ground for selenium, cadmium, chromium and selenium are marginally elevated when compared to the relevant GAC. This is based on very limited number of samples from 19 soil samples in total exceeding the relevant GAC. Geotechnics Limited considers that a limited number of locations with a marginally elevated concentration is not significant. Detriment to plant life is difficult to quantify as many of the GACs are based on agricultural crop yields rather than serious harm of death of a species. As the vegetation present on site appears to be in good condition, and the proposed development is unlikely to include significant areas of landscaping Geotechnics Limited do not consider any additional consideration is required with regards to risk to plants.

10.6 Hydrogeological Interpretation

Observations during progression of exploratory holes and during post-monitoring well installation have shown that groundwater at the site shows that groundwater occurs both as perched groundwater within Made Ground, as well as groundwater in the deeper natural deposits. The table below shows a summary of strata where monitoring wells are installed and the resting groundwater level (mOD).

Exploratory Hole	Reduced groundwater level (mOD)
Made Ground	
WS-BH104	8.19
WS-BH105	9.43
WS-BH106	8.94

WS-BH109	9.62
WS-BH110	8.11
WS-BH111	7.92
RC-BH105	8.84
WS-BH102	Dry
WS-BH103	7.76
CP-BH103	9.27
RC-BH101	7.64
Drift	
CP-BH101	7.65
CP-BH102	7.28
Bedrock	
RC-BH103	7.78
RC-BH104	8.36
RC-BH102	7.74

General groundwater observations show that groundwater was encountered within Made Ground deposits in three exploratory holes, WS-BH104, WS-BH105 and RC-BH105 with strikes in WS-BH104 and WS-BH105 at 0.90 mbgl. In WS-BH105 the strike rose to 0.55 mbgl after 20 minutes. Groundwater in RC-BH105 was struck at 2.20 mbgl and did not rise. Groundwater was not encountered in Made Ground during progression in any other exploratory hole.

Cross sections showing water strikes are presented in Appendix 13.

Groundwater was encountered within the Quaternary River Terrace Gravel Deposits in two exploratory holes, RC-BH103 and CP-BH102 with strikes at 2.63 mbgl rising to 2.00 mbgl and 5.60 mbgl with no rise respectively.

Groundwater was encountered in the Devonian Maughans Formation at 9.00 mbgl rising to 4.53 mbgl in RC-BH104. In other exploratory holes, water observations with exploratory hole progression showed that some exploratory holes remained dry and in others, groundwater levels encountered in the Quaternary River Terrace Gravel deposits above remained approximately consistent during drilling into the Devonian Maughans Formation.

Groundwater levels during monitoring show the following:

- Groundwater levels in Drift and Bedrock deposits are probably in hydraulic continuity, with the majority of groundwater levels being at depths of between 7.28 mOD and 7.78 mOD across the site, with a head difference of only 0.50 m across the site. It is uncertain what is causing the relatively high groundwater level in RC-BH104, and

groundwater was struck at 6.36 mOD during drilling.

- Groundwater levels in Made Ground monitoring wells show a wide variety of groundwater levels with levels varying between 7.64 mOD and 9.62 mOD. The wide range in levels demonstrates that groundwater in Made Ground deposits is not in lateral continuity. The majority of groundwater in Made Ground is also not in vertical continuity with the underlying aquifers, although in places, the level of groundwater within the underlying aquifers is within Made Ground deposits. However, the cohesive clay deposits which typically underlay the Made Ground will generally inhibit downward migration.

10.7 Water Results Summary

The summary of the analytical results obtained from sampling during this investigation are presented in Appendix 14.

Groundwater samples have been screened against Environmental Quality Standards (EQS), which are appropriate for the protection of surface water receptors. No groundwater abstractions occur in the vicinity of the site, and base flow to surface water courses is the most appropriate receptor to consider.

Exceedances of initial EQS GACs were encountered in both perched water in Made Ground and deeper groundwater for the following contaminants:

- Copper (maximum concentration of 3.2 µg/l compared to the unadjusted EQS of 1 µg/l)
- Manganese (maximum concentration of 3,000 µg/l compared to the unadjusted EQS of 123 µg/l)
- Mercury (maximum concentration of 0.34 µg/l compared to the unadjusted EQS of 0.07 µg/l), with the EQS exceeded on only one Made Ground sample
- Nickel (maximum concentration of 7.4 µg/l compared to the unadjusted EQS of 4 µg/l), with EQS exceedances in one Made Ground and two Natural ground samples
- Selenium (maximum concentration of 15 µg/l compared to the EQS of 10 µg/l), with one EQS exceedance in both Made Ground and Natural ground
- Fluoranthene (maximum concentration of 0.06 µg/l compared to the EQS of 0.0063 µg/l NB Laboratory limit of detection is 0.01 µg/l)

with three exceedances in Made Ground and one in Natural ground

- Benzo(b)fluoranthene (maximum concentration of 0.04 µg/l compared to the EQS of 0.00017 µg/l NB Laboratory limit of detection is 0.01 µg/l) with two exceedances in Made Ground
- Benzo(a)pyrene (maximum concentration of 0.01 µg/l compared to the EQS of 0.00017 µg/l NB Laboratory limit of detection is 0.01 µg/l) with one exceedance in Made Ground
- TPH (only Aliphatic >C21-C35 in one sample) (concentration of 24 µg/l compared to EQS of 10 µg/l) with one exceedance in Natural ground.

The majority of EQS exceedances show concentrations marginally above the EQS and exceedances are not shown across the whole site. For heavy metals there is no discernible difference between concentrations in perched groundwater in Made Ground and deeper groundwater in Natural deposits. The concentrations present are considered to be typical of regional background concentrations.

Where the exceedances are relatively large, mostly demonstrated for manganese in isolated areas in both Made Ground and Natural ground, these concentrations are likely to result from natural processes from the reduction of manganese bearing minerals both in natural groundwater and perched groundwater. No potential sources of manganese have been identified.

EQS values allocated to some PAH compounds are typically several orders of magnitude lower than commercial laboratories can achieve. Where detected, the concentrations are likely to exceed EQS values, but the concentrations present are generally considered to be very low. In addition, the concentrations recorded are likely to be due to the inclusion of colloids and particulate matter into the sample, artificially elevating apparent dissolved concentrations.

Use of the metal bioavailability assessment tool (M-BAT) for copper, nickel, zinc and manganese showed that based on other water chemistry parameters (dissolved organic carbon, pH and concentration of calcium), these metals were less bioavailable and higher GACs were calculated, although exceedances still occurred. However, this further demonstrates that risks to controlled water are low. The output of the M-BAT are shown in Appendix 15.

There is no evidence of gross impact of perched groundwater or natural groundwater from petroleum

hydrocarbons and no separate phase petroleum hydrocarbons were observed during monitoring and/or purging of groundwater prior to sampling.

No VOC or SVOC compounds were detected above the laboratory limit of detection.

I0.8 Gas Results Summary

The gas monitoring results obtained during these investigations are presented in Appendix 8. The gas results from the monitoring undertaken confirm the CM from the desk study that there is no significant sources of ground gas.

I0.9 Risk Assessment

Potential risks to construction workers and future uses of the site were identified in the Desk Study. The findings of the assessment have shown that the only potential concern is from the presence of hexavalent chrome in localised areas of Made Ground, probably related to the presence of slag. Potential risks to construction workers will be mitigated by the appropriate use of personal protective equipment and standard construction hygiene standards.

Following development, even if the Made Ground with hexavalent chromium GAC exceedances remains in-situ, the presence of buildings and hardstanding will break the pathway for exposure to future site users.

Assessment of contaminants in groundwater has not shown any gross levels of contaminants to be present. No visual, olfactory of chemical indications of gross petroleum hydrocarbon impact has been encountered in any soil or groundwater samples. Any potential sources of petroleum hydrocarbons in the southwest of the site in trenches within structures has therefore not impacted the soils and groundwater beneath.

Groundwater observations have shown that groundwater in Made Ground and natural deposits has shown that there is limited hydraulic continuity between perched groundwater in Made Ground and deeper groundwater in aquifers.

Concentrations of heavy metals in groundwater shown a similar distribution within Made Ground and natural deposits. This suggests that these concentrations are typical of regional contaminant concentrations, including from localised biogeochemical processes. The use of M-BAT shows that site specific screening values taking into account

hardness, calcium, pH and dissolved organic carbon for groundwater discharging into surface water courses would be higher than the conservative first pass values. Furthermore, the influent groundwater would be diluted by flow in surface water courses. Groundwater in Made Ground has been shown to have limited vertical and lateral hydraulic continuity so it is unlikely to migrate significantly to surface water courses.

Concentrations of organic contaminants shows localised and marginal exceedances of EQS values. Where detectable concentrations were recorded the values were only slightly above the laboratory limit of detection. All VOC and SVOC compounds were not detected above the laboratory limit of detection.

No significant ground gas sources were identified in the Desk Study. Confirmatory ground gas monitoring has confirmed this and no measures are required for ground gas protection measures in any proposed structures.

10.10 Waste Characterisation and Classification

If there is a portion of excess soil this will then have to be sent to a suitable landfill site. A two phase approach is required which comprises:

- Waste Characterisation; and
- Waste Classification (Waste Acceptance Criteria).

Waste Characterisation

The results of the total concentrations from the chemical testing on soil samples have been assessed to determine whether or not they are hazardous in terms of waste classification. The results of this assessment indicate Made Ground from CP-BH102 at 0.5m and Made Ground at WS-BH108 at 1.0m are hazardous due to the concentration of chromium. All of the other materials encountered during the investigation are classified as non-hazardous.

Hazardous material that is excavated will need to be removed from site. In accordance with the Waste Regulations, pre-treatment of hazardous materials is required prior to disposal. Due to the limited size of the site it is recommended that hazardous material be taken to a soil treatment centre for pre-treatment where the soils hazardous properties may be reduced. The site must register as a producer of Hazardous Waste with Natural Resources Wales and appropriate Duty of Care Waste Transfer procedures

followed.

Waste Classification

All other Made Ground material on site is therefore likely to be classified as either inert or non-hazardous. As an alternative location for off-site disposal of inert and non-hazardous waste, there are a number of sites which have Environmental Permits for site Reclamation and can accept certain categories of inert and non-hazardous wastes.

WAC analysis has shown that non-hazardous soils are suitable for disposal at waste facilities licensed to accept Inert Waste.

Note that the above assessment should only be seen as an initial guide. Defining the class of waste is carried out on the actual waste being disposed of and the destination landfill site will have the final decision on acceptability of the waste. Therefore, it is recommended that if soils are to be removed from the site, the appointed contractor should approach a landfill site with the available chemical data and seek a formal waste characterisation.

Testing Frequency

There are also set requirements for the required sampling and testing frequencies for materials being sent for disposal at landfills. The required testing frequencies for each different waste type are summarised below.

Testing Level	Quantity of Waste	Number of Samples	
		Homogeneous	Heterogeneous & New Wastes
Level 1 Characterisation (Description, Total Concentrations & Leaching)	<100T	2	5
	<500T	3	8
	<1000T	5	14
	10,000 T	11	22
Level 2 Compliance For Regularly Generated Wastes (Total Concentrations & Leaching)	Per additional 10,000T	+5 pro rata	+10 pro rata
Level 3 Verification Delivery document & visual check Chemical testing as per Level 2 suite		1 per defined waste sub-population per year	3 per defined waste sub-population per year
		Visual – Each Load	Visual – Each Load
		1 per year per waste stream	3 per year per waste stream

Materials Management and Reuse of Arisings On-site

When soil is excavated it is technically a waste and it is the responsibility of the holder of a material to form their own view on whether or not it is waste. This includes determining when waste that has been

treated in some way can cease to be classed as waste for a particular purpose. Soils can only be re-used if it fulfils the following requirements:

- There is a planned use for the material;
- There is planning permission for the proposed re-use;
- The material when re-used will not be a risk to flora, fauna or controlled waters;
- Appropriate procedures are followed to demonstrate the above criteria are met and the re-use of materials is recorded in a systematic way and appropriate permissions/permits are gained and relevant procedures followed.

As soil is technically a waste when it has been excavated, it cannot be re-used on site unless one of the following four procedures are implemented:

- the procedures are followed in the CL:AIRE Code of Practice 'The Definition of Waste: Development Industry Code of Practice' Version 2 (2011). If these procedures are followed, excavated arisings can be re-used without them being defined as waste "where it is certain that the material will be used for the purposes of construction in its natural state on the site from which it was excavated." or;
- the site registers a waste exemption with Natural Resources Wales in accordance with The Environmental Permitting (England and Wales) Regulations 2016 (as amended) so the material can be placed without an Environmental Permit (note that the rules for permit exemptions have been changed and the maximum quantity covered by a permit exemption for re-using soil is 1,000 T), or;
- the site applies for a full Environmental Permit (either a standard rules permit or a bespoke permit) from the Environment Agency under the Environmental Permitting (England and Wales) Regulations 2016 (as amended); or
- WRAP 'Quality Protocol: Aggregates from inert waste.' Only granular aggregates (e.g. Class 1 or Class 6 materials etc. apply, Class 2 materials are not covered by the WRAP Protocol).

The length of time taken for the above regimes also needs to be considered:

- CL:AIRE Code of Practice (CoP) takes

between 7 and 28 days to gain approval and fees of £40.00 plus £0.01 per m³ of soil used is payable to CL:AIRE;

- An Environmental Permit exemption typically takes up to 7 days to gain approval and there are no fees due;
- Allow a minimum of 12 weeks to develop a Waste Recovery Plan and gain approval or the Environmental Permit from Natural Resources Wales and there are significant costs preparing an application and for the fees payable to Natural Resources Wales (typically in excess of £7,000) for the permit.
- There are no fees to pay for the WRAP Aggregates protocol and there are no notice periods or statutory liaison required.

Given the size and extent of the likely redevelopment it is recommended that the developer applies for an Environmental Permit exemption.

10.11 Conclusions and Recommendations

There are no significant geoenvironmental risks present at the site. Prior to the intrusive investigation, the main area of concern was the presence of separate phase petroleum hydrocarbons due to infiltration of petroleum hydrocarbons through service / draining trenches. However, no evidence of any significant petroleum hydrocarbon impact has been encountered.

No further investigation of geoenvironmental risk is required.

It is recommended that one round of confirmatory groundwater sampling should be undertaken during any subsequent geotechnical investigation. This sampling should be undertaken using the low-flow

purging and sampling technique ('micropurging'), as this will minimise the incorporation of colloids and particulate matter into the sample which may then be digested at the laboratory and reported as part of the apparent dissolved phase concentrations. Using this technique will result in a more accurate assessment of actual dissolved phase heavy metals and organic contaminants.

Signed for and on behalf of Geotechnics Limited.

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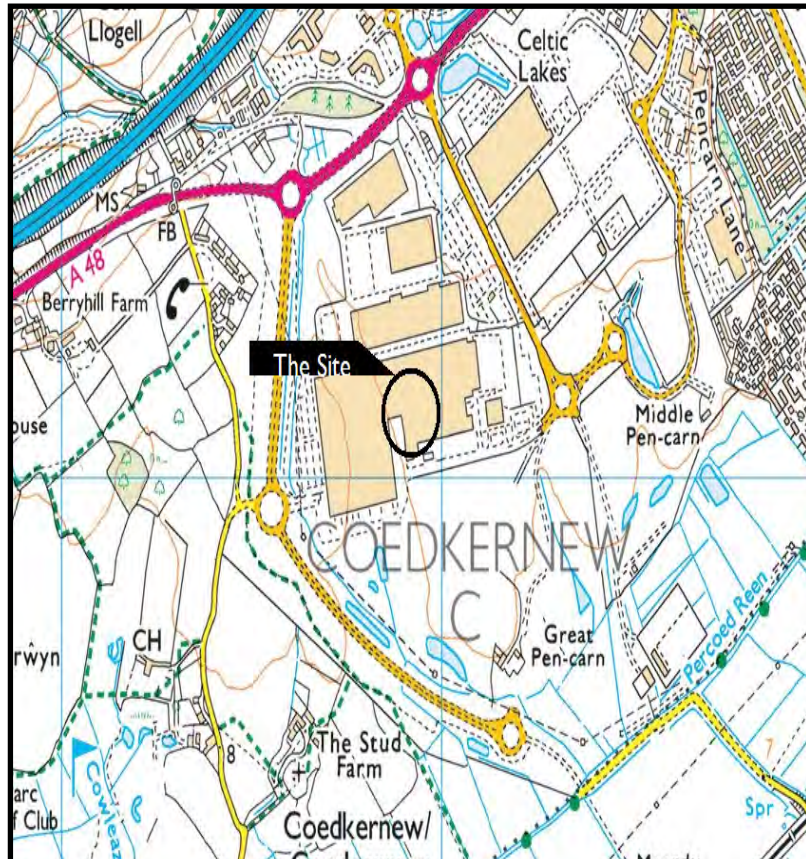
APPENDIX I

The Brief

APPENDIX 2

Site Location Plan

SITE LOCATION PLAN



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Ground Investigation
at Former Quinn Radiator Factory
Newport, Wales, NP10 8FS
for
Pinnacle Consulting Engineers Limited

GEOTECHNICS
geotechnical and geoenvironmental specialists

APPENDIX 3

Borehole Records

BOREHOLE RECORD - Cable Percussion

Preliminary

Project **NEWPORT QUINN SDD RFP** Engineer **PINNACLE CONSULTING ENGINEERS LIMITED** Borehole Project No **CP-BH101**
 Client **PINNACLE CONSULTING ENGINEERS LIMITED** National Grid Coordinates **327897.3 E 183971.2 N** Ground Level **9.65 m OD**


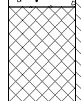
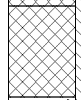

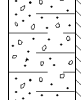


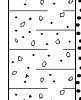

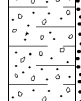

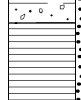


Sampling			Properties			Strata			Scale 1:50					
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD					
						MADE GROUND: Grey concrete	G.L.		9.65					
0.30	ES		PID=1.3			MADE GROUND: Dark brownish grey and black very sandy slightly silty subangular to subrounded fine to coarse gravel of slag, brick fragments and sandstone.	0.18		9.47					
0.30														
0.50- 0.65	B		PID=2.0				0.65		9.00					
0.50	ES													
0.80	D		PID=1.8			Firm brown mottled grey reddish brown slightly sandy slightly gravelly CLAY with a low subangular cobble content of sandstone. Gravel is subangular to subrounded fine to coarse of sandstone. Occasional pockets (<20mm) of yellowish brown and orangish brown fine to medium sand.								
1.00	ES													
1.00														
1.20- 1.70	B	(DRY)			C10									
1.20- 1.65														
1.80	D													
2.00- 2.40	B	(DRY)			C10									
2.00- 2.45														
2.50- 3.00	B					Firm grey mottled reddish brown and yellowish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of sandstone. Slight organic/peaty odour and occasional pockets of decomposed organic material up to 2mm. Between 3.00-3.45m, low strength.	2.40		7.25					
3.00- 3.45	UT46		PID=1.9											
3.00														
3.45- 3.50	D													
3.80	D													
4.00- 4.50	B	(DRY)			S11	Firm light grey mottled grey slightly sandy slightly gravelly CLAY with occasional pockets of decomposed organic material up to 2mm. Gravel is subangular to rounded fine to coarse of sandstone. Slight organic odour.	4.00		5.65					
4.00- 4.45	D		PID=1.3											
4.20														
4.80	D													
5.00- 5.45	UT85					Between 5.00-5.45m, low strength.								
5.45- 5.50	D					Extremely weak reddish brown MUDSTONE.	5.30		4.35					
							5.50		4.15					
						End of Borehole								
Boring						Progress			Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.18	0.35	Concrete Core	PO/SW	G.L.		DRY	27/05/21	08:00						None encountered.
1.20	0.35	Inspection Pit	PO/SW	5.50		DRY	27/05/21	18:00						
5.50	0.20	Cable Percussion	PO/SW											
Remarks														
AGS Inspection pit hand excavated to 1.20m depth and no services were found. ES sample = 1 x vial, 1 x plastic jar and 1 amber jar. The Borehole was terminated at 5.50m depth upon encountering bedrock. A 50mm standpipe was installed to 5.50m with a geowrapped slotted section from 4.00m to 5.50m with flush lockable protective cover. Backfill details from base of hole: fine gravel filter up to 4.00m, bentonite seal up to 0.20m, concrete up to ground level.														
Symbols and abbreviations are explained on the accompanying key sheet.														
All dimensions are in metres.														
Logged in accordance with BS5930:2015 + A1:2020														
Logged by EPS														
Figure 1 of 1 09/07/2021														
geotechnics														

BOREHOLE RECORD - Cable Percussion


Preliminary

Project NEWPORT QUINN SDD RFP Engineer PINNACLE CONSULTING ENGINEERS LIMITED Borehole Project No CP-BH102 PN214233

Client PINNACLE CONSULTING ENGINEERS LIMITED National Grid Coordinates 327806.2 E 183913.5 N Ground Level 10.28 m OD

Sampling			Properties			Strata	Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
0.20 0.35 0.50- 1.00 0.50 0.50	ES B ES		PID=2.2			MADE GROUND: Grey Concrete.	G.I.		10.28
1.00 1.00 1.20- 1.65	ES (DRY)		PID=5.1		C30	MADE GROUND: Dark brown and black slightly silty very sandy angular to subrounded fine to coarse gravel of sandstone. Low subangular cobble content of slag.	0.35		9.93
1.60- 2.00	B		PID=2.4			MADE GROUND: Dense light brown slightly silty sandy subangular to rounded fine to coarse gravel of sandstone. Low subrounded cobble content of sandstone.	1.00		9.28
2.00 2.00- 2.45 2.20 2.20- 2.80 2.20	D (DRY) ES ES		PID=1.7		C9	Firm reddish brown slightly sandy slightly gravelly CLAY with a medium subangular to subrounded cobble content of sandstone. Gravel is subangular to subrounded fine to coarse of sandstone. At 1.60m, geotextile layer.	1.60		8.68
3.00- 3.50 3.00 3.00- 3.45	B D (DRY)				C10				
3.60	D								
4.00- 4.50 4.00- 4.45	B (DRY)				C11				
4.80 5.00- 5.45	D (DRY)				C14	Below 4.80m, frequent pockets of grey and yellow fine to medium sand.			
5.60- 6.00	B					Very soft grey mottled brown slightly sandy slightly gravelly CLAY with occasional pockets of decomposed organic matter (up to 4mm). Gravel is subangular fine of sandstone.	5.60		4.68
6.20 6.50- 6.95	D UT21					Between 6.50-6.95m, low strength.			
6.95- 7.00 7.00- 7.40	D B								
7.50 7.60- 8.00	D B					Extremely weak reddish brown MUDSTONE (recovered as reddish brown slightly clayey sandy gravel).	7.60		2.68
8.00- 8.44	D	(YES)			S50/ 290				
						End of Borehole	8.44		1.84

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.35	0.35	Concrete Core	PO/SW	G.I.	1.20		24/05/21	13:30	5.60	4.50			6.00	Seepage, no rise.
1.20	0.30	Inspection Pit	PO/SW	1.20	1.20	Dry	24/05/21	17:00						
8.44	0.20	Cable Percussion	PO/SW	1.20	1.20	Dry	25/05/21	08:00						
				8.44	7.50		25/05/21	15:00						

Remarks  Inspection pit hand excavated to 1.20m depth and no services were found.
 ES sample = 1 x vial, 1 x plastic jar and 1 amber jar.
 The Borehole was terminated at 8.44m depth upon encountering bedrock.
 A 50mm standpipe was installed to 8.00m with a slotted section from 4.00m to 8.00m with flush lockable protective cover. Backfill details from base of hole: fine gravel filter up to 4.00m, bentonite seal up to 0.20m, concrete up to ground level.


Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Logged by EPS


Figure 1 of 1
09/07/2021





BOREHOLE RECORD - Cable Percussion

Preliminary

Project **NEWPORT QUINN SDD RFP** Engineer **PINNACLE CONSULTING ENGINEERS LIMITED** Borehole Project No **CP-BH105**
 Client **PINNACLE CONSULTING ENGINEERS LIMITED** National Grid Coordinates **327938.0 E 184231.7 N** Ground Level **10.80 m OD**

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %		Description	Depth	Legend	Level m OD	
0.10	ES B ES		PID=2.9			MADE GROUND: Concrete.	G.L.		10.80	
0.30						0.10	10.70			
0.50-0.65										
0.50										
0.65			PID=1.9			End of Borehole	0.65		10.15	

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.10	0.35	Concrete Core	PO/SW	G.I.			26/05/21	13:00						None encountered.
0.65	0.40	Inspection Pit	PO/SW	0.65			26/05/21	18:00						

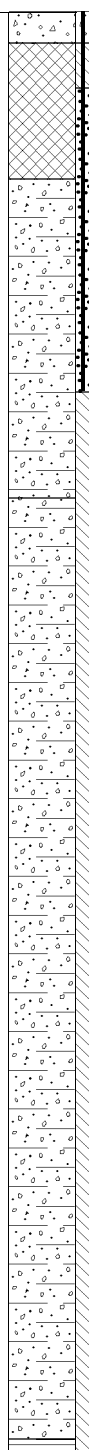
Remarks  The Borehole was terminated at 0.65m depth due to the presence of an obstruction. Unable to break out obstruction due to strong signal from cable avoidance tool.
 Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres.
 Backfill details from base of hole: bentonite seal up to 0.20m, tarmacadam up to ground level.
 Logged by **EPS**
 Figure **1 of 1**
 09/07/2021


BOREHOLE RECORD - Cable Percussion


Preliminary

Project NEWPORT QUINN SDD RFP Engineer PINNACLE CONSULTING ENGINEERS LIMITED Borehole Project No WS-BH109 PN214233

Client PINNACLE CONSULTING ENGINEERS LIMITED National Grid Coordinates 327871.3 E 183968.0 N Ground Level 10.75 m OD

Sampling			Properties			Strata	Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
						MADE GROUND: Grey reinforced concrete.	G.L.		10.75
0.30 0.30 0.50- 1.00 0.50 0.50 1.00 1.00 1.20- 1.70 1.20- 1.65	ES B ES ES B		PID=2.1			MADE GROUND: Dark grey very sandy slightly silty angular to subangular fine to coarse gravel of slag, clinker, firebrick, sandstone, metal, plastic and brick fragments. Some cobble sized fragments of metal.	0.20		10.55
			PID=2.2						
			PID=3.1						
		(DRY)			C14	Firm reddish brown mottled brown slightly sandy slightly gravelly CLAY with a slight organic odour. Gravel is subangular to subrounded fine to coarse of sandstone.	1.10		9.65
1.80 2.00- 2.50 2.00- 2.45 2.00	D B B		PID=1.4		C13				
		(DRY)							
2.80 3.00- 3.50 3.00- 3.45	D B D				S9				
		(DRY)							
3.50			PID=1.4			Firm grey mottled brown and black slightly sandy slightly gravelly CLAY with occasional pockets (up to 4mm) of decomposed organic material. Gravel is subangular to subrounded fine to coarse of sandstone.	3.20		7.55
3.80 4.00- 4.50 4.00- 4.45	D B D				S9				
		(DRY)							
4.50			PID=1.5						
4.80 5.00- 5.50 5.00- 5.45	D B D				S9	Below 5.00m, frequent pockets (up to 20mm) of decomposed organic material.			
		(DRY)							
5.80 6.00	D		PID=1.7						
6.50- 7.00 6.50- 6.95	B D				S12				
		(DRY)							
7.30	D								
8.00- 8.50 8.00- 8.45	B				C23	Below 8.00m, stiff.			
		(DRY)							
9.00	D								
9.50- 9.95	D	(DRY)			S50	Extremely weak reddish brown MUDSTONE.	9.40		1.35
						End of Borehole	9.95		0.80


Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.20	0.35	Concrete Core	PO/SW	G.I.		DRY	01/06/21	08:00						None encountered.
1.20	0.35	Inspection Pit	PO/SW	9.95		DRY	01/06/21	18:00						
9.95	0.20	Cable Percussion	PO/SW											

Remarks  Inspection pit hand excavated to 1.20m depth and no services were found.
 ES sample = 1 x vial, 1 x plastic jar and 1 amber jar.
 A 50mm standpipe was installed to 2.50m with a geowrapped slotted section from 0.50m to 2.50m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 2.50m, fine gravel filter up to 0.50m, bentonite seal up to 0.20m, concrete up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015 + A1:2020

Logged by EPS
 Figure 1 of 1
 09/07/2021



APPENDIX 4

Rotary Drillhole Records

Project NEWPORT QUINN SDD RFP

Engineer

PINNACLE CONSULTING ENGINEERS
LIMITED

Borehole
Project No

RC-BH101
PN214233

Client **PINNACLE CONSULTING ENGINEERS LIMITED**

National Grid	328065.2	E
Coordinates	184061.0	N

Ground Level 10.18 m OD

Sampling						Properties		Strata		Scale 1:50				
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Legend	Level m OD					
0.00- 0.20	B	1.20 (DRY)			S48	MADE GROUND: Soft dark brown slightly sandy slightly gravelly silt with many rootlets. Gravel is subangular to rounded fine to coarse of sandstone, brick, clinker and quartzite.	G.L.		10.18					
0.10	D					0.20	9.98							
0.20- 1.20	B													
1.00	D					1.20	8.98							
1.20- 2.20	B													
1.20- 1.65	D	1.20 (1.60)			S15	MADE GROUND: Brown very sandy silty gravel with a low subangular cobble content of sandstone. Gravel is angular to subrounded fine to coarse of sandstone, brick and quartzite. Occasional rootlets.	1.20		8.98					
1.50	D													
1.50	ES													
2.20- 2.45	D													
2.20- 2.65	D													
2.45- 3.55	B	3.20 (DRY)			S25	MADE GROUND: Dense reddish brown clayey sandy gravel with a medium cobble content of subangular sandstone. Gravel is subangular to rounded fine to coarse of sandstone. Between 1.20m and 2.20m, Rotary Open Hole techniques used to surpass obstructive strata.	2.45		7.73					
2.60	D													
2.60	ES													
2.82- 3.02	D													
3.20- 3.65	D													
3.55- 4.05	B	4.50 (DRY)			C50/235	Stiff brownish red mottled grey slightly sandy slightly gravelly CLAY. Gravel is angular to subangular fine to coarse of mudstone.	3.55		6.63					
3.70- 3.80	D													
4.05- 4.20	D													
4.20- 4.59														
Core Run/Depth (Core Dia/Time)	Depth Cased					TCR/SCR / Type	Length Max/Min	RQD %	SPT (FI)	Continued by Rotary techniques General				
4.50- 6.00 (92mm)	4.50 (DRY)	100 11	160 160	11	(NI)	Stiff brownish red mottled grey slightly sandy slightly gravelly CLAY. Gravel is angular to subangular fine to coarse of mudstone.								
						Detail								
						Between 4.50m and 5.84m, occasional pockets of grey silt.								
6.00- 7.50 (92mm)	4.50 (DRY)	84 84	680 540	79	(6)	Extremely weak brownish red MUDSTONE with occasional small clasts of grey siltstone. Discontinuities are subvertical medium to widely spaced, undulating and rough.	5.84		4.34					
6.00- 6.44	4.50 (DRY)				C50/285									
6.76- 6.89		C			(2)									
						Between 6.61-6.72m, occasional clasts (up to 70mm) of siltstone.								
						Between 7.19-7.50m, occasional clasts (up to 70mm) of siltstone.								
7.50- 7.87	4.50 (DRY)				C50/220	End of Borehole	7.50		2.68					

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	IJ	G.L.		Dry	07/06/21	08:00	1.60	1.20	1.50	20	3.20	Inflow.
2.20	0.12	Rotary Open Hole	IJ	7.50	4.50	Dry	07/06/21	18:00						
4.20	0.10	Dynamic Sampler	IJ	7.50	4.50	Dry	08/06/21	08:00						
4.50	0.12	Rotary Open Hole	IJ	7.50	4.50	Dry	08/06/21	18:00						
7.50	0.12	Rotary Core	IJ											

Remarks

Inspection pit hand excavated to 1.20m depth and no services were found.

ES sample = 2 x vial, 1 x plastic jar and 2 amber jar.

The Borehole was terminated at a depth of 7.50m on the instruction of the Engineer/Client.

Dynamic sample recovery: 2.20-3.20m,100%; 3.20-4.20m,100%.

A 50mm standpipe was installed to 3.00m with a geowrapped slotted section from 1.00m to 3.00m with flush lockable protective cover. Backfill details from base of hole: bentonite up to 3.00m, fine gravel filter up to 1.00m, bentonite up to 0.20m, concrete up to ground level.

All dimensions are in metres

AGS

Logged in accordance with BS5930:2015 + A1:2020

Logged by

EPS

Figure

1 of 1

09/07/2021

geotechnics

Preliminary

Project NEWPORT QUINN SDD RFP

Engineer

PINNACLE CONSULTING ENGINEERS
LIMITED

Borehole
Project No

RC-BH102
PN214233

Client **PINNACLE CONSULTING ENGINEERS LIMITED**

National Grid	327884.3	E
Coordinates	184090.9	N

Ground Level 10.35 m OD

Sampling						Properties		Strata		Scale 1:50				
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Legend	Level m OD					
0.20- 0.50	D	(1.20)			S10	MADE GROUND: Concrete.	G.L.		10.35					
0.50- 1.40	B					MADE GROUND: Dark grey and brown slightly silty sandy subangular to subrounded fine to coarse gravel of sandstone, slag and brick.	0.20		10.15					
0.50	D					MADE GROUND: Loose reddish brown slightly silty sandy angular to subrounded fine to coarse gravel of sandstone.	0.50		9.85					
1.00	D					Between 1.20m and 2.20m, Rotary Open Hole techniques used to surpass obstructive strata.	1.40		8.95					
1.00	ES													
1.20- 1.65	D	2.20 (1.20)			S29	MADE GROUND: Dark grey mottled brown clayey slightly gravelly sand. Gravel is subangular to subrounded fine to coarse of sandstone. At 1.40m, Black plastic obstruction.	2.70		7.65					
1.40- 1.80	D													
2.20- 2.65	D													
2.50	D													
2.50	ES													
2.70- 4.60	B	3.20 (DRY)			S14	Stiff brownish red slightly sandy gravelly CLAY. Gravel is angular to subangular fine to coarse of mudstone. Between 3.20-3.80m, high strength.	4.60		5.75					
2.70- 2.90	D													
3.20- 3.80	UT													
3.20- 3.65														
3.80- 4.25	D													
4.10- 4.40	D	4.50			S47	Below 4.10m, firm.	4.80		5.55					
4.60- 4.80	D													
4.80- 5.25	D													
Core Run/Depth (Core Dia/Time)	Depth Cased	TCR/SCR / Type	Length Max/Min	RQD %	SPT (FI)	Continued by Rotary techniques General	Detail							
4.80- 6.00 (92mm)	6.00	25 0	0 0	0	(AZCL)	Extremely weak brownish red MUDSTONE. Discontinuities are subhorizontal to subvertical, very closely to medium spaced, undulating and rough.	Between 4.80m and 6.00m, rare clasts (up to 35mm) of grey siltstone.							
6.00- 7.50 (92mm)	7.50	64 18	130 60	8	(NI)		Below 6.00m, extremely weak to very weak.							
6.00- 6.38	6.00				(AZCL) C50/ 230									
6.64- 6.84		C			(>25)		Between 6.67m and 7.00m, Occasional clasts of very weak grey siltstone.							
					(NI)									
					(15)									
					(NI)									
7.50- 9.00 (92mm)	9.00	33 0	0 0	0	(>25)									
					(NI)									
					(AZCL) C50/ 205									
7.50- 7.86	7.50				(NI)		Between 8.58m and 8.77m, Occasional clasts of very weak grey to weak siltstone.							
8.80- 8.90		C			(>25)		Below 8.87m, Discontinuities are subvertical to subhorizontal, closely to widely spaced, undulating and smooth. Between 9.50m and 12.10m, Occasional clasts of very weak to weak grey siltstone.							
9.00-10.50 (92mm)	9.00	66 34	120 10	15	(NI)									
					(23)									
9.00- 9.31	9.00				C50/ 160									
					(AZCL)									
Boring						Progress			Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	IJ	G.L.	3.80	DRY	01/06/21	08:00	1.20		1.20	20	3.20	Inflow - no rise.
4.80	0.10	Dynamic Sampler	IJ	3.80	3.20	2.73	02/06/21	08:00						
15.00	0.12	Rotary Core	IJ	3.80	3.20	2.73	02/06/21	18:00						
				13.50	9.00	2.73	02/06/21	18:00						
				13.50	9.00	2.73	03/06/21	08:00						
				15.00	9.00	2.73	03/06/21	18:00						
Remarks														
ES sample = 2 x vial, 1 x plastic jar and 2 amber jar.														
Inspection pit hand excavated to 1.20m depth and no services were found.														
The Borehole was terminated at a depth of 15.00m on the instruction of the Engineer/Client.														
** Driller's description.														
Dynamic sample recovery: 2.20-3.20m,100%; 3.80-4.80m,70%.														
A 50mm standpipe was installed to 12.00m with a geowrapped slotted section from 3.00m to 12.00m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 12.00m, fine gravel filter up to 3.00m, bentonite up to 0.20m, concrete up to ground level.														
Grounded in accordance with BS5930:2015 + A1:2020														
Symbols and abbreviations are explained on the accompanying key sheet.														
All dimensions are in metres														
Logged by EPS														
Figure 1 of 2														
09/07/2021														
geotechnics														

BOREHOLE RECORD - Dynamic Sampler and Rotary


Preliminary

Project **NEWPORT QUINN SDD RFP** Engineer **PINNACLE CONSULTING ENGINEERS LIMITED** Borehole Project No **RC-BH102** **PN214233**

Client **PINNACLE CONSULTING ENGINEERS LIMITED** National Grid Coordinates **327884.3 E 184090.9 N** Ground Level **10.35 m OD**

Drilling		Properties/Sampling				Strata		Scale 1:50		
Core Run/Depth (Core Dia/Time)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (FI)	Description General	Description Detail	Depth	Legend	Level m OD
10.39-10.50		C			(25)					
					(NI)					
10.50-12.00 (92mm)	9.00	100 77	120 10	45	(>25)					
					(NI)					
11.31-11.41 10.50-10.71	9.00	C			(>25)					
					(NI)					
					C50/ 135		Between 11.50m and 14.63m, with frequent clasts of very weak grey siltstone.			
					(17)					
12.00-13.50 (92mm)	9.00	100 93	310 30	75	(NI)					
					(14)					
12.62-12.83 12.00-12.34	9.00	C			(NI)					
					C50/ 185					
					(9)					
13.34-13.50		C								
13.50-15.00 (92mm)	9.00	86 82	230 30	66	(AZCL)					
13.50-13.80	9.00				C50/ 155 (9)					
14.32-14.49		C			(NI)					
					(8)					
15.00-15.13	9.00				C50/45	End of Borehole		15.00		-4.65

Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks 

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Logged by **EPS**

Figure **2 of 2**
09/07/2021



Preliminary

Project NEWPORT QUINN SDD RFP

Engineer

PINNACLE CONSULTING ENGINEERS
LIMITED

Borehole
Project No

RC-BH1 03
PN214233

Client **PINNACLE CONSULTING ENGINEERS LIMITED**

National Grid	327688.3	E
Coordinates	183914.9	N

Ground Level 9.99 m OD

Sampling						Properties			Strata		Scale 1:50			
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (F)	Description	Depth	Legend	Level m OD					
0.20- 0.45	B	1.20 (DRY)			S33	MADE GROUND: Concrete.	G.L.		9.99					
0.30	D					0.20	9.79							
0.30	ES					0.45	9.54							
0.50	D					0.60	9.39							
0.60- 1.20	B													
1.00	D													
1.00	ES													
1.20- 1.65	D													
1.60	D													
1.60	ES													
2.10	D	2.20 (DRY)			S7	MADE GROUND: Reddish brown slightly silty sandy gravel with rare subrounded cobbles of sandstone. Gravel is subangular to rounded fine to coarse of sandstone.	1.40		8.59					
2.10	ES					1.90		8.09						
2.20- 2.65	D					2.40		7.59						
3.05- 3.20	D	3.20 (2.63)			S42	Firm reddish brown mottled grey and brown slightly sandy slightly gravelly CLAY. Gravel is angular to subangular fine to coarse of sandstone.	3.05		6.94					
3.20- 3.80	UT87					3.20		6.79						
3.20- 3.65														
3.80	D	(AZCL)				Possible COBBLES of extremely weak brownish red mudstone. Recovered as clayey slightly sandy gravel of mudstone.	3.80		6.19					
3.80- 4.25	D													
						Stiff brownish red CLAY. Between 3.20-3.80m, high strength.	4.31		5.68					
Core Run/Depth (Core Dia/Time)	Depth Cased	TCR/SCR / Type	Length Max/Min	RQD %	SPT (F)	Continued by Rotary techniques General								
3.80- 4.50 (92mm)	4.50 (2.63)	82 27	190 190	27	(NI)	Very Stiff brownish red mottled grey slightly sandy slightly gravelly CLAY with occasional pockets of grey silty angular to subangular fine to coarse gravel of mudstone.								
4.50- 5.50 (92mm)	4.50 (2.63)	75 41	320 50	32	(AZCL)									
5.18- 5.40		C			(NI)									
5.40- 5.50		C			(10)									
5.50- 7.00 (92mm)	4.50 (2.63)	95 88	230 60	63	(NI)	Extremely weak brownish red MUDSTONE. Discontinuities are subhorizontal very closely to medium spaced, undulating and smooth.	6.05	XXXXXX	3.94					
5.50- 5.86	4.50 (2.63)				C50/ 205		6.39	XXXXXX	3.60					
					(AZCL)									
					(NI)									
7.00- 8.50 (92mm)	4.50 (2.63)	88 85	360 60	75	(3)									
7.17- 7.31		C			(12)									
					(13)									
7.00- 7.23	4.50 (2.63)				(AZCL)	Very weak grey SILTSTONE. Discontinuities are subhorizontal closely spaced, undulating and rough.								
8.00- 8.19		C			C50/ 105									
					(NI)									
					(8)	Extremely weak to very weak brownish red MUDSTONE. Discontinuities are subhorizontal to inclined (55 degrees) closely to widely spaced, undulating and smooth.	8.50		1.49					
						End of Borehole								
Boring						Progress			Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	IJ	G.L.	-	DRY	28/05/21	08:00	2.63	2.00				Inflow. Increasing with depth.
3.80	0.10	Windowless Sampler	IJ	3.20	3.20	2.63	28/05/21	18:00						
8.50	0.12	Rotary Core	IJ	3.20	4.50	2.63	01/06/21	08:00						
				8.50			01/06/21	18:00						
Remarks														
ES sample = 2 x vial, 1 x plastic jar and 2 amber jar.														
The Borehole was terminated at a depth of 8.50m on the instruction of the Engineer/Client.														
Inspection pit hand excavated to 1.20m depth and no services were found.														
Dynamic sample recovery: 1.20-2.20m, 80%; 2.20-3.20m, 100%.														
A 50mm standpipe was installed to 8.30m with a geowrapped slotted section from 2.00m to 8.30m with flush lockable protective cover. Backfill details from base of hole: collapsed material up to 8.30m, fine gravel filter up to 2.00m, bentonite up to 0.20m, concrete up to ground level.														
Logged in accordance with BS5930:2015 + A1:2020														
Logged by EPS														
Figure 1 of 1														
09/07/2021														
geotechnics														

BOREHOLE RECORD - Dynamic Sampler and Rotary

Preliminary

Project NEWPORT QUINN SDD RFP Engineer PINNACLE CONSULTING ENGINEERS LIMITED Borehole Project No RC-BH104 PN214233

Client PINNACLE CONSULTING ENGINEERS LIMITED National Grid Coordinates 327644.3 E 184173.4 N Ground Level 10.86 m OD

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (F)	Description		Depth	Legend	Level m OD
0.16- 0.40 0.30 0.30 0.40- 1.20	B	1.20 (DRY)			S50/ 270	MADE GROUND: Concrete.		G.I.		10.86
	D						10.70			
	ES						10.46			
	B									
1.00 1.00 1.20- 1.62	D	2.20 (DRY)			S15	MADE GROUND: Very dense reddish brown sandy slightly silty to silty gravel with a low subrounded cobble content of sandstone. Gravel is subangular to rounded fine to coarse of sandstone. From 1.20m to 2.20m, drilled using Rotary Open Hole techniques to pass obstruction.				
	ES									
	D									
2.20- 2.65 2.30 2.30 2.50- 2.80	D	3.20 (DRY)			S12	MADE GROUND: Medium dense reddish brown slightly clayey sandy gravel with a low subangular cobble content of sandstone. Gravel is subangular to subrounded fine to coarse of slag and sandstone.		2.20		8.66
	D								8.36	
	ES									
	D									
3.00 3.00 3.20- 3.50 3.20- 3.65 3.50- 3.80	D	3.20 (DRY)			S50/ 190	Firm reddish brown mottled red slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of sandstone. At 3.15m, subrounded cobble of sandstone.		3.20		7.66
	ES									
	D									
	D									
3.80- 3.90 3.90- 4.24	D	3.20 (DRY)				Stiff brownish red slightly sandy slightly gravelly CLAY with occasional small pockets of light grey silt. Gravel is angular to subangular of mudstone. Below 3.50m, very stiff.		3.80		7.06
	D									
						Extremely weak brownish red MUDSTONE. Between 3.80m and 3.90m, Recovered as slightly clayey sandy gravel. Between 3.90-4.50m, no recovery.		4.50		6.36
Core Run/Depth (Core Dia/Time)	Depth Cased	TCR/SCR / Type	Length Max/Min	RQD %	SPT (F)	Continued by Rotary techniques General				
4.50- 6.00 (92mm)	4.50 (DRY)	73 56	400 40	34	(AZCL)	Extremely weak to weak brownish red MUDSTONE. Discontinuities are subhorizontal to subvertical closely to medium spaced, undulating and planar and rough.	Detail	At 4.90m, subrounded cobble sized clast of siltstone. Below 5.35m, with occasional clasts (<20mm) of very weak light grey siltstone.		
					(NI)					
5.74- 5.90		C			(12)					
					(NI)					
6.00- 7.50 (92mm)	4.50 (DRY)	56 27	230 50	23	(16)					
					(NI)					
6.69- 6.79		C			(8)					
					(AZCL)					
6.00- 6.31	4.50 (DRY)				C50/ 160					
					(NI)					
7.50- 9.00 (92mm)	4.50 (9.00)	95 38	180 10	0	(17)	Extremely weak to very weak brownish red MUDSTONE. Discontinuities are subvertical to subhorizontal closely spaced, undulating and smooth with dark brown discolouration on aperture surface.	Between 7.02m and 7.50m, set of discontinuities: Subhorizontal, closely spaced, undulating and smooth. Between 7.50m and 8.95m, discontinuities are subvertical closely to medium spaced, undulating and smooth. Between 7.50m and 8.95m, Extremely weak. Between 7.70m and 7.90m, Occasional small pockets (<20mm) of light grey silt. Between 8.95m and 9.96m, Extremely weak to very weak.	7.02		3.84
					(13)					
					(NI)					
					(NI)					
7.50- 7.72	4.50 (DRY)				(AZCL)					
					C50/ 135					
9.00-10.50 (92mm)	4.50 (4.53)	73 67	200 20	39	(NI)					
					(AZCL)					
9.00- 9.22	4.50 (9.00)				C50/95					
					(17)					
9.98-10.18		C			(NI)					
								9.96		0.90

Boring				Progress				Groundwater			
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to
1.20	0.40	Inspection Pit	IJ	G.I.	-	DRY	27/05/21	08:00	9.00	4.50	4.53
2.20	0.12	Rotary Open Hole	IJ	12.00	4.50	4.53	27/05/21	18:00			
3.90	0.10	Dynamic Sampler	IJ	12.00	4.50	2.43	28/05/21	08:00			
4.50	0.12	Rotary Open Hole	IJ	15.10	4.50	2.43	28/05/21	18:00			
15.10	0.12	Rotary Core	IJ								

Remarks Inspection pit hand excavated to 1.20m depth and no services were found. Logged by EPS

AGS sample = 2 x vial, 1 x plastic jar and 2 amber jar. Figure 1 of 2

The Borehole was terminated at a depth of 15.00m on the instruction of the Engineer/Client. 09/07/2021

Dynamic sample recovery: 2.20-3.20m,100%; 3.20-3.90m,100%.

A 50mm standpipe was installed to 15.00m with a geowrapped slotted section from 3.00m to 15.00m with flush lockable protective cover. Backfill details from base of hole: fine gravel filter up to 3.00m, bentonite up to 0.20m, concrete up to ground level.

geotechnics

All dimensions are in metres. Logged in accordance with BS5930:2015 + A1:2020

BOREHOLE RECORD - Dynamic Sampler and Rotary

Preliminary

Project NEWPORT QUINN SDD RFP Engineer PINNACLE CONSULTING ENGINEERS LIMITED Borehole Project No RC-BH104 PN214233

Client PINNACLE CONSULTING ENGINEERS LIMITED National Grid Coordinates 327644.3 E 184173.4 N Ground Level 10.86 m OD

Drilling		Properties/Sampling				Strata		Scale 1:50		
Core Run/Depth (Core Dia/Time)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (FI)	Description General	Description Detail	Depth	Legend	Level m OD
10.40-10.50		C			(17) (15)	Interbedded very weak brownish red MUDSTONE and very weak grey SILTSTONE. Discontinuities are subvertical, very closely to closely spaced, undulating and smooth.		9.96		0.90
10.50-12.00 (92mm) 10.50-10.68 (4.53) 10.83-11.01	4.50 (4.53) 4.50 (4.53)	100 96	190 30	66	(10) C50/90			10.50		0.36
12.00-13.50 (92mm) 12.00-12.20 (4.53)	4.50 (2.43) 4.50 (4.53)	75 65	250 20	31	(AZCL) C50/ 105	Extremely weak to very weak brownish red MUDSTONE. Discontinuities are subvertical to subhorizontal very closely to closely spaced, planar and rough.	Between 10.50m and 12.00m, some fracture surfaces are undulating. Between 10.55m and 10.80m, occasional clasts (<25mm) of very weak grey siltstone. Between 11.80m and 12.00m, occasional clasts (<25mm) of very weak grey siltstone. Below 11.90m, reddish dark brown discolouration on fracture surfaces. Between 12.35m and 12.60m, occasional clasts (<25mm) of very weak grey siltstone. Below 13.00m, very weak to weak in places.			
13.07-13.17		C			(NI) (8) (NI)					
13.50-15.00 (92mm) 13.50-13.58 (4.53) 13.65-13.73	4.50 (2.43) 4.50 (4.53)	90 77	220 30	40	(AZCL) C50/10					
		C			(16) (NI) (10) (NI)					
15.00-15.10	4.50 (4.53)				(17) C50/20	End of Borehole		15.10		-4.24

Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015 + A1:2020

Logged by EPS

Figure 2 of 2 09/07/2021

BOREHOLE RECORD - Dynamic Sampler and Rotary

Preliminary

Project NEWPORT QUINN SDD RFP

Engineer

PINNACLE CONSULTING ENGINEERS LIMITED

Borehole Project No

RC-BH105
PN214233

Client PINNACLE CONSULTING ENGINEERS LIMITED

National Grid Coordinates 328067.3 E
184249.6 N

Ground Level 10.77 m OD

Sampling			Properties			Strata		Scale 1:50						
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N (FI)	Description	Depth	Legend	Level m OD					
0.10- 0.40	B					Dark grey ASPHALT.	G.L. 0.10		10.77					
0.40- 2.20	B					MADE GROUND: Brown and grey slightly silty sandy gravel. Gravel is subangular to subrounded fine to coarse of sandstone, brick fragments and quartzite.	0.40		10.37					
1.00	D					MADE GROUND: Very dense brown silty sandy gravel with a low subangular to subrounded cobble content of sandstone. Gravel is angular to subrounded fine of coarse of sandstone, brick fragments and quartzite.								
1.20- 1.65	D	1.20 (DRY)			S50	Between 1.20m and 3.20m, drilled using Rotary Open Hole techniques to pass obstruction.								
1.80	D													
1.80	ES													
2.20- 3.20	B													
2.20- 2.62	D	1.20 (2.20)			S50/ 270									
2.80	D													
3.20- 3.65	D	3.20 (2.20)			S29	MADE GROUND: Medium dense silty slightly gravelly sand with some small pockets of partially degraded organic material. Gravel is subangular to subrounded fine to coarse of sandstone.	3.20		7.57					
3.40	D													
3.40	ES						3.60		7.17					
3.80	D													
4.10- 4.20	D					MADE GROUND: Medium dense brownish red clayey sandy gravel with a low subrounded cobble content of sandstone. Gravel is subangular to subrounded fine to coarse of sandstone.	4.10		6.67					
4.20- 4.59	D	3.20 (DRY)			S50/ 235		4.50		6.27					
						Stiff brownish red mottled grey slightly sandy slightly gravelly CLAY. Gravel is angular fine to coarse of mudstone.								
Core Run/Depth (Core Dia/Time)	Depth Cased	TCR/SCR / Type	Length Max/Min	RQD %	SPT (FI)	Continued by Rotary techniques General	Detail							
4.50- 6.00 (92mm)	4.50 (DRY)	0 0	0 0	0	(NR)	** MUDSTONE. No recovery.								
6.00- 7.50 (92mm)	4.50 (DRY)	90 90	480 80	76	(AZCL)	Extremely weak to very weak brownish red MUDSTONE with occasional clasts (<85mm) of grey siltstone. Discontinuities are subhorizontal to subvertical very closely to widely spaced, undulating and smooth.	Between 6.00m and 10.50m, some discontinuities with rough fracture surfaces.							
6.00- 6.40	4.50 (DRY)				C50/ 245									
6.63- 6.84		C			(6)									
7.50- 9.00 (92mm)	4.50 (DRY)	92 92	890 40	90	(AZCL)									
7.50- 7.83	4.50 (DRY)				C50/ 180									
8.06- 8.34		C			(4)									
8.83- 9.00		C												
9.00-10.50 (92mm)	4.50 (DRY)	88 85	370 40	78	(AZCL)									
9.00- 9.30	4.50 (DRY)				C50/ 150 (12)									
9.80-10.00		C			(NI)									
					(6)									
Boring			Progress			Groundwater								
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	IJ	G.L.	-	DRY	03/06/21	08:00	2.20	1.20	2.20	20	3.20	Groundwater Encountered.
3.20	0.12	Rotary Open Hole	IJ	4.20	4.50	DRY	03/06/21	18:00						
4.50	0.10	Dynamic Sampler	IJ	4.20	4.50	DRY	04/06/21	08:00						
10.50	0.12	Rotary Core	IJ	10.50	4.50	DRY	04/06/21	18:00						
Remarks Inspection pit hand excavated to 1.20m depth and no services were found. AGS sample = 2 x vial, 1 x plastic jar and 2 amber jar. The Borehole was terminated at a depth of 10.50m under the instruction of the Engineer/Client. ** Driller's description. Dynamic sample recovery: 3.20-4.20m, 100%. A 50mm standpipe was installed to 4.00m with a geowrapped slotted section from 1.00m to 4.00m with flush lockable protective cover. Backfill details from base of hole: bentonite up to 4.00m, fine gravel filter up to 1.00m, bentonite up to 0.20m, concrete up to ground														
Symbols and abbreviations are explained on the accompanying key sheet. All dimensions are in metres.										Logged by EPS Figure 1 of 2 09/07/2021				

geotechnics

BOREHOLE RECORD - Dynamic Sampler and Rotary

Preliminary

Project **NEWPORT QUINN SDD RFP** Engineer **PINNACLE CONSULTING ENGINEERS LIMITED** Borehole Project No **RC-BH105**
 Client **PINNACLE CONSULTING ENGINEERS LIMITED** National Grid Coordinates **328067.3 E 184249.6 N** Ground Level **10.77 m OD**

Drilling		Properties/Sampling				Strata		Scale 1:50		
Core Run/Depth (Core Dia/Time)	Depth Cased & (to Water)	Type TCR/SCR%	Length Max/Min	RQD %	SPT N (FI)	Description General	Description Detail	Depth	Legend	Level m OD
10.50-10.80	4.50 (DRY)				C50/ 145	End of Borehole		10.50		0.27

Drilling				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks **Level.**
 Symbols and abbreviations are explained on the accompanying key sheet.
 All dimensions are in metres. Logged in accordance with BS5930:2015 + A1:2020

Logged by **EPS**
 Figure **2 of 2**
 09/07/2021

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APPENDIX 5

Rotary Drillhole Photographs

PHOTOGRAPHS

Project Number : PN214233

Project : Newport Quinn



RC-BH102 2.2 - 4.8



RC-BH102 4.8 - 6.0

PHOTOGRAPHS

Project Number : PN214233

Project : Newport Quinn



RC-BH102 6.0 - 7.5



RC-BH102 7.5 - 9.0

PHOTOGRAPHS

Project Number : PN214233

Project : Newport Quinn



RC-BH102 10.5 - 12.0



RC-BH102 12.0 - 13.5

PHOTOGRAPHS

Project Number : PN214233

Project : Newport Quinn



RC-BH102 13.5 - 15.0



RC-BH103 1.2 - 3.2

PHOTOGRAPHS

Project Number : PN214233

Project : Newport Quinn



RC-BH103 3.8 - 5.5



RC-BH103 5.5 - 7.0

PHOTOGRAPHS

Project Number : PN214233

Project : Newport Quinn



RC-BH103 7.5 - 8.5



RC-BH104 2.2 - 3.9

PHOTOGRAPHS

Project Number : PN214233

Project : Newport Quinn



RC-BH104 4.5 - 7.5



RC-BH104 7.5 - 9.0

PHOTOGRAPHS

Project Number : PN214233

Project : Newport Quinn



RC-BH104 9.0 - 10.5



RC-BH104 10.5 - 12.0

PHOTOGRAPHS

Project Number : PN214233

Project : Newport Quinn



RC-BH104 12.0-13.5

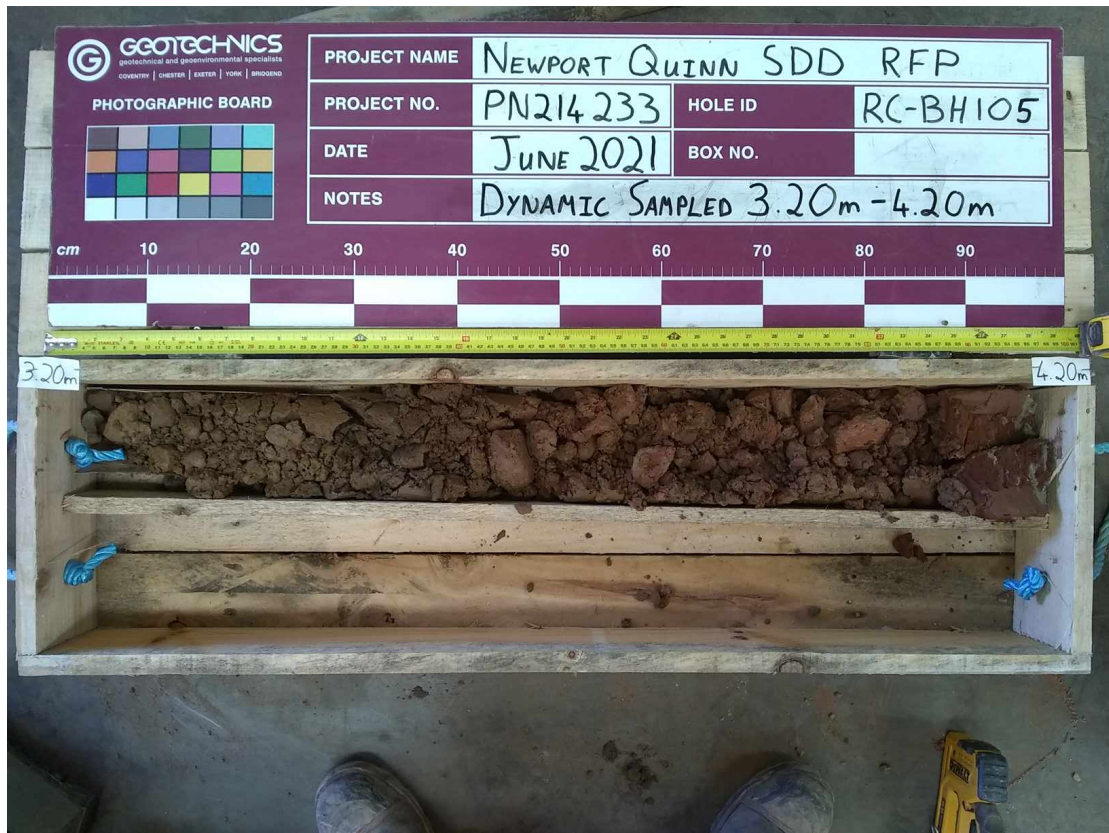


RC-BH104 13.5 - 15.0

PHOTOGRAPHS

Project Number : PN214233

Project : Newport Quinn



RC-BH105 3.2 - 4.2

APPENDIX 6

Dynamic Probe Test Results

BOREHOLE RECORD - Dynamic Sampler

Preliminary

Project **NEWPORT QUINN SDD RFP** Engineer **PINNACLE CONSULTING ENGINEERS LIMITED** Borehole Project No **WS-BH101**
 Client **PINNACLE CONSULTING ENGINEERS LIMITED** National Grid Coordinates **328073.3 E 184133.3 N** Ground Level **10.68 m OD**

Sampling			Properties			Strata	Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
0.00- 0.20	B		PID=1.5		55	MADE GROUND: Very soft dark brown slightly sandy silt with many rootlets. Gravel is subangular to rounded fine to coarse of sandstone and quartzite.	G.L.		10.68
0.10	D						0.20		10.48
0.10	ES								
0.20- 1.20	B		PID=2.3		55	MADE GROUND: Reddish brown very sandy slightly silty subangular to subrounded fine to coarse gravel of sandstone. Medium subangular cobble content of sandstone.			
0.80	D								
0.80	ES								
0.80									
1.20- 1.65	D	(DRY)				MADE GROUND: Very dense yellowish brown very sandy slightly silty subangular to subrounded fine to coarse gravel of sandstone. High subrounded cobble content of sandstone.	1.20		9.48
							1.65		9.03
						End of Borehole			

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	GM/EP	G.I.			27/05/21	08:00						None encountered
1.65	0.05	Windowless Sampler	GM/EP	1.65			27/05/21	18:00						

Remarks Inspection pit hand excavated to 1.20m depth and no services were found.
 AGS sample = 1 x vial, 1 x plastic jar and 1 amber jar.
 The Window Sample Borehole was terminated at 1.65m depth due to cobble obstruction.
 Backfill details from base of hole: bentonite up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015 + A1:2020

Logged by **EPS**
 Figure **1 of 1**
 09/07/2021

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BOREHOLE RECORD - Dynamic Sampler

Preliminary

Project NEWPORT QUINN SDD RFP Engineer PINNACLE CONSULTING ENGINEERS LIMITED Borehole Project No WS-BH102 PN214233

Client PINNACLE CONSULTING ENGINEERS LIMITED National Grid Coordinates 328116.8 E 184058.9 N Ground Level 10.47 m OD

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD	
0.00- 0.30	B					MADE GROUND: Very soft brown slightly sandy slightly gravelly clay with occasional rootlets. Gravel is subangular to subrounded fine to coarse of sandstone.	G.L.		10.47	
0.10	D									
0.10	ES		PID=3.4				0.30		10.17	
0.30- 1.20	B					MADE GROUND: Light brown very sandy silty subangular to subrounded fine to coarse gravel of sandstone. Medium subangular cobble content of sandstone. Below 1.00m, high subangular cobble content.				
0.50	D									
0.50	ES		PID=3.6							
1.00	D									
1.00	ES		PID=2.16							
1.20- 2.00	B	(DRY)			S50					
1.20- 1.65	D									
2.00	D	(DRY)			S50/185	Below 1.00m becomes very dense.				
2.00- 2.28	D					At 2.28, obstruction encountered.	2.28		8.19	
2.00	ES		PID=3.5			End of Borehole				
2.00										

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	GM/EPG	G.I.		DRY	24/05/21	08:00						None encountered.
2.28	0.10	Dynamic Sampler	GM	2.28			24/05/21	18:00						

Remarks Inspection pit hand excavated to 1.20m depth and no services were found. The Dynamic Sample Borehole was terminated at 2.28m depth due to the presence of an obstruction. ES sample = 2 x vial, 1 x plastic jar and 2 amber jar. A 50mm standpipe was installed to 2.28m with a geowrapped slotted section from 1.00m to 2.28m with flush lockable protective cover. Backfill details from base of hole: fine gravel filter up to 1.00m, bentonite seal up to 0.10m, concrete up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Logged by EPS

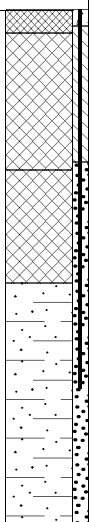
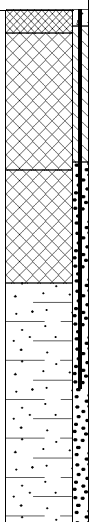
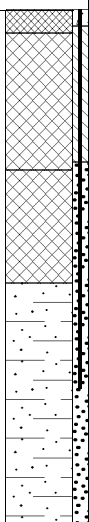
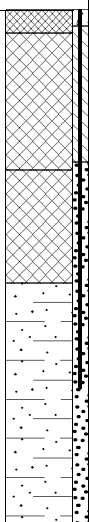
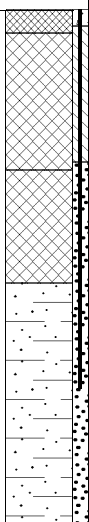
Figure 1 of 1 09/07/2021

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BOREHOLE RECORD - Dynamic Sampler

Preliminary

Project **NEWPORT QUINN SDD RFP** Engineer **PINNACLE CONSULTING ENGINEERS LIMITED** Borehole Project No **WS-BH103**
 Client **PINNACLE CONSULTING ENGINEERS LIMITED** National Grid Coordinates **327941.8 E 184024.5 N** Ground Level **9.89 m OD**

Sampling			Properties			Strata	Scale 1:50			
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD	
0.00- 0.15	B		PID=4.1			MADE GROUND: Very soft dark brown slightly sandy slightly gravelly silt with many rootlets. Gravel is subangular to subrounded fine to coarse of sandstone, brick and pottery fragments.	G.L.		9.89	
0.10	D						0.15		9.74	
0.10	ES									
0.10										
0.15- 1.05	B		PID=4.3			MADE GROUND: Brown very gravelly silty fine to coarse sand with a medium subangular cobble content of concrete and sandstone. Gravel is angular to rounded fine to coarse of concrete, brick, pottery fragments, sandstone and quartzite.	1.05		8.84	
0.50	D									
0.50	ES									
0.50										
1.00	D		PID=4.4			MADE GROUND: Very dense yellowish brown mottled reddish brown very sandy slightly silty subangular fine to coarse gravel of sandstone. Low subangular cobble content of sandstone.	1.80		8.09	
1.00	ES									
1.00										
1.20- 1.59	D	(DRY)			S50/ 240					
1.40	ES		PID=1.8			Soft brownish red slightly sandy CLAY with occasional pockets (up to 30mm) of grey slightly sandy silt. At 2.50m, firm.	3.38		6.51	
1.40										
2.00- 2.45	D	(DRY)			S6					
2.40	D									
2.40	ES		PID=1.7			At 3.38m, obstruction.				
2.40										
2.90- 3.00	D									
3.00- 3.38	D	(DRY)			S50/ 230					
End of Borehole										

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	GM/EPS	G.I.		DRY	26/05/21	08:00						None encountered.
2.00	0.09	Dynamic Sampler	GM/EPS	3.38			26/05/21	18:00						
3.38	0.08	Dynamic Sampler	GM/EPS											

Remarks Inspection pit hand excavated to 1.20m depth and no services were found. The Dynamic Sample Borehole was terminated at 3.38m depth due to the presence of an obstruction. A 50mm standpipe was installed to 2.50m with a geowrapped slotted section from 1.00m to 2.50m with flush lockable protective cover. Backfill details from base of hole: fine gravel filter up to 1.00m, bentonite seal up to 0.10m, concrete up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Logged by **EPS**

Figure **1 of 1**

09/07/2021

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BOREHOLE RECORD - Dynamic Sampler

Preliminary

Project **NEWPORT QUINN SDD RFP** Engineer **PINNACLE CONSULTING ENGINEERS LIMITED** Borehole Project No **WS-BH104**
 Client **PINNACLE CONSULTING ENGINEERS LIMITED** National Grid Coordinates **327872.2 E 183928.8 N** Ground Level **10.07 m OD**

Sampling			Properties			Strata	Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
0.25- 0.50	B					MADE GROUND: Grey concrete	G.L.		10.07
0.25	D						0.25		9.82
0.25	ES		PID=1.6			MADE GROUND: Dark brown mottled black very sandy slightly silty subangular to rounded fine to coarse gravel of slag, limestone and sandstone. Medium subangular cobble content of slag.			
0.25									
0.50- 0.90	B					MADE GROUND: Light brown sandy slightly silty subangular to rounded fine to coarse gravel of sandstone. Low subrounded cobble content of sandstone.	0.90		9.17
0.50	D								
0.50	ES		PID=1.4				1.40		8.67
0.90- 1.20	B								
1.00	D								
1.00	ES		PID=1.3			Firm reddish brown mottled brown slightly sandy slightly gravelly CLAY with a low rounded cobble content of sandstone. Gravel is subrounded to rounded fine to coarse of sandstone.			
1.00		(YES)			S13				
1.20- 1.65	D								
1.20- 1.40	D								
1.40- 2.00	B								
2.00	D								
2.00- 2.25	D	(YES)			S50/95	At 2.25m, obstruction.	2.25		7.82
2.00	ES		PID=1.5						
2.00						End of Borehole			

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.25	0.35	Concrete Core	GM/EP	G.I.			25/05/21	11:00	0.90					Seepage, no rise.
1.20	0.40	Inspection Pit	GM/EP	2.25	2.00		25/05/21	13:00						
2.25	0.09	Dynamic Sampler	GM/EP											

Remarks Inspection pit hand excavated to 1.20m depth and no services were found. The Dynamic Sample Borehole was terminated at 2.25m depth due to the presence of an obstruction. A 50mm standpipe was installed to 2.00m with a geowrapped slotted section from 0.50m to 2.00m with flush lockable protective cover. Backfill details from base of hole: fine gravel filter up to 0.50m, bentonite seal up to 0.10m, concrete up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Logged by **EPS**

Figure **1 of 1**

09/07/2021

geotechnics

BOREHOLE RECORD - Dynamic Sampler

Preliminary

Project **NEWPORT QUINN SDD RFP** Engineer **PINNACLE CONSULTING ENGINEERS LIMITED** Borehole Project No **WS-BH105**
 Client **PINNACLE CONSULTING ENGINEERS LIMITED** National Grid Coordinates **327743.5 E 183907.3 N** Ground Level **10.05 m OD**

Sampling			Properties			Strata	Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
0.20- 0.70	B					MADE GROUND: Grey concrete	G.L.		10.05
0.20	D						0.20		9.85
0.20	ES		PID=3.4			MADE GROUND: Dark brown mottled grey and black very gravelly slightly silty fine to coarse sand with a low subangular cobble content of slag and sandstone. Gravel is subangular to subrounded fine to coarse of slag, brick, concrete and sandstone.			
0.20									
0.50	D		PID=5.8						
0.50	ES								
0.70- 1.05	B						1.05		9.00
1.10	D					Stiff reddish brown slightly sandy slightly gravelly CLAY. Gravel is subrounded to rounded fine to coarse of sandstone			
1.10	ES		PID=3.3		S17	At 1.30m, becomes orangish brown mottled brown.			
1.20- 1.65	D	(YES)							
1.60	D		PID=2.9		S19	Stiff reddish brown slightly sandy slightly gravelly CLAY with occasional pockets (up to 40mm) of coarse grey sand. Gravel is subangular to subrounded fine to coarse of sandstone.	1.90		8.15
1.60	ES								
2.00- 2.45	D	(YES)							
2.30	D		PID=2.4						
2.30	ES								
2.30									
2.70- 3.10	D						2.70		7.35
3.00- 3.45	D	(YES)			S13	Firm light grey slightly sandy SILT with occasional pockets (up to 30mm) of grey fine to coarse sand. Frequent pockets (up to 2mm) of decomposed organic material.	3.10		6.95
3.10- 3.50	D								
3.50- 3.90	D					Stiff brownish red slightly sandy CLAY with occasional pockets (up to 20mm) of grey fine to coarse sand.			
3.90- 4.00	D						3.90		6.15
4.00- 4.44	D	(YES)			S50/285	Extremely weak brownish red MUDSTONE. Recovered as slightly silty gravel.			
							4.44		5.61
						End of Borehole			

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.20	0.35	Concrete Core	GM/EP	G.I.			26/05/21	08:00	0.90		0.55	20		Slow inflow.
1.20	0.40	Inspection Pit	GM/EP	4.44	1.00	0.90	26/05/21	18:00						
2.00	0.10	Dynamic Sampler	GM/EP											
3.00	0.09	Dynamic Sampler	GM/EP											
4.44	0.07	Dynamic Sampler	GM/EP											

Remarks Inspection pit hand excavated to 1.20m depth and no services were found.
 AGS sample = 2 x vial, 1 x plastic jar and 2 amber jar.
 The Dynamic Sample Borehole was terminated at 4.44m depth upon encountering bedrock
 A 50mm standpipe was installed to 1.00m with a geowrapped slotted section from 0.50m to 1.00m with flush lockable protective cover. Backfill details from base of hole: bentonite seal up to 1.00m, fine gravel filter up to 0.50m, bentonite seal up to 0.10m, concrete up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015 + A1:2020

Logged by **EPS**
 Figure **1 of 1**
 09/07/2021

geotechnics

BOREHOLE RECORD - Dynamic Sampler

Preliminary

Project **NEWPORT QUINN SDD RFP** Engineer **PINNACLE CONSULTING ENGINEERS LIMITED** Borehole Project No **WS-BH107**
 Client **PINNACLE CONSULTING ENGINEERS LIMITED** National Grid Coordinates **327651.5 E 184120.4 N** Ground Level **11.00 m OD**

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD	
0.10- 0.35	B					MADE GROUND: Black tarmacadam.	G.I.		11.00	
0.10	D						0.10		10.90	
0.10	ES					MADE GROUND: Orangish brown very gravelly slightly silty fine to coarse sand with a low subangular cobble content of sandstone. Gravel is subangular to subrounded fine to coarse of sandstone.	0.35		10.65	
0.10	ES		PID=							
0.35- 1.00	B					MADE GROUND: Brown very sandy slightly silty subangular to subrounded fine to coarse gravel of sandstone. Medium subrounded cobble content of sandstone.	1.20		9.80	
0.50	D		PID=							
0.50	ES									
1.00- 1.20	B					MADE GROUND: Very dense yellowish brown and dark reddish brown very sandy silty subangular fine to coarse gravel of sandstone.	1.62		9.38	
1.00	D					At 1.20m, cobble obstruction.				
1.00	ES		TR= 100%			At 1.62m, cobble obstruction.				
1.20- 1.60	B				50/85					
1.20- 1.60	D	(DRY)								
1.20- 1.44	D	(DRY)								
1.60	D	(DRY)			50*/20					
1.60- 1.62						End of Borehole				

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	GM/EPS	G.I.			26/05/21	08:00						None encountered.
1.62	0.10	Dynamic Sampler	GM/EPS	1.62			26/05/21	18:00						

Remarks Inspection pit hand excavated to 1.20m depth and no services were found.
 AGS sample = 1 x vial, 1 x plastic jar and 1 amber jar.
 The Dynamic Sample Borehole was terminated at 1.62m depth upon encountering an obstruction.
 Backfill details from base of hole: bentonite seal up to 0.35m, tarmacadam up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015 + A1:2020



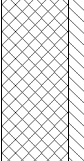
Figure 1 of 1
 09/07/2021

geotechnics

BOREHOLE RECORD - Dynamic Sampler

Preliminary

Project **NEWPORT QUINN SDD RFP** Engineer **PINNACLE CONSULTING ENGINEERS LIMITED** Borehole Project No **WS-BH108**
 Client **PINNACLE CONSULTING ENGINEERS LIMITED** National Grid Coordinates **328245.5 E 184180.5 N** Ground Level **13.31 m OD**

Sampling			Properties			Strata	Scale 1:50				
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD		
0.00- 0.30	B	(DRY)	PID=4.0	54/ 250		MADE GROUND: Very soft slightly sandy slightly gravelly clay with many rootlets. Gravel is subangular to subrounded fine to coarse of sandstone.	G.L.		13.31		
0.10	D						0.20		13.11		
0.10	ES										
0.20- 0.80	B		PID=1.56				MADE GROUND: Reddish brown sandy to very sandy silty subangular fine to coarse gravel of sandstone. Medium subangular to cobble content of sandstone. Below 0.90m, high angular cobble content of sandstone. At 1.00m, sandstone boulder.				
0.30	D										
0.30	ES										
0.50			PID=4.22								
0.80- 1.20	B										
1.00	D										
1.00	ES										
1.00											
1.20- 1.60	D										
						End of Borehole	1.60		11.71		

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.35	Inspection Pit	GM/EPS	G.I.		DRY	25/05/21	08:00						None encountered
1.20	0.05	Dynamic Sampler	GM/EPS	1.60			25/05/21	10:45						

Remarks Inspection pit hand excavated to 1.20m depth and no services were found.
 AGS sample = 1 x vial, 1 x plastic jar and 1 amber jar.
 The Dynamic Sample Borehole was terminated at 1.60m depth upon encountering an obstruction.
 Backfill details from base of hole: bentonite seal up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015 + A1:2020

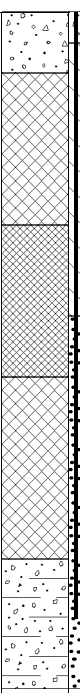
Logged by **EPS**
 Figure **1 of 1**
 09/07/2021

geotechnics

BOREHOLE RECORD - Dynamic Sampler

Preliminary

Project NEWPORT QUINN SDD RFP Engineer PINNACLE CONSULTING ENGINEERS LIMITED Borehole WS-BH110
 Client PINNACLE CONSULTING ENGINEERS LIMITED National Grid Coordinates 327807.0 E 183961.4 N Project No PN214233 Client Ref. EPS Ground Level 10.95 m OD

Sampling			Properties			Strata	Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD
0.00			TR= %			MADE GROUND: Grey reinforced concrete.	G.L.		10.95
0.40- 0.80	B					MADE GROUND: Brown and black very sandy slightly silty angular to subrounded fine to coarse gravel of sandstone. Medium subangular cobble content of slag.	0.40		10.55
0.50	B								
0.50	ES		PID=1.5						
0.50									
0.80- 1.20	B								
1.00	B								
1.00	ES		PID=1.3				1.40		9.55
1.20- 1.40	D					MADE GROUND: Stiff brown mottled grey slightly sandy slightly gravelly clay. Gravel is subrounded to rounded fine to coarse of sandstone. Below 2.10m, becomes very stiff and reddish brown.			
1.20 2.00		(DRY)	TR= 100%		S21				
1.20- 1.65	D								
1.40- 2.10	B								
2.00	D								
2.00 2.45		(DRY)	TR= 100%		S30				
2.00- 2.45	ES						2.40		8.55
2.00			PID=1.4			MADE GROUND: Yellowish brown very sandy slightly clayey subangular fine to coarse gravel of sandstone. Low cobble content. At 2.50m, cobble obstruction. At 2.70m, pocket (up to 30mm) of light grey silty sand with a strong organic odour. Below 3.00m, loose.			
2.10- 2.40	D								
2.40- 3.00	D								
2.45 3.00		(DRY)	TR= 100%		50/295				
2.50- 2.95	D	(DRY)			S5				
3.00- 3.45	D	(DRY)	PID=1.7			Soft becoming firm reddish brown slightly sandy slightly gravelly CLAY with a low angular cobble content of sandstone. Gravel is angular to subangular fine to coarse of sandstone.			
2.70			TR= 50%						
3.00 4.00							3.60		7.35
3.80	D								
3.80	ES		PID=1.4		S13				
3.80		(DRY)							
4.00- 4.45	D						4.45		6.50
						End of Borehole			

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.40	0.35	Concrete Core	PO/SW	G.I.			25/05/21	08:00						None encountered.
1.20	0.35	Inspection Pit	GM/EP	4.45			25/05/21	18:00						
4.45	0.35	Windowless Sampler	GM/EP											

Remarks Inspection pit hand excavated to 1.20m depth and no services were found.
 AGS sample = 1 x vial, 1 x plastic jar and 1 amber jar.
 A 50mm standpipe was installed to 4.00m with a geowrapped slotted section from 2.00m to 4.00m with flush lockable protective cover. Backfill details from base of hole: fine gravel filter up to 2.00m, bentonite up to 0.20m, concrete up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres. Logged in accordance with BS5930:2015 + A1:2020

Logged by EPS
 Figure 1 of 1
 09/07/2021

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BOREHOLE RECORD - Cable Percussion

Preliminary

Project **NEWPORT QUINN SDD RFP** Engineer **PINNACLE CONSULTING ENGINEERS LIMITED** Borehole Project No **WS-BH111**
 Client **PINNACLE CONSULTING ENGINEERS LIMITED** National Grid Coordinates **327709.5 E 183945.3 N** Ground Level **10.92 m OD**

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w %	SPT N	Description	Depth	Legend	Level m OD	
						MADE GROUND: Grey reinforced concrete.	G.L.		10.92	
0.40	ES		PID=1.9			MADE GROUND: Brown very sandy silty angular to subrounded fine to coarse gravel of slag and sandstone. Low to medium subangular cobble content. At 0.40m, black plastic membrane. Below 1.00m, slag is absent. At 1.20m, cobble obstruction.	0.40		10.52	
0.40										
0.50- 1.00	B									
1.00	ES		PID=2.0							
1.00										
1.20- 1.70	B									
1.20- 1.50		(DRY)			C50/150					
1.80	D					MADE GROUND: Very dense reddish brown very sandy slightly silty subrounded fine to coarse gravel of sandstone. Medium subangular to subrounded cobble content of sandstone. Occasional pockets (up to 10mm) of fine to coarse sand.	2.00		8.92	
2.00- 2.50	B	(DRY)			C50/150					
2.00- 2.27										
2.80	D					Extremely weak reddish brown MUDSTONE	3.00		7.92	
3.00- 3.30	B				S50					
3.00- 3.45	D	(DRY)					3.45		7.47	
						End of Borehole				

Boring				Progress					Groundwater					
Depth	Hole Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.40	0.35	Concrete Core	PO/SW	3.45	3.00	DRY	27/05/21	08:00						None encountered.
1.20	0.35	Inspection Pit	PO/SW	0.00			27/05/21	18:00						
3.45	0.20	Cable Percussion	PO/SW											


Remarks  Inspection pit hand excavated to 1.20m depth and no services were found.
 ES sample = 1 x vial, 1 x plastic jar and 1 amber jar.
 The Borehole was terminated at 3.45m depth upon encountering bedrock.
 A 50mm standpipe was installed to 3.00m with a geowrapped slotted section from 2.00m to 3.00m with flush lockable protective cover. Backfill details from base of hole: fine gravel filter up to 2.00m, bentonite seal up to 0.20m, concrete up to ground level.

Symbols and abbreviations are explained on the accompanying key sheet.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Logged by **EPS**
 Figure **1 of 1**
 09/07/2021



APPENDIX 7

Exploratory Hole Location Plan



- Key
- Locations By Type - Empty
 - Locations By Type - CP
 - Locations By Type - DS
 - Locations By Type - DS+RC

GEOTECHNICS
geotechnical and geoenvironmental specialists

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River Lane
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Email: mail@geotechnics.co.uk

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Engineer:
Pinnacle Consulting Engineers Limited

Client:
Pinnacle Consulting Engineers Limited

Project:
NEWPORT QUINN SDD RFP

Drawing Title:
Exploratory Hole Location Plan

Scale: 1:3500 at A3	Date: 20/07/2021
Project No.: PN214233	Exploratory Hole Location Plan

APPENDIX 8

Monitoring Results

FIELDWORK - Insitu Gas Monitoring - Daily Record

Project NEWPORT QUINN SDD RFP

Project No

PN214233

Date

17/06/2021

Client Pinnacle Consulting Engineers Limited

Sheet No.

1 (1 of 3)

Equipment Used

GI Infra Red Gas Analyser

MK1 ☐

MK2 ☐

GA2000 ☐

Other Gas Data GFM435;

Weather / Site Conditions

Wind

Still ☐

Light ☒

Moderate ☐

Strong ☐

Cloud Cover

None ☐

Slight ☐

Cloudy ☒

Overcast ☐

Precipitation

Dry ☒

Slight ☐

Moderate ☐

Heavy ☐

Borehole	Depth to Base (m)	Depth to Water (m bgl)	Current Hole Depth (m bgl)	Methane (Peak) CH4 (% VOL)	Methane (Steady) CH4 (% VOL)	Carbon Dioxide (Peak) (% VOL)	Carbon Dioxide (Steady) (% VOL)	Oxygen O2 (% VOL)	Remarks
CP-BH101	5.50	2.00	4.87	0.0	0.0	0.6	0.6	19.7	
CP-BH102	8.00	3.00	8.17	1.4	1.2	0.0	0.0	19.6	
CP-BH103	3.00	1.33	3.04	0.0	0.0	1.0	0.9	18.3	
RC-BH101	3.00	2.54	2.85	0.0	0.0	0.0	0.0	15.5	
RC-BH102	12.00	2.61	11.86	0.0	0.0	0.3	0.0	19.9	
RC-BH103	8.30	2.21	8.24	0.0	0.0	0.2	0.0	12.2	
RC-BH104	15.00	2.50	14.80	0.0	0.0	0.5	0.5	14.5	
RC-BH105	4.00	2.29	4.00	0.0	0.0	0.1	0.0	19.8	
WS-BH102	2.28	Dry	1.85	0.0	0.0	1.8	1.8	19.2	
WS-BH103	2.50	2.13	2.50	0.0	0.0	0.0	0.0	20.0	
WS-BH104	2.00	1.88	1.91	0.0	0.0	0.0	0.0	20.0	
WS-BH105	1.00	0.71	0.96	0.0	0.0	0.0	0.0	18.3	
WS-BH106	1.50	1.46	1.53	0.0	0.0	1.1	1.0	18.6	
WS-BH109	2.50	1.13	2.54	0.0	0.0	0.0	0.0	19.7	
WS-BH110	4.00	2.84	4.00	0.0	0.0	0.2	0.2	18.0	
WS-BH111	3.00	3.00	3.14	0.0	0.0	0.0	0.0	17.6	

Remarks

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FIELDWORK - Insitu Gas Monitoring - Daily Record

Project NEWPORT QUINN SDD RFP

Project No

PN214233

Date

17/06/2021

Client Pinnacle Consulting Engineers Limited

Sheet No.

1 (2 of 3)

Equipment Used

GI Infra Red Gas Analyser

MK1 ☐

MK2 ☐

GA2000 ☐

Other Gas Data GFM435;

Weather / Site Conditions

Wind

Still ☐

Light ☒

Moderate ☐

Strong ☐

Cloud Cover

None ☐

Slight ☐

Cloudy ☒

Overcast ☐

Precipitation

Dry ☒

Slight ☐

Moderate ☐

Heavy ☐

Borehole	Depth to Base (m)	Oxygen (Steady) (% VOL)	Hydrogen Sulphide H2S (ppm)	Carbon Monoxide CO (ppm)	Barometric Pressure (mbar)	Diff. Pressure (Pa)	Flow Rate (Peak) (l/hr)	Flow Rate (Steady) (l/hr)	Remarks
CP-BH101	5.50	19.7	0	1	1006	0	0.0	0.0	
CP-BH102	8.00	19.8	0	6	1007	0	0.0	0.0	
CP-BH103	3.00	18.5	0	11	1006	0	0.0	0.0	
RC-BH101	3.00	15.5	25	136	1006	0	0.0	0.0	
RC-BH102	12.00	20.3	0	1	1006	0	0.0	0.0	
RC-BH103	8.30	12.2	0	0	1006	0	0.0	0.0	
RC-BH104	15.00	14.5	0	77	1007	0	119.8	0.0	
RC-BH105	4.00	20.4	0	1	1008	0	0.0	0.0	
WS-BH102	2.28	19.2	0	18	1006	0	0.0	0.0	
WS-BH103	2.50	20.3	0	0	1006	0	0.0	0.0	
WS-BH104	2.00	20.6	0	0	1007	0	0.0	0.0	
WS-BH105	1.00	20.4	0	0	1007	0	0.0	0.0	
WS-BH106	1.50	18.8	0	3	1007	0	0.0	0.0	
WS-BH109	2.50	20.2	0	1	1006	0	0.0	0.0	
WS-BH110	4.00	18.2	0	1	1006	0	0.0	0.0	
WS-BH111	3.00	17.6	0	3	1006	0	0.0	0.0	

Remarks

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FIELDWORK - Insitu Gas Monitoring - Daily Record

Project NEWPORT QUINN SDD RFP

Project No

PN214233

Date

17/06/2021

Client Pinnacle Consulting Engineers Limited

Sheet No.

1 (3 of 3)

Equipment Used

GI Infra Red Gas Analyser

MK1 ☐

MK2 ☐

GA2000 ☐

Other Gas Data GFM435;

Weather / Site Conditions

Wind

Still ☐

Light ☒

Moderate ☐

Strong ☐

Cloud Cover

None ☐

Slight ☐

Cloudy ☒

Overcast ☐

Precipitation

Dry ☒

Slight ☐

Moderate ☐

Heavy ☐

Borehole	Depth to Base (m)	PID Reading (ppm)	Remarks
CP-BH101	5.50	1.0	
CP-BH102	8.00	1.6	
CP-BH103	3.00	1.0	
RC-BH101	3.00	1.0	
RC-BH102	12.00	1.0	
RC-BH103	8.30	1.0	
RC-BH104	15.00	1.0	
RC-BH105	4.00	1.0	
WS-BH102	2.28	1.0	
WS-BH103	2.50	1.0	
WS-BH104	2.00	1.0	
WS-BH105	1.00	1.0	
WS-BH106	1.50	1.0	
WS-BH109	2.50	1.0	
WS-BH110	4.00	1.0	
WS-BH111	3.00	1.0	

Remarks



APPENDIX 9

Laboratory Test Results - Geotechnical



Certificate of Analysis

Certificate Number 21-13747

Issued: 05-Jul-21

Client Geotechnics LTD
The Geotechnical Centre
Unit 1B Borders Ind. Park
River Lane
Saltney
Chester
CH4 8RJ

Our Reference 21-13747

Client Reference PN214233

Order No ON29740

Contract Title Newport

Description One Soil sample.

Date Received 01-Jun-21

Date Started 30-Jun-21

Date Completed 05-Jul-21

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. 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 except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick
Contracts Manager



Summary of Chemical Analysis

Soil Samples

Our Ref 21-13747

Client Ref PN214233

Contract Title Newport

Lab No	1869237
Sample ID	WS-BH103
Depth	2.40
Other ID	
Sample Type	ES
Sampling Date	26/05/2021
Sampling Time	n/s

Test	Method	LOD	Units	
Metals				
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l	18
Inorganics				
pH	DETSC 2008#		pH	7.7
Chloride Aqueous Extract	DETSC 2055	1	mg/l	5.9
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l	< 1.0
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	36
Sulphur as S, Total	DETSC 2320	0.01	%	< 0.01
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.03

Information in Support of the Analytical Results

Our Ref 21-13747
Client Ref PN214233
Contract Newport

Containers Received & Deviating Samples

Lab No	Sample ID	Date		Holding time exceeded for tests	Inappropriate container for tests
		Sampled	Containers Received		
1869237	WS-BH103 2.40 SOIL	26/05/21	PT 1L (1kg)		
<p>Key: P-Plastic T-Tub</p> <p>DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.</p>					

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.
Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.
The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-
Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report



Certificate of Analysis

Certificate Number 21-13748

Issued: 06-Jul-21

Client Geotechnics LTD
The Geotechnical Centre
Unit 1B Borders Ind. Park
River Lane
Saltney
Chester
CH4 8RJ

Our Reference 21-13748

Client Reference PN214233

Order No ON28458

Contract Title Newport

Description 3 Soil samples.

Date Received 28-May-21

Date Started 30-Jun-21

Date Completed 06-Jul-21

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. 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 except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick
Contracts Manager



Summary of Chemical Analysis

Soil Samples

Our Ref 21-13748

Client Ref PN214233

Contract Title Newport

Lab No	1869238	1869239	1869240
Sample ID	WS-BH102	WS-BH108	CP-BH102
Depth	0.50	1.00	2.20
Other ID			
Sample Type	ES	ES	ES
Sampling Date	24/05/2021	25/05/2021	24/05/2021
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
Metals						
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l	10	< 10	23
Inorganics						
pH	DETSC 2008#		pH			9.4
Chloride Aqueous Extract	DETSC 2055	1	mg/l	< 1.0	14	180
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l	< 1.0	2.1	< 1.0
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	300	83	92
Sulphur as S, Total	DETSC 2320	0.01	%	0.03	0.10	0.02
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.07	0.24	0.06

Information in Support of the Analytical Results

Our Ref 21-13748

Client Ref PN214233

Contract Newport

Containers Received & Deviating Samples

Lab No	Sample ID	Date		Containers Received	Holding time exceeded for tests	Inappropriate container for tests
		Sampled				
1869238	WS-BH102 0.50 SOIL	24/05/21		PT 1L (1kg)	Ammonia Aqueous Extract (3 days)	
1869239	WS-BH108 1.00 SOIL	25/05/21		PT 1L (1kg)		
1869240	CP-BH102 2.20 SOIL	24/05/21		PT 1L (1kg)	Ammonia Aqueous Extract (3 days)	

Key: P-Plastic T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report



Certificate of Analysis

Certificate Number 21-13750

Issued: 06-Jul-21

Client Geotechnics LTD
The Geotechnical Centre
Unit 1B Borders Ind. Park
River Lane
Saltney
Chester
CH4 8RJ

Our Reference 21-13750

Client Reference PN214233

Order No ON29764

Contract Title Newport

Description 3 Soil samples.

Date Received 04-Jun-21

Date Started 30-Jun-21

Date Completed 06-Jul-21

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. 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 except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick
Contracts Manager



Summary of Chemical Analysis

Soil Samples

Our Ref 21-13750

Client Ref PN214233

Contract Title Newport

Lab No	1869243	1869244	1869245
Sample ID	CP-BH101	WS-BH109	RC-BH104
Depth	4.20	6.00	3.00
Other ID			
Sample Type	ES	ES	ES
Sampling Date	27/05/2021	27/05/2021	01/06/2021
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
Metals						
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l	< 10	< 10	< 10
Inorganics						
pH	DETSC 2008#		pH	7.4	11.5	10.4
Chloride Aqueous Extract	DETSC 2055	1	mg/l	4.8	42	1200
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l	< 1.0	8.7	< 1.0
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	33	38	550
Sulphur as S, Total	DETSC 2320	0.01	%	0.02	0.12	0.18
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.04	0.32	0.55

Information in Support of the Analytical Results

Our Ref 21-13750
 Client Ref PN214233
 Contract Newport

Containers Received & Deviating Samples

Lab No	Sample ID	Date		Containers Received	Holding time exceeded for tests	Inappropriate container for tests
		Sampled				
1869243	CP-BH101 4.20 SOIL	27/05/21		PT 1L (1kg)	Ammonia Aqueous Extract (3 days), Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
1869244	WS-BH109 6.00 SOIL	27/05/21		PT 1L (1kg)	Ammonia Aqueous Extract (3 days), Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
1869245	RC-BH104 3.00 SOIL	01/06/21		PT 1L (1kg)		

Key: P-Plastic T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

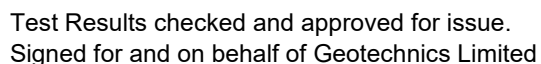
From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report

Form REP008 Rev 3

Note: Any descriptions, opinions or interpretations are outside the scope of UKAS accreditation.
The results within this report relate only to the samples tested and received from the client.



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203 Torrington Avenue, Tile Hill,
Coventry, CV4 9UT

LABORATORY RESULTS - Point Load Strength Determination

Project NEWPORT QUINN SDD RFP

Project No: PN214233

Sample					w %	W mm	D mm	Fail Load kN	Test Type/ Direction	De mm	De ² mm ²	Is MN/m ²	F	Is ₅₀ MN/m ²
Hole	Depth (Specimen Depth) m	Type	Sample Ref	Description										
RC-BH10 1	6.76-	C	N83558	Extremely weak brownish red MUDSTONE.		86	86	0.21	D/PL	86.00	7396	0.028	1.276	0.036
	6.89					86	59	0.16	A/PD	80.38	6460	0.024	1.238	0.030
	(6.76- 6.89)					86	58	0.12	A/PD	79.69	6351	0.018	1.233	0.022
RC-BH10 2	6.64-	C	N83559	Extremely weak brownish red MUDSTONE.		86	81	0.17	A/PD	94.18	8869	0.020	1.330	0.026
	6.84													
	(6.64- 6.84)													
RC-BH10 2	8.80-	C	N83560	Weak grey SILTSTONE.		86	87	5.06	D/PL	87.00	7569	0.668	1.283	0.857
	8.90					86	79	2.30	A/PD	93.01	8650	0.266	1.322	0.352
	(8.80- 8.90)													
RC-BH10 2	10.39-	C	N83561	Weak grey SILTSTONE.		86	86	1.34	D/PL	86.00	7396	0.181	1.276	0.232
	10.50					86	60	1.66	A/PD	81.06	6570	0.252	1.243	0.313
	(10.39- 10.50)					86	44	1.18	A/PD	69.41	4818	0.246	1.159	0.285
RC-BH10 2	11.31-	C	N83562	Extremely weak brownish red MUDSTONE.		86	87	0.12	D/PL	87.00	7569	0.015	1.283	0.020
	11.41					87	59	0.15	A/PD	80.84	6536	0.022	1.241	0.028
	(11.31- 11.41)					87	45	0.93	A/PD	70.60	4985	0.187	1.168	0.218
RC-BH10 2	13.34-	C	N83564	Very weak brownish red MUDSTONE.		87	87	0.91	D/PL	87.00	7569	0.120	1.283	0.154
	13.50					87	81	0.61	A/PD	94.72	8973	0.068	1.333	0.091
	(13.34- 13.50)					87	41	0.83	A/PD	67.39	4542	0.183	1.144	0.210
RC-BH10 2	14.32-	C	N83580	Very weak brownish red MUDSTONE.		86	82	0.56	A/PD	94.76	8979	0.063	1.333	0.084
	14.49													
	(14.32- 14.49)													
RC-BH10 3	5.40-	C	N83566	Extremely weak brownish red MUDSTONE.		85	85	0.08	D/PL	85.00	7225	0.011	1.270	0.014
	5.50					85	52	0.07	A/PD	75.02	5628	0.012	1.200	0.015
	(5.40- 5.50)					85	49	0.08	A/PD	72.82	5303	0.016	1.184	0.019
RC-BH10 3	7.17-	C	N83567	Very weak to weak brownish red MUDSTONE.		86	87	1.68	D/PL	87.00	7569	0.222	1.283	0.284
	7.31					87	72	3.44	A/PD	89.31	7976	0.431	1.298	0.559
	(7.17- 7.31)					87	69	2.20	A/PD	87.43	7643	0.288	1.286	0.370
RC-BH10 3	8.00-	C	N83568	Extremely weak to very weak brownish red MUDSTONE.		86	86	0.18	D/PL	86.00	7396	0.025	1.276	0.032
	8.19					86	86	0.30	D/PL	86.00	7396	0.041	1.276	0.052
	(8.00- 8.19)					86	69	0.30	A/PD	86.92	7555	0.040	1.283	0.051
RC-BH10 4	5.74-	C	N83569	Extremely weak brownish red MUDSTONE.		86	86	0.06	D/PL	86.00	7396	0.009	1.276	0.011
	5.90					86	59	0.07	A/PD	80.38	6460	0.011	1.238	0.013
	(5.74- 5.90)					86	51	0.08	A/PD	74.73	5584	0.015	1.198	0.017

Remarks  Test Type D - Diametral, A - Axial, I - Lump or Irregular Test
 Direction PL - parallel to planes of weakness, R - Random or unknown orientation,
 PD - perpendicular to planes of weakness
 Fail Load UF - unacceptable failure
 For Standards followed see Laboratory Test Certificate


GEOTECHNICS
 geotechnical and geoenvironmental specialists

LABORATORY RESULTS - Point Load Strength Determination

Project NEWPORT QUINN SDD RFP

Project No: PN214233

Sample					w	W	D	Fail Load	Test Type/ Direction	De	De ²	Is	F	Is ₅₀
Hole	Depth (Specimen Depth) m	Type	Sample Ref	Description	%	mm	mm	kN		mm	mm ²	MN/m ²		MN/m ²
RC-BH10 4	6.69- 6.79 (6.69- 6.79)	C	N83570	Extremely weak brownish red MUDSTONE.		86	69	0.08	A/PD	86.92	7555	0.011	1.283	0.014
RC-BH10 4	10.40- 10.50 (10.40- 10.50)	C	N83572	Weak grey SILTSTONE.		86	72	3.44	A/PD	88.79	7884	0.436	1.295	0.565
RC-BH10 4	10.83- 11.01 (10.83- 11.01)	C	N83573	Very weak brownish red MUDSTONE.		87 87 87 87	87 87 69 71	0.53 1.01 1.57 1.73	D/PL D/PL A/PD A/PD	87.00 87.00 87.43 88.68	7569 7569 7643 7865	0.070 0.133 0.205 0.220	1.283 1.283 1.286 1.294	0.090 0.171 0.264 0.284
RC-BH10 4	13.07- 13.17 (13.07- 13.17)	C	N83574	Weak brownish red MUDSTONE.		87 87 87	87 49 28	2.78 4.56 1.78	D/PL A/PD A/PD	87.00 73.67 55.69	7569 5428 3102	0.367 0.840 0.575	1.283 1.191 1.050	0.471 1.000 0.604
RC-BH10 4	13.65- 13.73 (13.65- 13.73)	C	N83575	Weak brownish red MUDSTONE.		87 87 85	87 52 48	3.80 3.99 5.60	D/PL A/PD A/PD	87.00 75.90 72.08	7569 5760 5195	0.502 0.692 1.077	1.283 1.207 1.179	0.644 0.835 1.270
RC-BH10 5	6.63- 6.84 (6.63- 6.84)	C	N83576	Extremely weak brownish red MUDSTONE.		85 86 86	86 81 78	0.25 0.20 0.21	D/PL A/PD A/PD	86.00 94.18 92.42	7396 8869 8541	0.033 0.023 0.024	1.276 1.330 1.318	0.042 0.031 0.032
RC-BH10 5	8.83- 9.00 (8.83- 9.00)	C	N83578	Very weak brownish red MUDSTONE.		86 86 86	86 67 82	0.40 0.40 0.37	D/PL A/PD A/PD	86.00 85.65 94.76	7396 7336 8979	0.054 0.054 0.041	1.276 1.274 1.333	0.069 0.069 0.055
RC-BH10 5	9.80- 10.00 (9.80- 10.00)	C	N83579	Extremely weak brownish red MUDSTONE.		87 88 88	88 79 59	0.20 0.17 0.10	D/PL A/PD A/PD	88.00 94.08 81.31	7744 8852 6611	0.026 0.019 0.015	1.290 1.329 1.245	0.033 0.025 0.019

Remarks  Test Type D - Diametral, A - Axial, I - Lump or Irregular Test
 Direction PL - parallel to planes of weakness, R - Random or unknown orientation,
 PD - perpendicular to planes of weakness
 Fail Load UF - unacceptable failure
 For Standards followed see Laboratory Test Certificate

GEOTECHNICS
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TEST REPORT
Determination Of Water Content
ISO 17892-1: 2014

Project No: D21327 Project Name: Newport Quinn SDD RFP ATS Sample No: 24776	Client: Geotechnics Address: Unit 1 Borders Industrial Park River Lane Saltney Chester CH4 8RJ
--	---

Site Ref / Hole ID: CP BH0101 Sample No: Sampling Certificate Received: No	Depth (m): 1.20 - 1.70 Sample Type: Bulk Material Description: Brown very gravelly sandy CLAY
---	--

Location in Works: N/A Date Sampled: 16 June 2021 Sampled By: Geotechnics Date Received: 16 June 2021	Material Source: Site Generated Material Supplier: Site Generated Specification: BS1377 Date Tested: 23 June 2021
--	--

Test Results

Moisture Content (%)	15.9
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Remarks:

TEST REPORT

LIQUID LIMIT, PLASTIC LIMIT & PLASTICITY INDEX

BS 1377:Part 2:1990. Clause 4.3/5.3/5.4

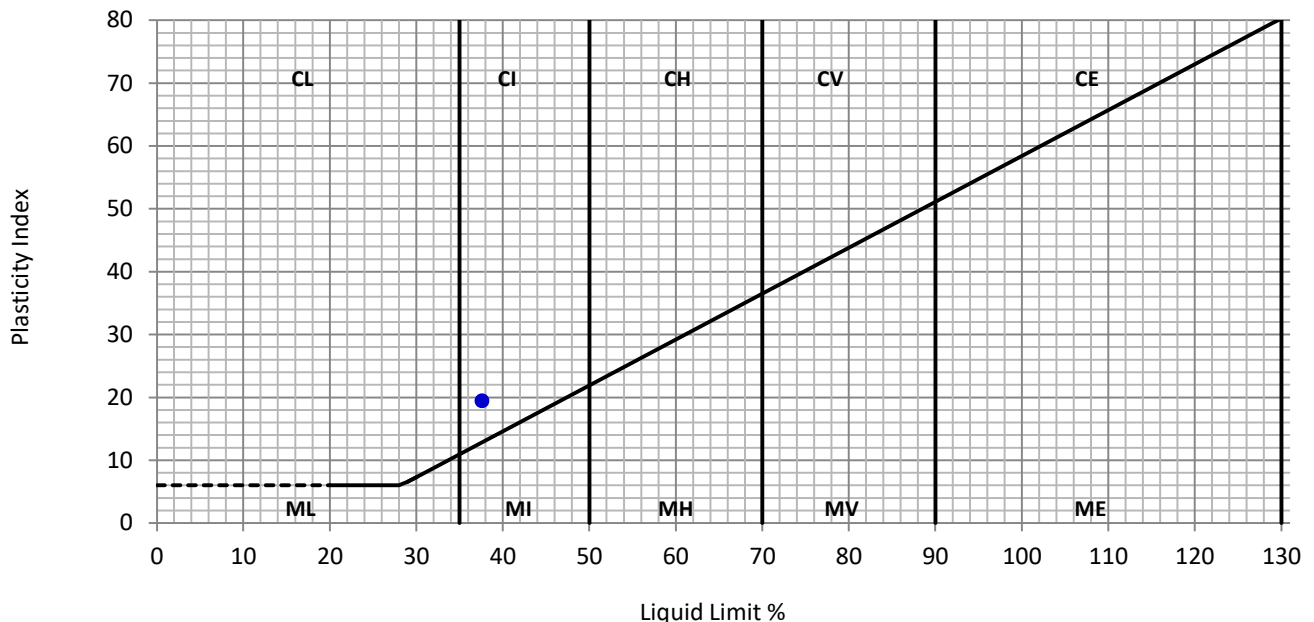
Project No:	D21327	Client:	Geotechnics
Project Name:	Newport Quinn SDD RFP	Address:	Unit 1 Borders Industrial Park River Lane Saltney Chester CH4 8RJ
ATS Sample No:	24776		

Site Ref / Hole ID:	CP BH0101	Depth (m):	1.20 - 1.70
Sample No:		Sample Type:	Bulk
Sampling Certificate Received:	No	Material Description:	Brown very gravelly sandy CLAY
Location in Works:	N/A	Material Source:	Site Generated
Date Sampled:	16 June 2021	Material Supplier:	Site Generated
Sampled By:	Geotechnics	Specification:	BS1377
Date Received:	16 June 2021	Date Tested:	23 June 2021

Test Results

Liquid Limit	38	%
Plastic Limit	18	%
Plasticity Index	19	%

Preparation:	4.2.4 Sieved Specimen
Proportion retained on 425µm sieve:	55 %



Remarks:

QA Ref.

BS1377 - 2
Rev. 2.0



Apex Testing Solutions

Sturmi Way, Village Farm Industrial Est, Pyle,
Bridgend, CF33 6BZ
Tel: 01656 746762 Fax: 01656 749096



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Approver

L Davis

L Davis, Quality Manager

Date

23/06/2021

Fig.

ATT

TEST REPORT
Determination Of Water Content
ISO 17892-1: 2014

Project No:	D21327	Client:	Geotechnics
Project Name:	Newport Quinn SDD RFP	Address:	Unit 1 Borders Industrial Park River Lane Saltney Chester CH4 8RJ
ATS Sample No:	24777		
Site Ref / Hole ID:	CPBH102	Depth (m):	2.00 -
Sample No:		Sample Type:	Disturbed
Sampling Certificate Received:	No	Material Description:	Brown very gravelly sandy CLAY
Location in Works:	N/A	Material Source:	Site Generated
Date Sampled:	16 June 2021	Material Supplier:	Site Generated
Sampled By:	Geotechnics	Specification:	BS1377
Date Received:	16 June 2021	Date Tested:	22 June 2021

Test Results

Moisture Content (%)	10.9
----------------------	------

Remarks:

QA Ref.

EN ISO 17892-1:2014 E



Apex Testing Solutions

Sturmi Way, Village Farm Industrial Est,
Pyle, Bridgend, CF33 6BZ

Tel: 01656 746762 Fax: 01656 749096



7771

Approver

A Grogan

Date

22/06/2021

A Grogan, Laboratory Manager

Fig

MC

TEST REPORT
LIQUID LIMIT, PLASTIC LIMIT & PLASTICITY INDEX
BS 1377:Part 2:1990. Clause 4.3/5.3/5.4

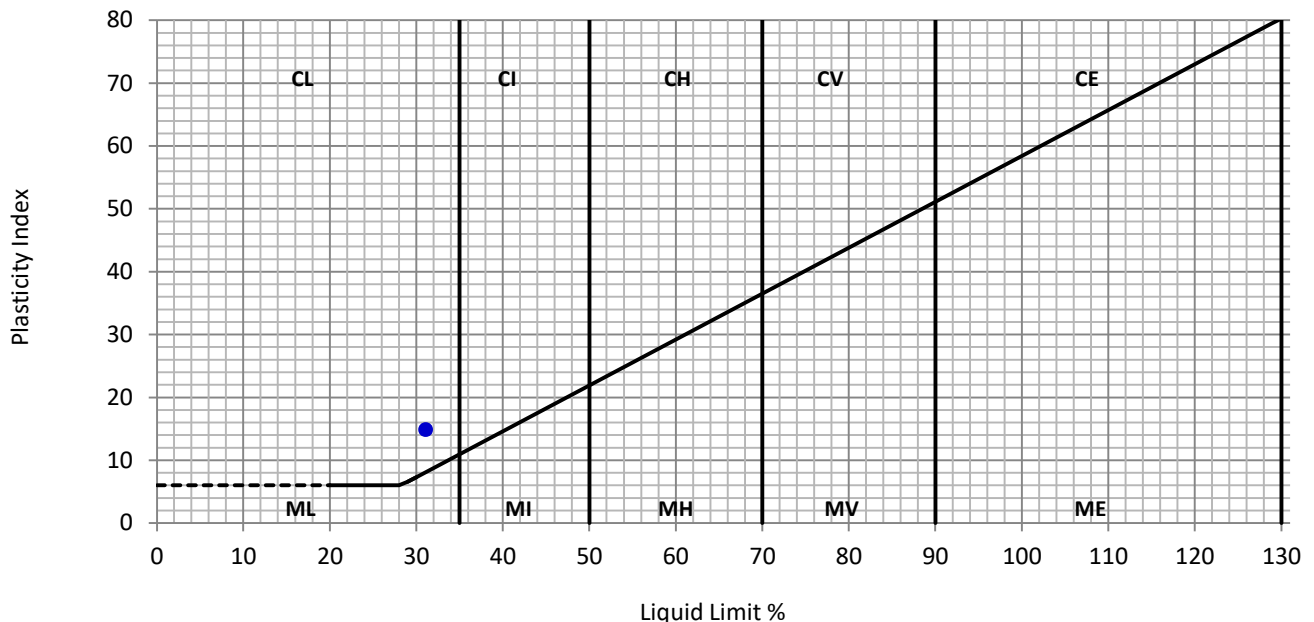
Project No:	D21327	Client:	Geotechnics
Project Name:	Newport Quinn SDD RFP	Address:	Unit 1 Borders Industrial Park River Lane Saltney Chester CH4 8RJ
ATS Sample No:	24777		

Site Ref / Hole ID:	CPBH102	Depth (m):	2.00 -
Sample No:		Sample Type:	Disturbed
Sampling Certificate Received:	No	Material Description:	Brown very gravelly sandy CLAY
Location in Works:	N/A	Material Source:	Site Generated
Date Sampled:	16 June 2021	Material Supplier:	Site Generated
Sampled By:	Geotechnics	Specification:	BS1377
Date Received:	16 June 2021	Date Tested:	22 June 2021

Test Results

Liquid Limit	31	%
Plastic Limit	16	%
Plasticity Index	15	%

Preparation:	4.2.4 Sieved Specimen
Proportion retained on 425µm sieve:	49 %



Remarks:

QA Ref.

BS1377 - 2
Rev. 2.0



Apex Testing Solutions

Sturmi Way, Village Farm Industrial Est, Pyle,
Bridgend, CF33 6BZ
Tel: 01656 746762 Fax: 01656 749096



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Approver

L Davis

L Davis, Quality Manager

Date

22/06/2021

Fig.

ATT

TEST REPORT
Determination Of Water Content
ISO 17892-1: 2014

Project No: D21327 Project Name: Newport Quinn SDD RFP ATS Sample No: 24778	Client: Geotechnics Address: Unit 1 Borders Industrial Park River Lane Saltney Chester CH4 8RJ
--	---

Site Ref / Hole ID: RC BH101 Sample No: Sampling Certificate Received: No Location in Works: N/A Date Sampled: 16 June 2021 Sampled By: Geotechnics Date Received: 16 June 2021	Depth (m): 2.82 - 3.02 Sample Type: Disturbed Material Description: Brown CLAY Material Source: Site Generated Material Supplier: Site Generated Specification: BS1377 Date Tested: 22 June 2021
--	---

Test Results

Moisture Content (%)	32.1
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Remarks:

TEST REPORT

LIQUID LIMIT, PLASTIC LIMIT & PLASTICITY INDEX

BS 1377:Part 2:1990. Clause 4.3/5.3/5.4

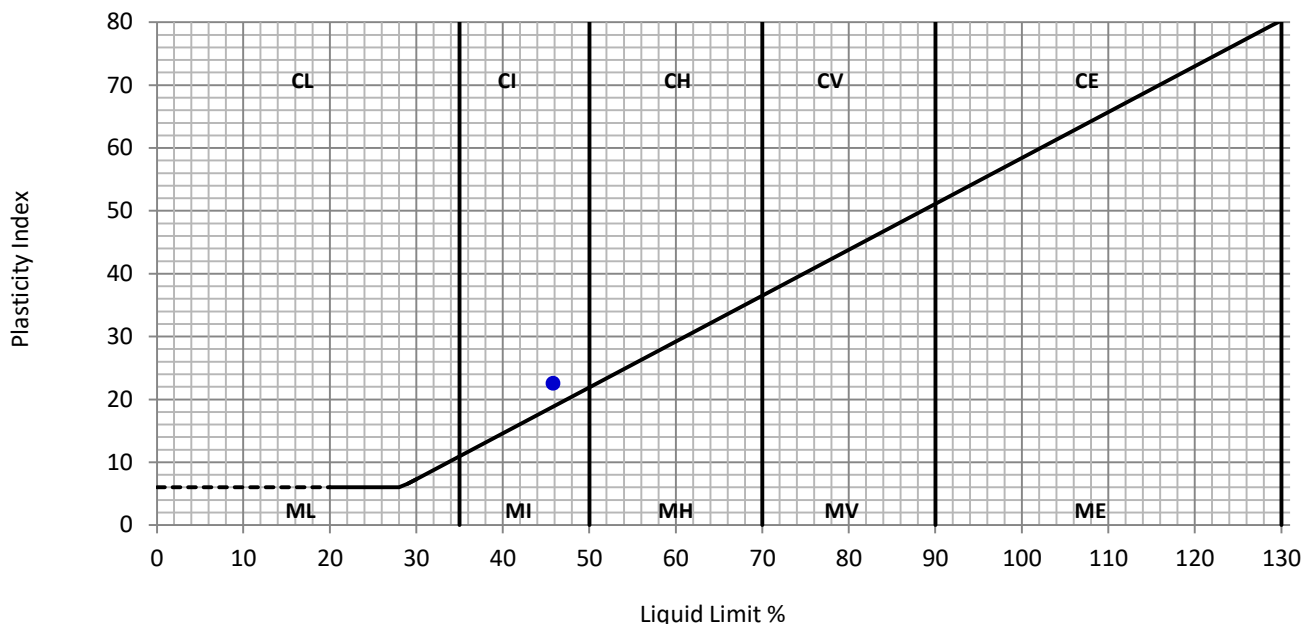
Project No:	D21327	Client:	Geotechnics
Project Name:	Newport Quinn SDD RFP	Address:	Unit 1 Borders Industrial Park River Lane Saltney Chester CH4 8RJ
ATS Sample No:	24778		

Site Ref / Hole ID:	RC BH101	Depth (m):	2.82 - 3.02
Sample No:		Sample Type:	Disturbed
Sampling Certificate Received:	No	Material Description:	Brown CLAY
Location in Works:	N/A	Material Source:	Site Generated
Date Sampled:	16 June 2021	Material Supplier:	Site Generated
Sampled By:	Geotechnics	Specification:	BS1377
Date Received:	16 June 2021	Date Tested:	21 June 2021

Test Results

Liquid Limit	46	%
Plastic Limit	23	%
Plasticity Index	23	%

Preparation:	4.2.3 Natural Specimen
Proportion retained on 425µm sieve:	0 %



Remarks:

QA Ref.

BS1377 - 2
Rev. 2.0



Apex Testing Solutions

Sturmi Way, Village Farm Industrial Est, Pyle,
Bridgend, CF33 6BZ
Tel: 01656 746762 Fax: 01656 749096



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Approver

L Davis

L Davis, Quality Manager

Date

22/06/2021

Fig.

ATT

TEST REPORT
Determination Of Water Content
ISO 17892-1: 2014

Project No:	D21327	Client:	Geotechnics
Project Name:	Newport Quinn SDD RFP	Address:	Unit 1 Borders Industrial Park River Lane Saltney Chester CH4 8RJ
ATS Sample No:	24779		

Site Ref / Hole ID:	RC BH102	Depth (m):	2.70 - 2.90
Sample No:		Sample Type:	Disturbed
Sampling Certificate Received:	No	Material Description:	Brown CLAY
Location in Works:	N/A	Material Source:	Site Generated
Date Sampled:	16 June 2021	Material Supplier:	Site Generated
Sampled By:	Geotechnics	Specification:	BS1377
Date Received:	16 June 2021	Date Tested:	22 June 2021

Test Results

Moisture Content (%)	19.6
----------------------	------

Remarks:

QA Ref.

EN ISO 17892-1:2014 E



Apex Testing Solutions

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7771

Approver

A Grogan

Date

22/06/2021

A Grogan, Laboratory Manager

Fig

MC

TEST REPORT
LIQUID LIMIT, PLASTIC LIMIT & PLASTICITY INDEX
BS 1377:Part 2:1990. Clause 4.3/5.3/5.4

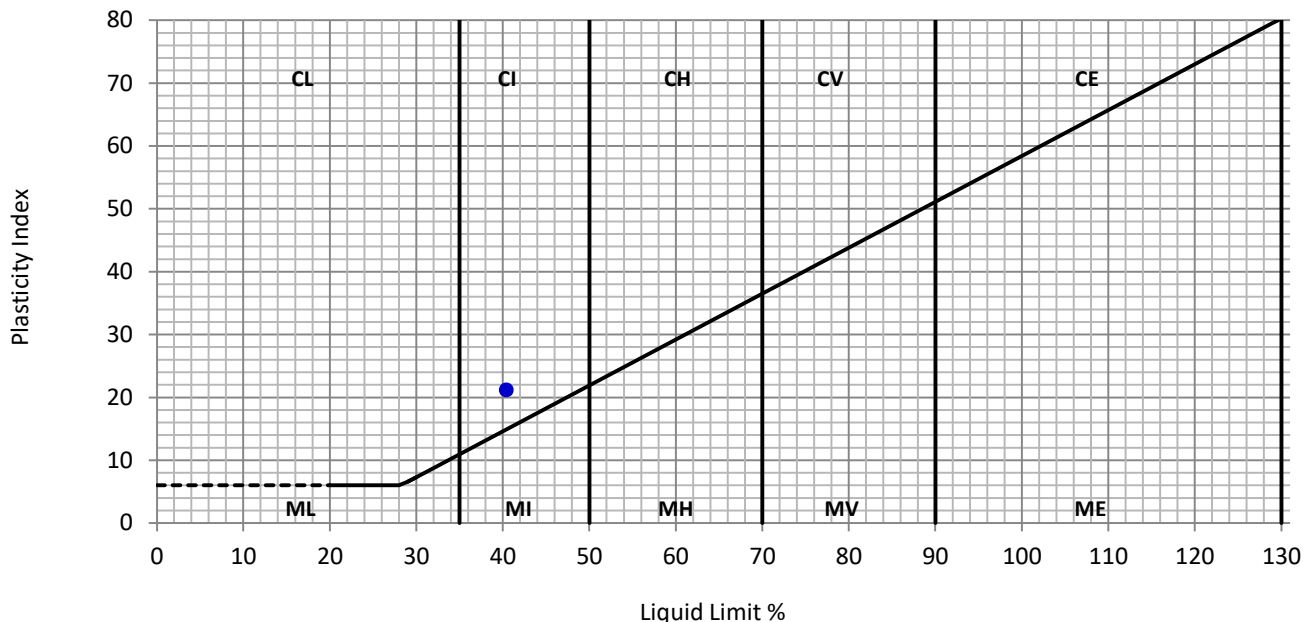
Project No:	D21327	Client:	Geotechnics
Project Name:	Newport Quinn SDD RFP	Address:	Unit 1 Borders Industrial Park River Lane Saltney Chester CH4 8RJ
ATS Sample No:	24779		

Site Ref / Hole ID:	RC BH102	Depth (m):	2.70 - 2.90
Sample No:		Sample Type:	Disturbed
Sampling Certificate Received:	No	Material Description:	Brown CLAY
Location in Works:	N/A	Material Source:	Site Generated
Date Sampled:	16 June 2021	Material Supplier:	Site Generated
Sampled By:	Geotechnics	Specification:	BS1377
Date Received:	16 June 2021	Date Tested:	21 June 2021

Test Results

Liquid Limit	40	%
Plastic Limit	19	%
Plasticity Index	21	%

Preparation:	4.2.3 Natural Specimen
Proportion retained on 425µm sieve:	0 %



Remarks:

QA Ref.

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Rev. 2.0



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Approver

L Davis

L Davis, Quality Manager

Date

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Fig.

ATT

TEST REPORT
Determination Of Water Content
ISO 17892-1: 2014

Project No: D21327 Project Name: Newport Quinn SDD RFP ATS Sample No: 24780	Client: Geotechnics Address: Unit 1 Borders Industrial Park River Lane Saltney Chester CH4 8RJ
--	---

Site Ref / Hole ID: RC BH103 Sample No: Sampling Certificate Received: No	Depth (m): 3.05 - 3.20 Sample Type: Disturbed Material Description: Brown gravelly sandy CLAY
--	--

Location in Works: N/A Date Sampled: 16 June 2021 Sampled By: Geotechnics Date Received: 16 June 2021	Material Source: Site Generated Material Supplier: Site Generated Specification: BS1377 Date Tested: 22 June 2021
--	--

Test Results

Moisture Content (%)	9.1
----------------------	-----

Remarks:

TEST REPORT

LIQUID LIMIT, PLASTIC LIMIT & PLASTICITY INDEX

BS 1377:Part 2:1990. Clause 4.3/5.3/5.4

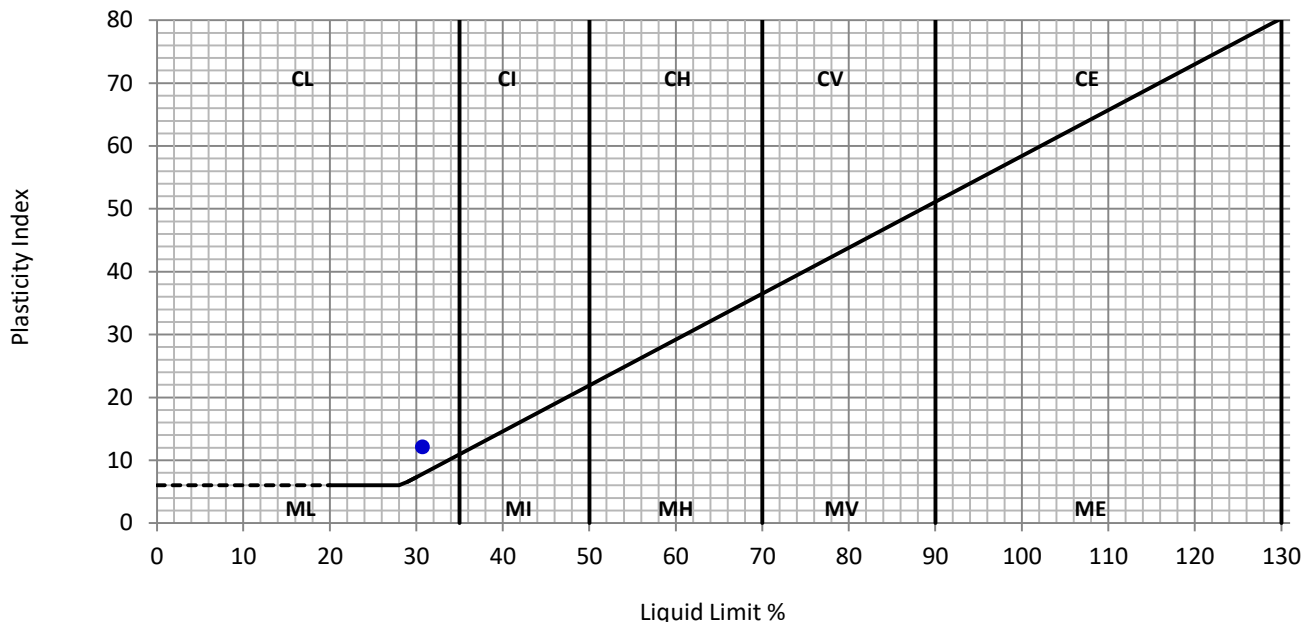
Project No:	D21327	Client:	Geotechnics
Project Name:	Newport Quinn SDD RFP	Address:	Unit 1 Borders Industrial Park River Lane Saltney Chester CH4 8RJ
ATS Sample No:	24780		

Site Ref / Hole ID:	RC BH103	Depth (m):	3.05 - 3.20
Sample No:		Sample Type:	Disturbed
Sampling Certificate Received:	No	Material Description:	Brown gravelly sandy CLAY
Location in Works:	N/A	Material Source:	Site Generated
Date Sampled:	16 June 2021	Material Supplier:	Site Generated
Sampled By:	Geotechnics	Specification:	BS1377
Date Received:	16 June 2021	Date Tested:	21 June 2021

Test Results

Liquid Limit	31	%
Plastic Limit	19	%
Plasticity Index	12	%

Preparation:	4.2.4 Sieved Specimen
Proportion retained on 425µm sieve:	11 %



Remarks:

QA Ref.

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Date

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Fig.

ATT

TEST REPORT
Determination Of Water Content
ISO 17892-1: 2014

Project No:	D21327	Client:	Geotechnics
Project Name:	Newport Quinn SDD RFP	Address:	Unit 1 Borders Industrial Park River Lane Saltney Chester CH4 8RJ
ATS Sample No:	24783		

Site Ref / Hole ID:	WS BH103	Depth (m):	2.40 -
Sample No:		Sample Type:	Disturbed
Sampling Certificate Received:	No	Material Description:	Brown slightly gravelly CLAY
Location in Works:	N/A	Material Source:	Site Generated
Date Sampled:	16 June 2021	Material Supplier:	Site Generated
Sampled By:	Geotechnics	Specification:	BS1377
Date Received:	16 June 2021	Date Tested:	22 June 2021

Test Results

Moisture Content (%)	38.1
----------------------	------

Remarks:

QA Ref.

EN ISO 17892-1:2014 E



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Approver

A Grogan

Date

22/06/2021

Fig

MC

A Grogan, Laboratory Manager

TEST REPORT

LIQUID LIMIT, PLASTIC LIMIT & PLASTICITY INDEX

BS 1377:Part 2:1990. Clause 4.3/5.3/5.4

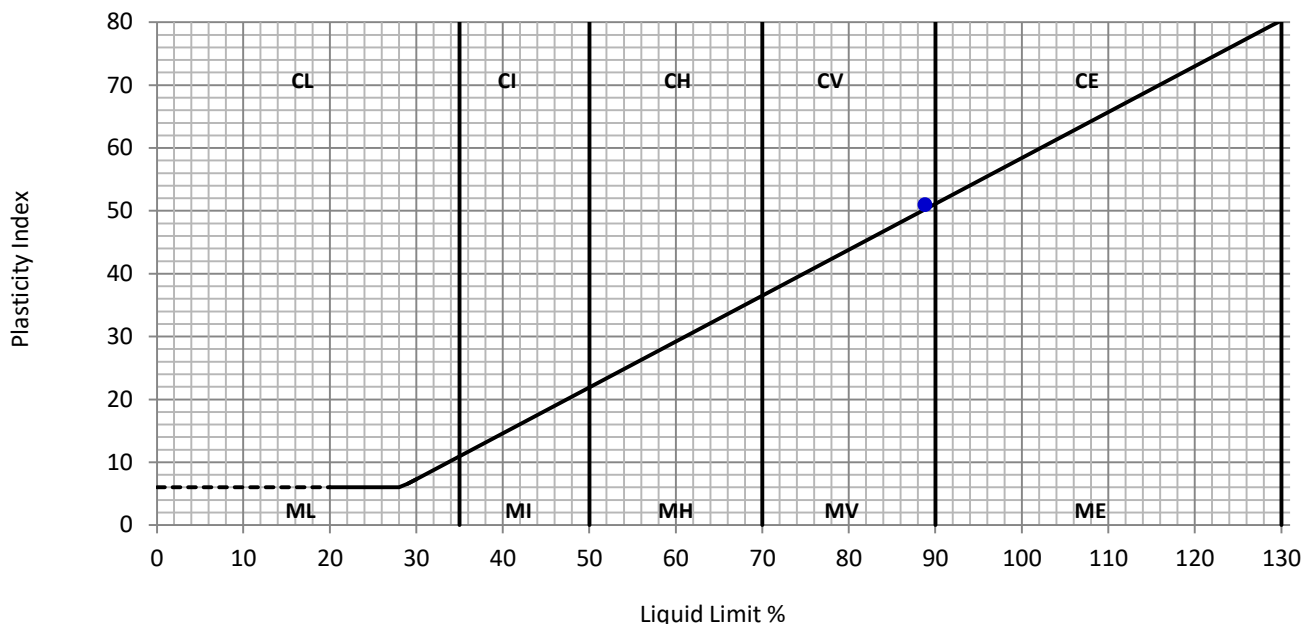
Project No:	D21327	Client:	Geotechnics
Project Name:	Newport Quinn SDD RFP	Address:	Unit 1 Borders Industrial Park River Lane Saltney Chester CH4 8RJ
ATS Sample No:	24783		

Site Ref / Hole ID:	WS BH103	Depth (m):	2.40 -
Sample No:		Sample Type:	Disturbed
Sampling Certificate Received:	No	Material Description:	Brown slightly gravelly CLAY
Location in Works:	N/A	Material Source:	Site Generated
Date Sampled:	16 June 2021	Material Supplier:	Site Generated
Sampled By:	Geotechnics	Specification:	BS1377
Date Received:	16 June 2021	Date Tested:	21 June 2021

Test Results

Liquid Limit	89	%
Plastic Limit	38	%
Plasticity Index	51	%

Preparation:	4.2.4 Sieved Specimen
Proportion retained on 425µm sieve:	11 %



Remarks:

QA Ref.

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Date

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Fig.

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TEST REPORT
Determination Of Water Content
ISO 17892-1: 2014

Project No:	D21327	Client:	Geotechnics
Project Name:	Newport Quinn SDD RFP	Address:	Unit 1 Borders Industrial Park River Lane Saltney Chester CH4 8RJ
ATS Sample No:	24784		
Site Ref / Hole ID:	WS BH105	Depth (m):	1.10 -
Sample No:		Sample Type:	Disturbed
Sampling Certificate Received:	No	Material Description:	Brown very gravelly sandy CLAY
Location in Works:	N/A	Material Source:	Site Generated
Date Sampled:	16 June 2021	Material Supplier:	Site Generated
Sampled By:	Geotechnics	Specification:	BS1377
Date Received:	16 June 2021	Date Tested:	22 June 2021

Test Results

Moisture Content (%)	8.6
----------------------	-----

Remarks:

QA Ref.

EN ISO 17892-1:2014 E



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Date

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Fig

MC

TEST REPORT

LIQUID LIMIT, PLASTIC LIMIT & PLASTICITY INDEX

BS 1377:Part 2:1990. Clause 4.3/5.3/5.4

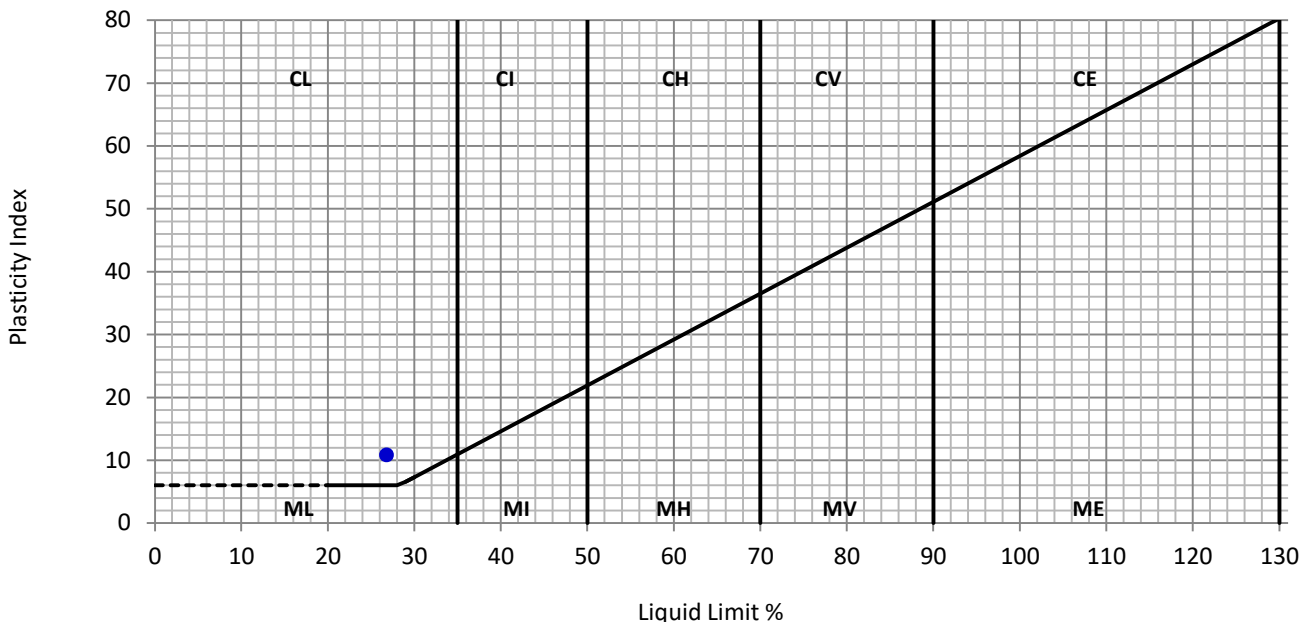
Project No:	D21327	Client:	Geotechnics
Project Name:	Newport Quinn SDD RFP	Address:	Unit 1 Borders Industrial Park River Lane Saltney Chester CH4 8RJ
ATS Sample No:	24784		

Site Ref / Hole ID:	WS BH105	Depth (m):	1.10 -
Sample No:		Sample Type:	Disturbed
Sampling Certificate Received:	No	Material Description:	Brown very gravelly sandy CLAY
Location in Works:	N/A	Material Source:	Site Generated
Date Sampled:	16 June 2021	Material Supplier:	Site Generated
Sampled By:	Geotechnics	Specification:	BS1377
Date Received:	16 June 2021	Date Tested:	22 June 2021

Test Results

Liquid Limit	27	%
Plastic Limit	16	%
Plasticity Index	11	%

Preparation:	4.2.4 Sieved Specimen
Proportion retained on 425µm sieve:	48 %



Remarks:

QA Ref.

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Approver

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L Davis, Quality Manager

Date

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Fig.

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TEST REPORT
Determination Of Water Content
ISO 17892-1: 2014

Project No: D21327 Project Name: Newport Quinn SDD RFP ATS Sample No: 24786	Client: Geotechnics Address: Unit 1 Borders Industrial Park River Lane Saltney Chester CH4 8RJ
--	---

Site Ref / Hole ID: WS BH109 Sample No: Sampling Certificate Received: No	Depth (m): 1.20 - 1.70 Sample Type: Bulk Material Description: Brown very gravelly sandy CLAY
--	--

Location in Works: N/A Date Sampled: 16 June 2021 Sampled By: Geotechnics Date Received: 16 June 2021	Material Source: Site Generated Material Supplier: Site Generated Specification: BS1377 Date Tested: 23 June 2021
--	--

Test Results

Moisture Content (%)	16.4
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Remarks:

TEST REPORT
LIQUID LIMIT, PLASTIC LIMIT & PLASTICITY INDEX
BS 1377:Part 2:1990. Clause 4.3/5.3/5.4

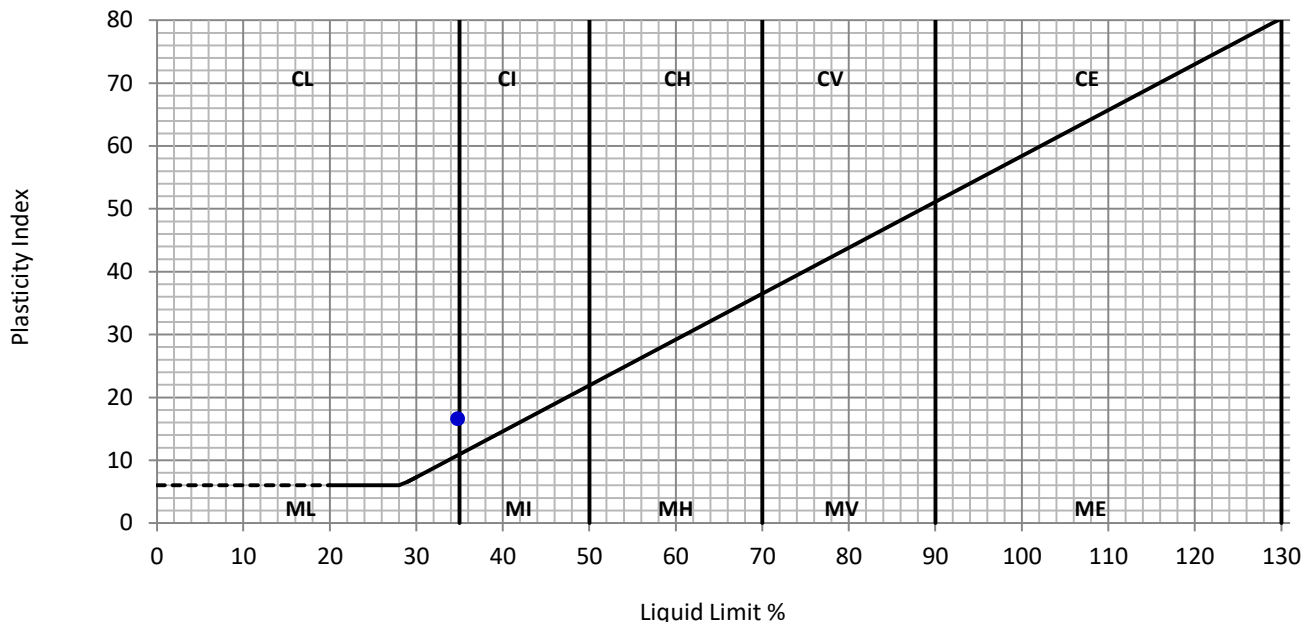
Project No:	D21327	Client:	Geotechnics
Project Name:	Newport Quinn SDD RFP	Address:	Unit 1 Borders Industrial Park River Lane Saltney Chester CH4 8RJ
ATS Sample No:	24786		

Site Ref / Hole ID:	WS BH109	Depth (m):	1.20 - 1.70
Sample No:		Sample Type:	Bulk
Sampling Certificate Received:	No	Material Description:	Brown very gravelly sandy CLAY
Location in Works:	N/A	Material Source:	Site Generated
Date Sampled:	16 June 2021	Material Supplier:	Site Generated
Sampled By:	Geotechnics	Specification:	BS1377
Date Received:	16 June 2021	Date Tested:	23 June 2021

Test Results

Liquid Limit	35	%
Plastic Limit	18	%
Plasticity Index	17	%

Preparation:	4.2.4 Sieved Specimen
Proportion retained on 425µm sieve:	42 %



Remarks:

QA Ref.

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Rev. 2.0



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Approver

L Davis

L Davis, Quality Manager

Date

23/06/2021

Fig.

ATT

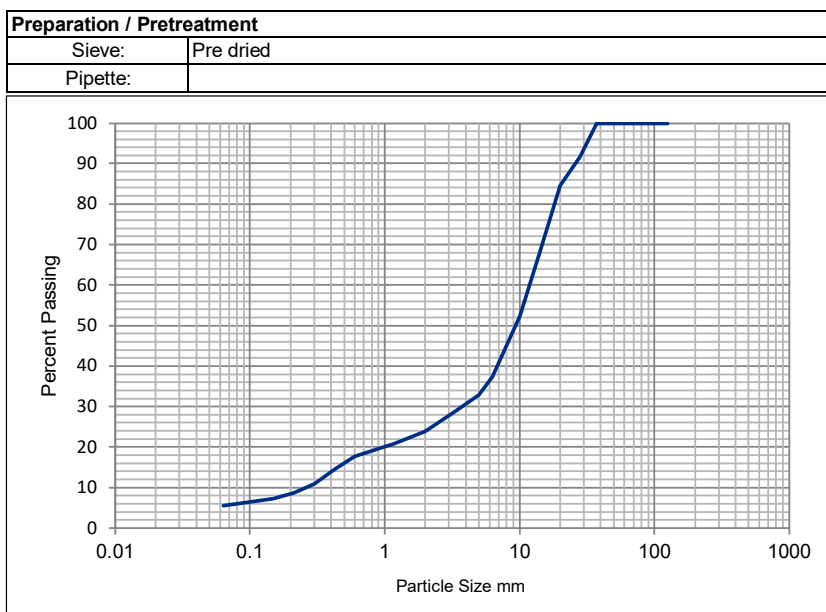
TEST REPORT
PARTICLE SIZE DISTRIBUTION ANALYSIS
BS1377:Part 2:1990

Project No:	D21327	Client:	Geotechnics
Project Name:	Newport Quinn SDD RFP	Address	Unit 1 Borders Industrial Park River Lane Saltney Chester CH4 8RJ
ATS Sample No:	24781		

Site Ref / Hole ID:	RC BH104	Depth (m):	0.40 - 1.20
Sample No:		Sample Type:	Bulk
Sampling Certificate Received:	No	Material Description:	Brown silty sandy GRAVEL
Location in Works:	N/A	Material Source:	Site Generated
Date Sampled:	16 June 2021	Material Supplier:	Site Generated
Sampled By:	Geotechnics	Specification:	BS1377
Date Received:	16 June 2021	Date Tested:	22 June 2021

Test Results

Sieving	
Particle Size mm	% Passing
125	100
90	100
75	100
63	100
50	100
37.5	100
28	92
20	85
14	68
10	52
6.3	37
5.0	33
3.35	29
2.00	24
1.18	21
0.600	18
0.425	15
0.300	11
0.212	9
0.150	7
0.063	6



Sample Portions		Particle Density Mg/m3	Uniformity Coefficient D ₆₀ / D ₁₀
Cobbles / Boulders	0	N/A	
Gravel	76		
Sand	18	Dry mass of sample, kg	
Silt / Clay	6	5.1	N/A

Remarks:

TEST REPORT
PARTICLE SIZE DISTRIBUTION ANALYSIS
BS1377:Part 2:1990

Project No:	D21327	Client:	Geotechnics
Project Name:	Newport Quinn SDD RFP	Address	Unit 1 Borders Industrial Park River Lane Saltney Chester CH4 8RJ
ATS Sample No:	24782		

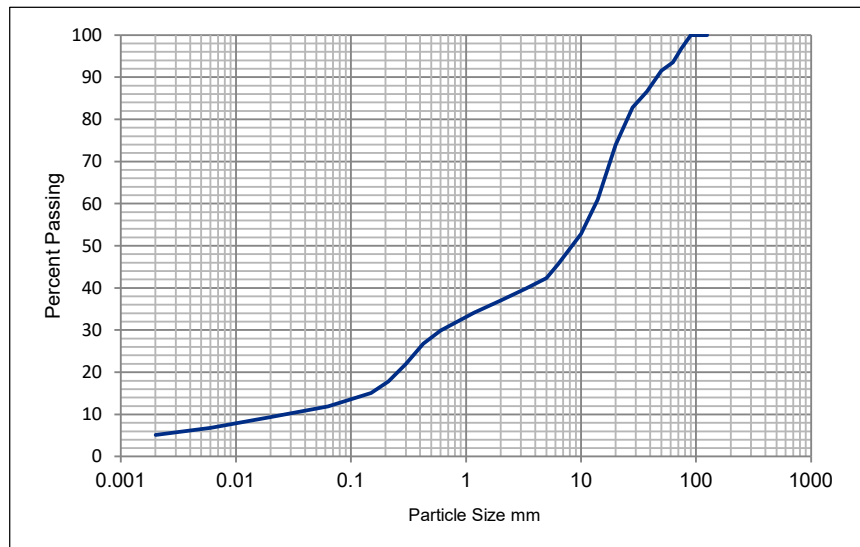
Site Ref / Hole ID:	WS BH102	Depth (m):	0.30 - 1.20
Sample No:		Sample Type:	Bulk
Sampling Certificate Received:	No	Material Description:	Brown slightly silty sandy GRAVEL
Location in Works:	N/A	Material Source:	Site Generated
Date Sampled:	16 June 2021	Material Supplier:	Site Generated
Sampled By:	Geotechnics	Specification:	BS1377
Date Received:	16 June 2021	Date Tested:	28 June 2021

Test Results

Sieving	
Particle Size mm	% Passing
125	100
90	100
75	97
63	94
50	92
37.5	87
28	83
20	74
14	61
10	53
6.3	46
5.0	42
3.35	40
2.00	37
1.18	34
0.600	30
0.425	27
0.300	22
0.212	18
0.150	15
0.063	12

Sedimentation	
Particle Size mm	% Passing
0.0201	9
0.0060	7
0.0020	5

Preparation / Pretreatment	
Sieve:	Pre dried
Pipette:	as BS1377



Sample Portions		Particle Density Mg/m3	Uniformity Coefficient D_{60} / D_{10}
Cobbles / Boulders	6	2.65 assumed	
Gravel	57	Dry mass of sample, kg	
Sand	25		
Silt	7		
Clay	5	21.3	

Remarks:

QA Ref.

BS1377 - 2
Rev. 1.0



Apex Testing Solutions

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Approver

A Grogan

A Grogan, Laboratory Manager

Date

28/06/2021

Fig

PSD

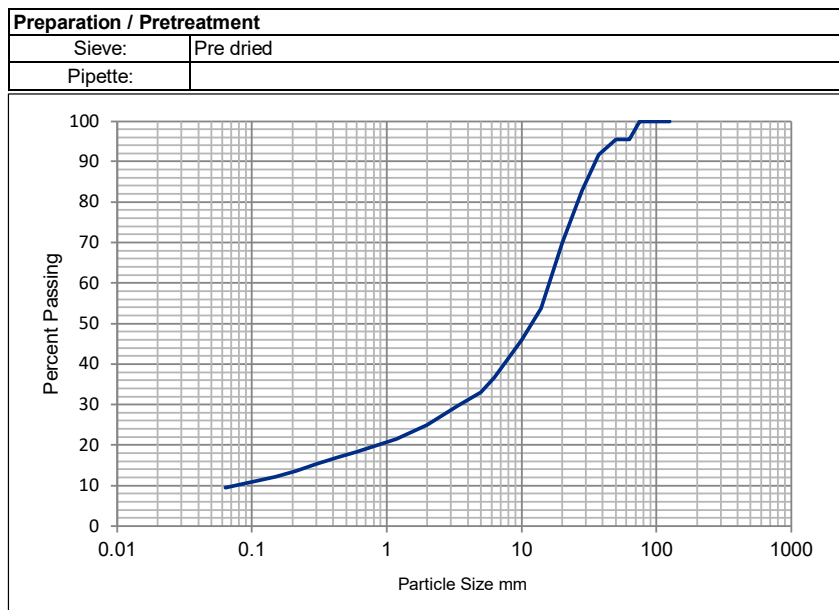
TEST REPORT
PARTICLE SIZE DISTRIBUTION ANALYSIS
BS1377:Part 2:1990

Project No:	D21327	Client:	Geotechnics
Project Name:	Newport Quinn SDD RFP	Address	Unit 1 Borders Industrial Park River Lane Saltney Chester CH4 8RJ
ATS Sample No:	24785		

Site Ref / Hole ID:	WS BH108	Depth (m):	0.80 - 1.20
Sample No:		Sample Type:	Bulk
Sampling Certificate Received:	No	Material Description:	Brown silty sandy GRAVEL with low cobble content
Location in Works:	N/A	Material Source:	Site Generated
Date Sampled:	16 June 2021	Material Supplier:	Site Generated
Sampled By:	Geotechnics	Specification:	BS1377
Date Received:	16 June 2021	Date Tested:	22 June 2021

Test Results

Sieving	
Particle Size mm	% Passing
125	100
90	100
75	100
63	95
50	95
37.5	92
28	83
20	70
14	54
10	46
6.3	37
5.0	33
3.35	30
2.00	25
1.18	21
0.600	18
0.425	17
0.300	15
0.212	14
0.150	12
0.063	10



Sample Portions		Particle Density Mg/m3	Uniformity Coefficient D_{60} / D_{10}
Cobbles / Boulders	5	N/A	
Gravel	70		
Sand	15	Dry mass of sample, kg	
Silt / Clay	10	13.4	N/A

Remarks:

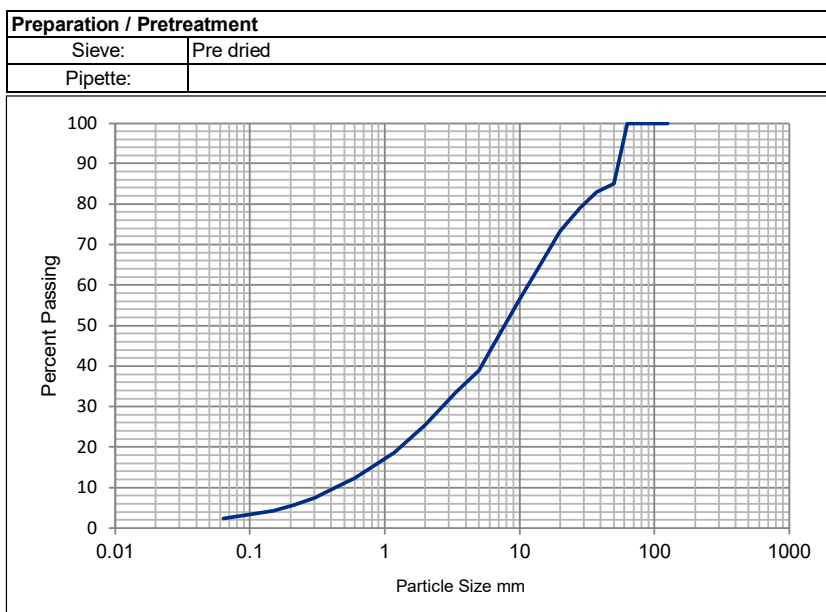
TEST REPORT
PARTICLE SIZE DISTRIBUTION ANALYSIS
BS1377:Part 2:1990

Project No:	D21327	Client:	Geotechnics
Project Name:	Newport Quinn SDD RFP	Address	Unit 1 Borders Industrial Park River Lane Saltney Chester CH4 8RJ
ATS Sample No:	24787		

Site Ref / Hole ID:	WS BH110	Depth (m):	0.40 - 0.80
Sample No:		Sample Type:	Bulk
Sampling Certificate Received:	No	Material Description:	Grey & black sandy GRAVEL
Location in Works:	N/A	Material Source:	Site Generated
Date Sampled:	16 June 2021	Material Supplier:	Site Generated
Sampled By:	Geotechnics	Specification:	BS1377
Date Received:	16 June 2021	Date Tested:	22 June 2021

Test Results

Sieving	
Particle Size mm	% Passing
125	100
90	100
75	100
63	100
50	85
37.5	83
28	79
20	73
14	64
10	57
6.3	45
5.0	39
3.35	33
2.00	25
1.18	19
0.600	12
0.425	10
0.300	8
0.212	6
0.150	4
0.063	3



Sample Portions		Particle Density Mg/m3	Uniformity Coefficient D ₆₀ / D ₁₀
Cobbles / Boulders	0	N/A	
Gravel	75		
Sand	23	Dry mass of sample, kg	
Silt / Clay	3	8.9	N/A

Remarks:

QA Ref.		Apex Testing Solutions Sturmi Way, Village Farm Industrial Est, Pyle, Bridgend, CF33 6BZ Tel: 01656 746762 Fax: 01656 749096	 7771	Approver <i>A Grogan</i>	Date 22/06/2021	Fig PSD
BS1377 - 4 Rev. 1.0				A Grogan, Laboratory Manager		

TEST REPORT
PARTICLE SIZE DISTRIBUTION ANALYSIS
BS1377:Part 2:1990

Project No:	D21327	Client:	Geotechnics
Project Name:	Newport Quinn SDD RFP	Address	Unit 1 Borders Industrial Park River Lane Saltney Chester CH4 8RJ
ATS Sample No:	24788		

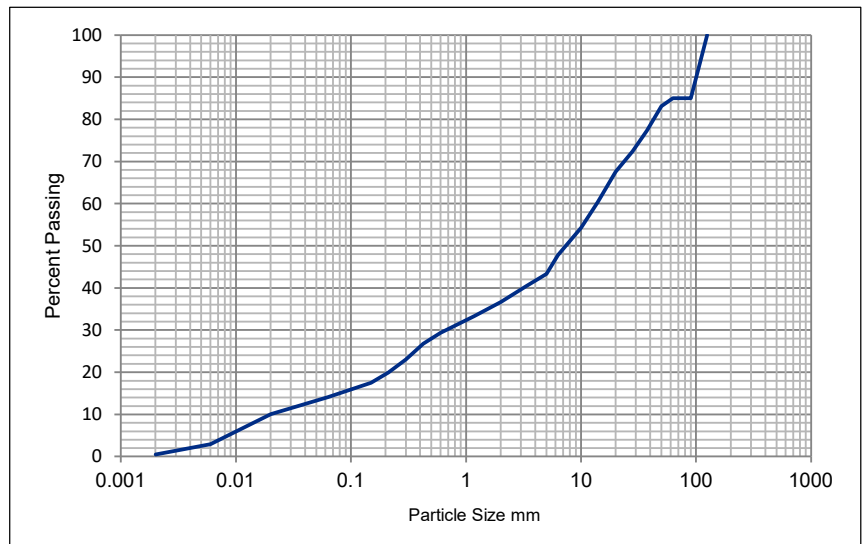
Site Ref / Hole ID:	WS BH111	Depth (m):	0.50 - 1.00
Sample No:		Sample Type:	Bulk
Sampling Certificate Received:	No	Material Description:	Dark brown silty sandy GRAVEL with high cobble content
Location in Works:	N/A	Material Source:	Site Generated
Date Sampled:	16 June 2021	Material Supplier:	Site Generated
Sampled By:	Geotechnics	Specification:	BS1377
Date Received:	16 June 2021	Date Tested:	28 June 2021

Test Results

Sieving	
Particle Size mm	% Passing
125	100
90	85
75	85
63	85
50	83
37.5	77
28	72
20	68
14	60
10	54
6.3	48
5.0	43
3.35	40
2.00	37
1.18	33
0.600	29
0.425	27
0.300	23
0.212	20
0.150	18
0.063	14

Sedimentation	
Particle Size mm	% Passing
0.0201	10
0.0060	3
0.0020	1

Preparation / Pretreatment	
Sieve:	Pre dried
Pipette:	as BS1377



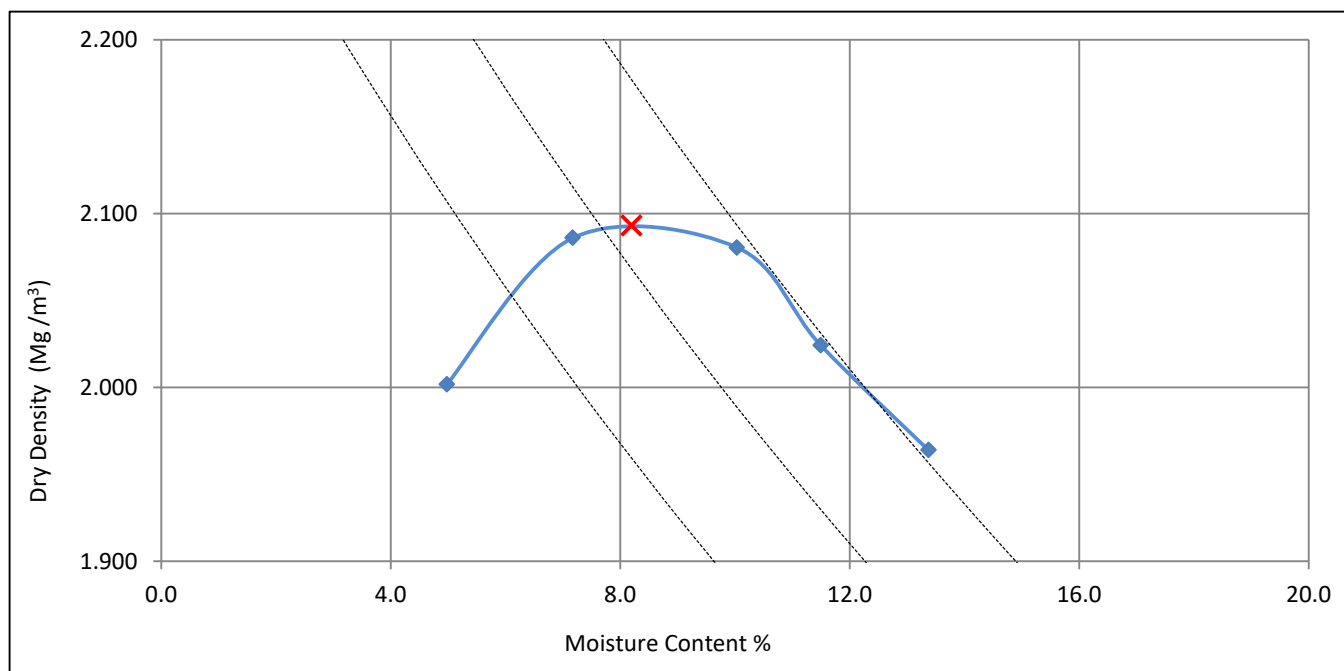
Sample Portions		Particle Density Mg/m3	Uniformity Coefficient D₆₀ / D₁₀
Cobbles / Boulders	15	2.65 assumed	
Gravel	48		
Sand	23	Dry mass of sample, kg	
Silt	14	13.1	
Clay	1		

Remarks:

TEST REPORT
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377:Part 4:1990: Clause 3.4

Project No:	D21327	Client:	Geotechnics
Project Name:	Newport Quinn SDD RFP	Address:	Unit 1 Borders Industrial Park River Lane Saltney Chester CH4 8RJ
ATS Sample No:	24782		

Site Ref / Hole ID:	WSBH102	Depth (m):	0.3-1.2
Sample No:		Sample Type:	Bulk
Sampling Certificate Received:	No	Material Description:	Brown clayey sandy GRAVEL
Location in Works:	N/A	Material Source:	Site Generated
Date Sampled:	16 June 2021	Material Supplier:	Site Generated
Sampled By:	Geotechnics	Specification:	BS1377
Date Received:	16 June 2021	Date Tested:	22 June 2021



Test Method:	BS 1377: part 4: 1990: clause 3.3, 2.5kg rammer in a 1 litre mould
Preparation:	Original sample was oven dried @ 105 oC, single specimen tested

Particle Density, Mg/m ³	2.65	assumed	Derived Parameters ✗	
Material > 37.5mm	13	%	Maximum Dry Density, Mg/m ³	2.09
Material < 37.5mm > 20mm	13	%	Optimum Moisture Content %	8.2

Remarks: Natural MC = 10.5, Tested as an "X" sample due to oversize

QA Ref.

BS1377 - 4
Rev. 2.0



Apex Testing Solutions

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Approver

L Davis

L Davis, Quality Manager

Date

22/06/2021

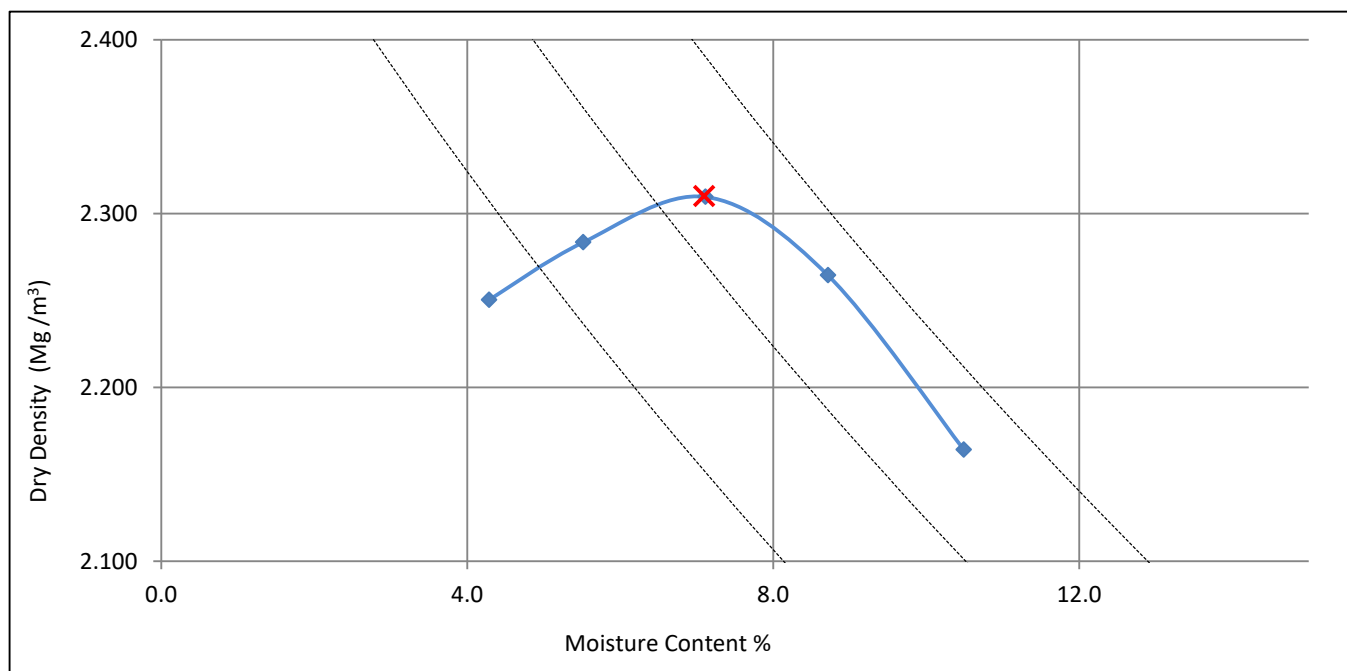
Fig.

COMP

TEST REPORT
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377:Part 4:1990: Clause 3.4

Project No:	D21327	Client:	Geotechnics
Project Name:	Newport Quinn SDD RFP	Address:	Unit 1 Borders Industrial Park River Lane Saltney Chester CH4 8RJ
ATS Sample No:	24786		

Site Ref / Hole ID:	WSBH108	Depth (m):	0.8-1.2
Sample No:		Sample Type:	Bulk
Sampling Certificate Received:	No	Material Description:	Brown silty sandy GRAVEL with low cobble content
Location in Works:	N/A	Material Source:	Site Generated
Date Sampled:	16 June 2021	Material Supplier:	Site Generated
Sampled By:	Geotechnics	Specification:	BS1377
Date Received:	16 June 2021	Date Tested:	25 June 2021



Test Method:	BS 1377: part 4: 1990: clause 3.3, 2.5kg rammer in a 1 litre mould
Preparation:	Original sample was oven dried @ 105 oC, single specimen tested

Particle Density, Mg/m ³	2.88	assumed	Derived Parameters ✗	
Material > 37.5mm	8	%	Maximum Dry Density, Mg/m ³	2.31
Material < 37.5mm > 20mm	23	%	Optimum Moisture Content %	7.1

Remarks:	Natural MC = 5.7, Tested as an "X" sample due to oversize
----------	---

QA Ref.

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L Davis

L Davis, Quality Manager

Date

25/06/2021

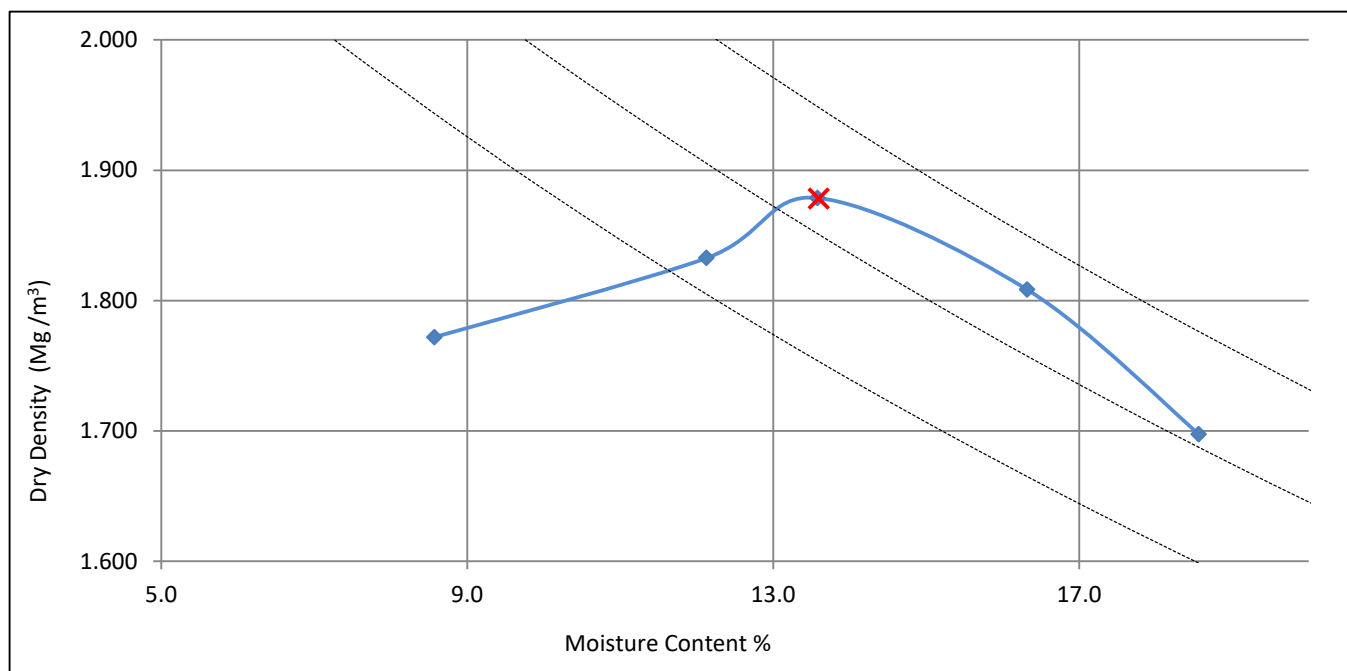
Fig.

COMP

TEST REPORT
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377:Part 4:1990: Clause 3.4

Project No:	D21327	Client:	Geotechnics
Project Name:	Newport Quinn SDD RFP	Address:	Unit 1 Borders Industrial Park River Lane Saltney Chester CH4 8RJ
ATS Sample No:	24786		

Site Ref / Hole ID:	WSBH109	Depth (m):	1.2-1.7
Sample No:		Sample Type:	Bulk
Sampling Certificate Received:	No	Material Description:	Brown very gravelly sandy CLAY
Location in Works:	N/A	Material Source:	Site Generated
Date Sampled:	16 June 2021	Material Supplier:	Site Generated
Sampled By:	Geotechnics	Specification:	BS1377
Date Received:	16 June 2021	Date Tested:	25 June 2021



Test Method:	BS 1377: part 4: 1990: clause 3.3, 2.5kg rammer in a 1 litre mould
Preparation:	Original sample was oven dried @ 105 oC, single specimen tested

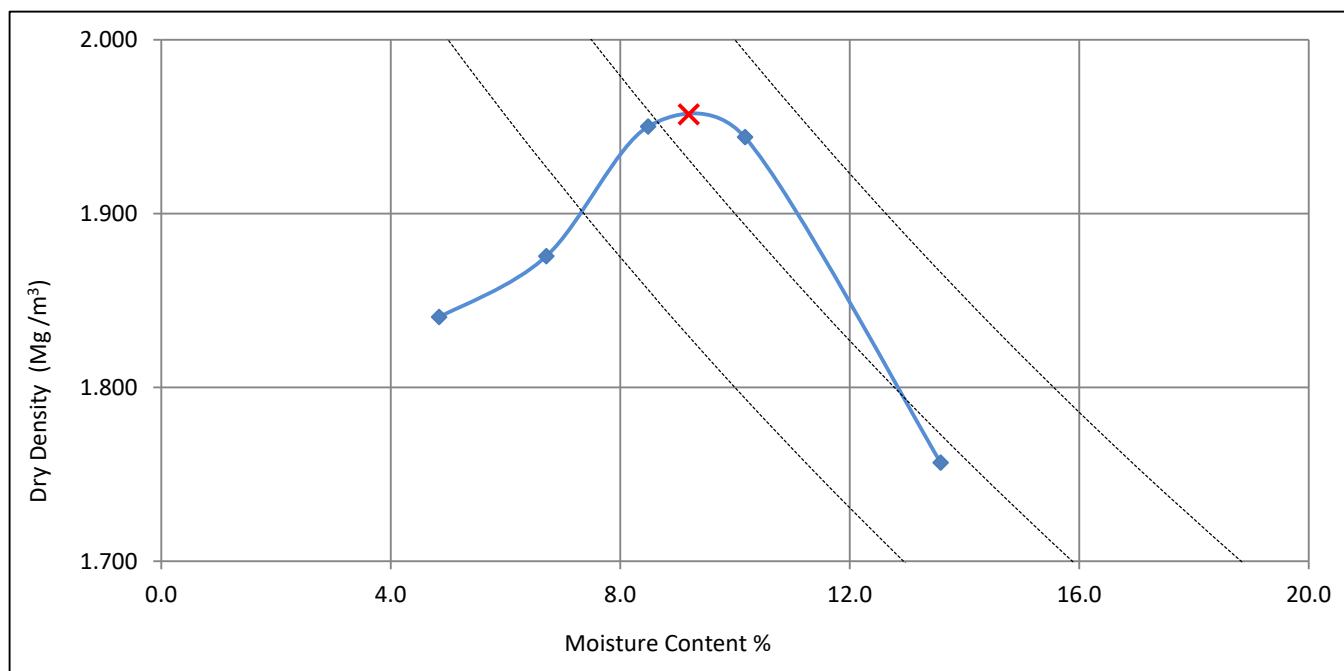
Particle Density, Mg/m³	2.65	assumed	Derived Parameters ✗
Material > 37.5mm	8	%	Maximum Dry Density, Mg/m³
Material < 37.5mm > 20mm	3	%	Optimum Moisture Content %

Remarks:	Natural MC = 16.4, Tested as an "X" sample due to oversize
----------	--

TEST REPORT
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377:Part 4:1990: Clause 3.4

Project No:	D21327	Client:	Geotechnics
Project Name:	Newport Quinn SDD RFP	Address:	Unit 1 Borders Industrial Park River Lane Saltney Chester CH4 8RJ
ATS Sample No:	24787		

Site Ref / Hole ID:	WSBH110	Depth (m):	0.4-0.8
Sample No:		Sample Type:	Bulk
Sampling Certificate Received:	No	Material Description:	Grey & black sandy GRAVEL
Location in Works:	N/A	Material Source:	Site Generated
Date Sampled:	16 June 2021	Material Supplier:	Site Generated
Sampled By:	Geotechnics	Specification:	BS1377
Date Received:	16 June 2021	Date Tested:	25 June 2021



Test Method:	BS 1377: part 4: 1990: clause 3.3, 2.5kg rammer in a 1 litre mould
Preparation:	Original sample was oven dried @ 105 oC, single specimen tested

Particle Density, Mg/m³	2.50	assumed	Derived Parameters ✗
Material > 37.5mm	17	%	Maximum Dry Density, Mg/m³
Material < 37.5mm > 20mm	10	%	Optimum Moisture Content %

Remarks: Natural MC = 10.2, Tested as an "X" sample due to oversize

QA Ref.

BS1377 - 4
Rev. 2.0



Apex Testing Solutions

Sturmi Way, Village Farm Industrial Est, Pyle,
Bridgend, CF33 6BZ
Tel: 01656 746762 Fax: 01656 749096



7771

Approver

L Davis

L Davis, Quality Manager

Date

25/06/2021

Fig.

COMP



Contract Number: 54502

Client Ref:

Report Date: **01-07-2021**

Client PO: **D21327**

Client **Apex Drilling Services Ltd**
Sturmi Way
Village Farm Industrial Estate, Pyle
Bridgend
CF33 6BZ

Contract Title: **Newport Quinn SDD RFP**
For the attention of: **Andrew Grogan**

Date Received: **16-06-2021**

Date Completed: **01-07-2021**

Test Description	Qty
PSD Wet Sieve method BS 1377:1990 - Part 2 : 9.2 - * UKAS	2
CBR: Remoulded Specimen and tested at top only BS 1377:1990 - Part 4 : 7 - * UKAS	3
Quick Undrained Triaxial Compression test - single specimen at one confining pressure (100mm or 38mm diameter) BS 1377:1990 - Part 7 : 8 - * UKAS	5
One-dimensional Consolidation 75mm or 50mm diameter specimens (5 days) BS 1377:1990 - Part 5 : 3 - * UKAS	3
Samples Received - @ Non Accredited Test	11
Disposal of samples for job	1

Notes: Observations and Interpretations are outside the UKAS Accreditation

* - denotes test included in laboratory scope of accreditation

- denotes test carried out by approved contractor

@ - denotes non accredited tests

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 except in full, without the prior written approval of the laboratory.

Approved Signatories:

Emma Sharp (Office Manager) - Paul Evans (Director) - Richard John (Quality/Technical Manager)

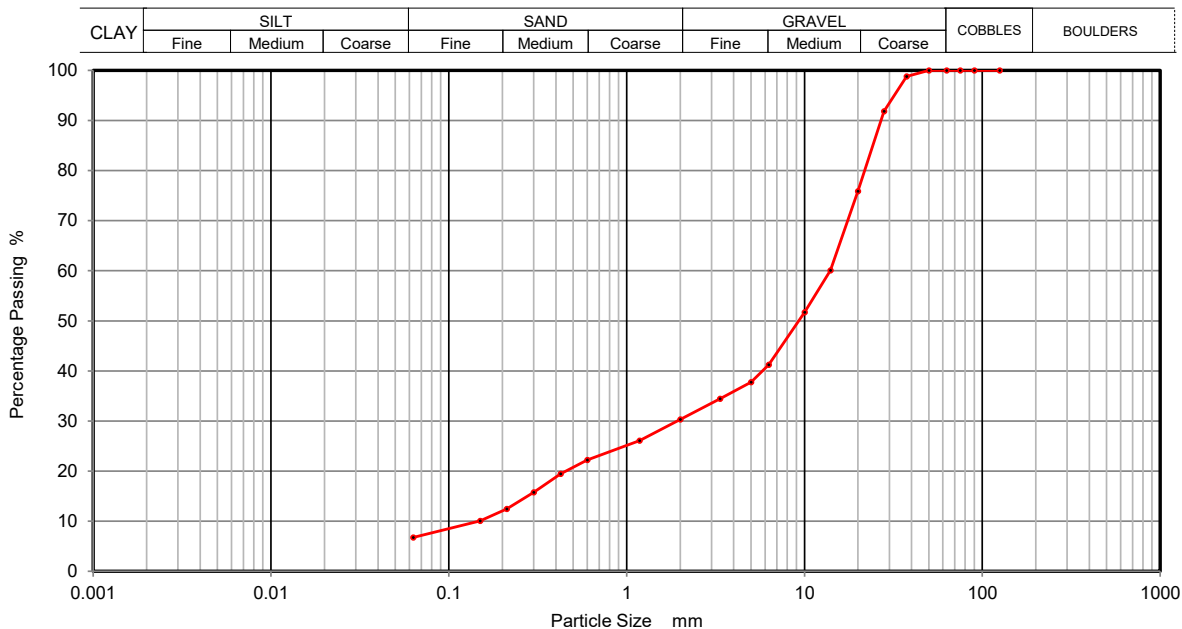
Shaun Jones (Laboratory manager) - Wayne Honey (Administrative Assistant / Health and Safety)



PARTICLE SIZE DISTRIBUTION
BS 1377 Part 2:1990
Wet Sieve, Clause 9.2

Contract Number	54502
Borehole/Pit No.	RC-BH101
Sample No.	
Depth Top	0.20
Depth Base	1.20
Sample Type	B

Site Name	Newport Quinn SDD RFP
Soil Description	Brown slightly clayey/silty fine to coarse sandy fine to coarse GRAVEL
Date Tested	29/06/2021



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	99		
28	92		
20	76		
14	60		
10	52		
6.3	41		
5	38		
3.35	34		
2	30		
1.18	26		
0.6	22		
0.425	19		
0.3	16		
0.212	12		
0.15	10		
0.063	7		

Sample Proportions	% dry mass
Cobbles	0
Gravel	70
Sand	23
Silt and Clay	7

Remarks
 Preparation and testing in accordance with BS1377 unless noted below

Operator	Checked	05/07/2021	Richard John	
David	Approved	06/07/2021	Paul Evans	

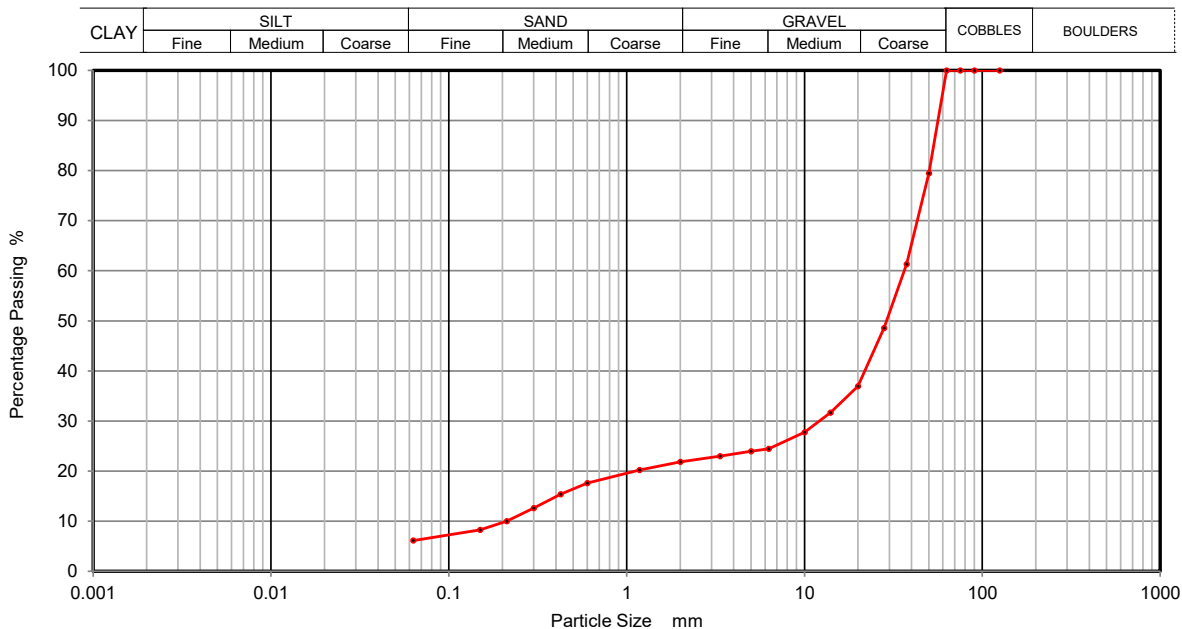




**PARTICLE SIZE DISTRIBUTION
BS 1377 Part 2:1990
Wet Sieve, Clause 9.2**

Contract Number	54502
Borehole/Pit No.	RC-BH103
Sample No.	
Depth Top	0.60
Depth Base	1.20
Sample Type	B

Site Name	Newport Quinn SDD RFP
Soil Description	Brown slightly clayey/silty fine to coarse sandy fine to coarse GRAVEL
Date Tested	29/06/2021



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	79		
37.5	61		
28	49		
20	37		
14	32		
10	28		
6.3	24		
5	24		
3.35	23		
2	22		
1.18	20		
0.6	18		
0.425	15		
0.3	13		
0.212	10		
0.15	8		
0.063	6		

Sample Proportions	% dry mass
Cobbles	0
Gravel	78
Sand	16
Silt and Clay	6


Remarks
Preparation and testing in accordance with BS1377 unless noted below

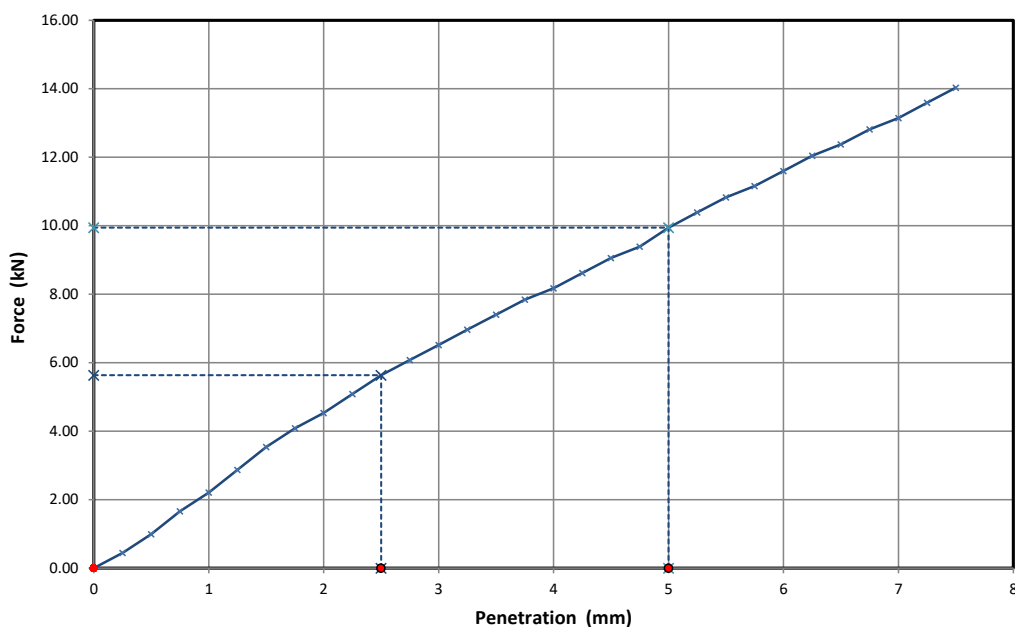
Operator	Checked	05/07/2021	Richard John	
David	Approved	06/07/2021	Paul Evans	





**California Bearing Ratio
BS 1377: Part 4: 1990 Clause 7**

	California Bearing Ratio BS 1377: Part 4: 1990 Clause 7	Contract Number	54502
		Borehole/Pit No.	CP-BH102
Site Name	Newport Quinn SDD RFP	Sample No.	
Soil Description	Brown fine to coarse gravelly clayey sandy SILT	Depth Top	0.50
Compaction Method	2.5 Kg Rammer	Depth Base	1.00
Retained 20mm (%)	12	Sample Type	B
Date Tested	22/06/2021		



Initial Sample Conditions	
Moisture Content (%)	10
Moisture Top (%)	10
Moisture Bottom (%)	
Bulk Density (Mg/m3)	2.28
Dry Density (Mg/m3)	2.07

Specified Testing Parameters	
Surcharge (Kg)	2
Soaking Time (hours)	N/A
Swelling (mm)	N/A
Remarks	


CBR Test Values			
2.5mm Top	43	2.5mm Bottom	
5mm Top	50	5mm Bottom	
CBR Value %	50	CBR Value %	

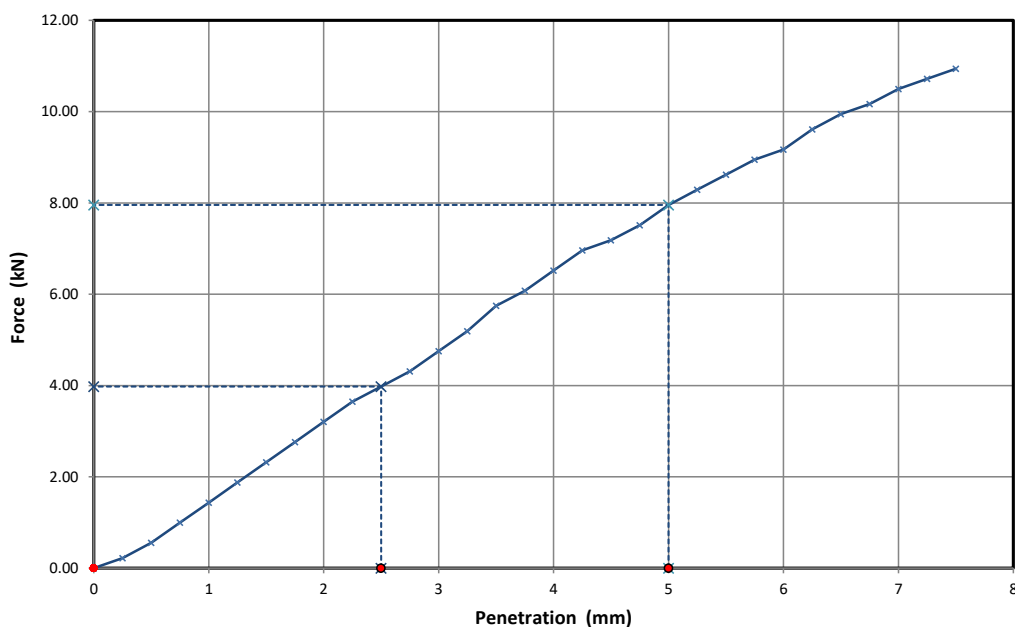
Operators	Checked	05/07/2021	Richard John	
Conal	Approved	06/07/2021	Paul Evans	





**California Bearing Ratio
BS 1377: Part 4: 1990 Clause 7**

	California Bearing Ratio BS 1377: Part 4: 1990 Clause 7	Contract Number	54502
		Borehole/Pit No.	CP-BH103
Site Name	Newport Quinn SDD RFP	Sample No.	
Soil Description	Brown fine to medium gravelly silty SAND	Depth Top	0.50
Compaction Method	2.5 Kg Rammer	Depth Base	1.00
Retained 20mm (%)	0	Sample Type	B
Date Tested	22/06/2021		



Initial Sample Conditions	
Moisture Content (%)	6.4
Moisture Top (%)	6.4
Moisture Bottom (%)	
Bulk Density (Mg/m3)	2.17
Dry Density (Mg/m3)	2.04

Specified Testing Parameters	
Surcharge (Kg)	2
Soaking Time (hours)	N/A
Swelling (mm)	N/A
Remarks	

CBR Test Values			
2.5mm Top	30	2.5mm Bottom	
5mm Top	40	5mm Bottom	
CBR Value %	40	CBR Value %	

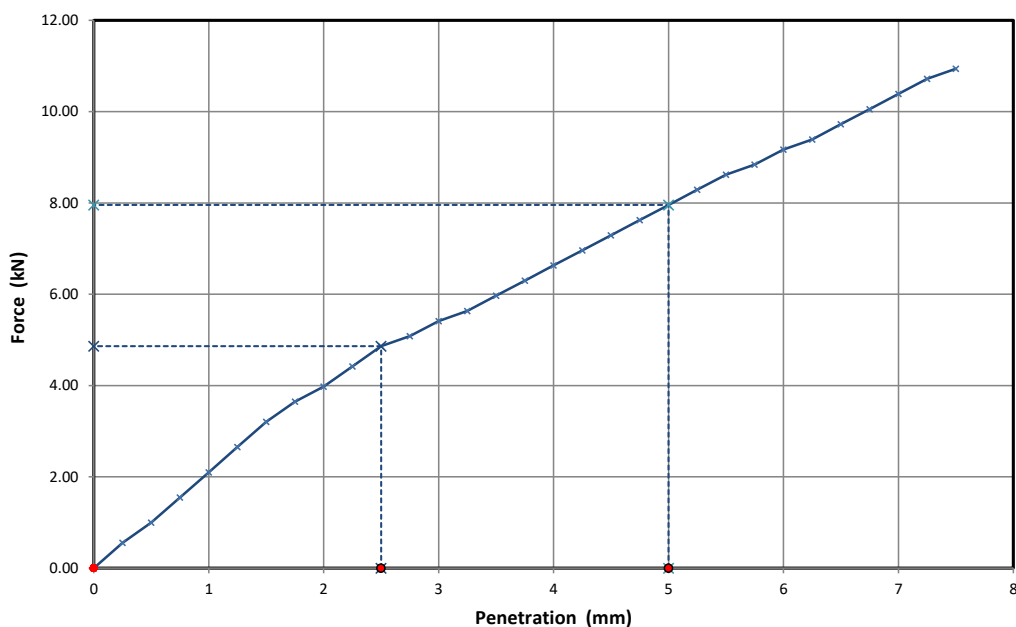
Operators	Checked	05/07/2021	Richard John	
Conal	Approved	06/07/2021	Paul Evans	





**California Bearing Ratio
BS 1377: Part 4: 1990 Clause 7**

Contract Number	54502	Site Name	Newport Quinn SDD RFP
Borehole/Pit No.	RC-BH101	Sample No.	
Depth Top	0.20	Depth Base	1.20
Compaction Method	2.5 Kg Rammer	Sample Type	B
Retained 20mm (%)	24	Date Tested	22/06/2021



Initial Sample Conditions	
Moisture Content (%)	11
Moisture Top (%)	11
Moisture Bottom (%)	
Bulk Density (Mg/m3)	2.17
Dry Density (Mg/m3)	1.95

Specified Testing Parameters	
Surcharge (Kg)	2
Soaking Time (hours)	N/A
Swelling (mm)	N/A
Remarks	

CBR Test Values			
2.5mm Top	37	2.5mm Bottom	
5mm Top	40	5mm Bottom	
CBR Value %	40	CBR Value %	

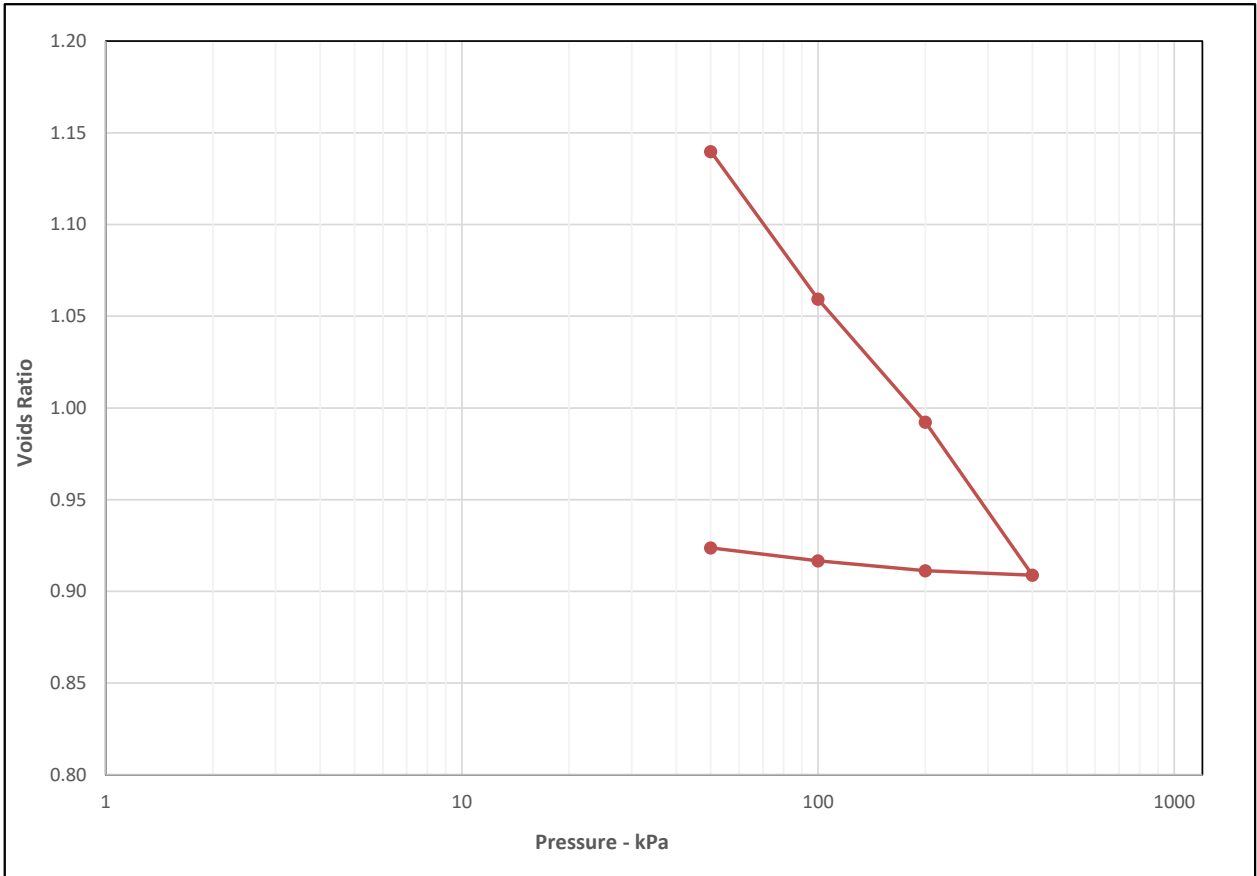
Operators	Checked	05/07/2021	Richard John	
Conal	Approved	06/07/2021	Paul Evans	





ONE DIMENSIONAL CONSOLIDATION TEST
BS1377:Part 5:1990, clause 3

		Contract Number	54502
		Borehole/Trialpit No.	CP-BH102
Site Name	Newport Quinn SDD RFP	Sample No.	
Soil Description	Dark brown sandy silty CLAY	Depth Top (m)	6.50
		Depth Base (m)	6.95
Lab Temperature	20°C	Sample Location	Top
Remarks	Cv Calculated Using T90 Particle Density Assumed Unless Stated Otherwise	Sample Type	U
Date Tested	17/06/2021		



Initial Sample Conditions		Pressure Range			Mv m2/MN	Cv m2/yr	Pressure Range			Mv m2/MN	Cv m2/yr
Moisture Content (%)	50	0	-	50	1.5	8.5		-			
Bulk Density (Mg/m3)	1.72	50	-	100	0.75	2.1		-			
Dry Density (Mg/m3)	1.14	100	-	200	0.33	3.6		-			
Voids Ratio	1.3148	200	-	400	0.21	4.5		-			
Degree of saturation	100.7	400	-	200	0.0065	14		-			
Height (mm)	19.72	200	-	100	0.028	14		-			
Diameter (mm)	75.1	100	-	50	0.073	7.3		-			
Particle Density (Mg/m3)	2.65		-					-			

Operators	Checked	05/07/2021	Richard John	
Wayne W	Approved	06/07/2021	Paul Evans	





ONE DIMENSIONAL CONSOLIDATION TEST
BS1377:Part 5:1990, clause 3

Contract Number

54502

Borehole/Trialpit No.

RC-BH102

Site Name

Newport Quinn SDD RFP

Sample No.

Soil Description

Reddish brown silty CLAY

Depth Top (m)

3.20

Depth Base (m)

3.80

Lab Temperature

20°C

Sample Location

Top

Remarks

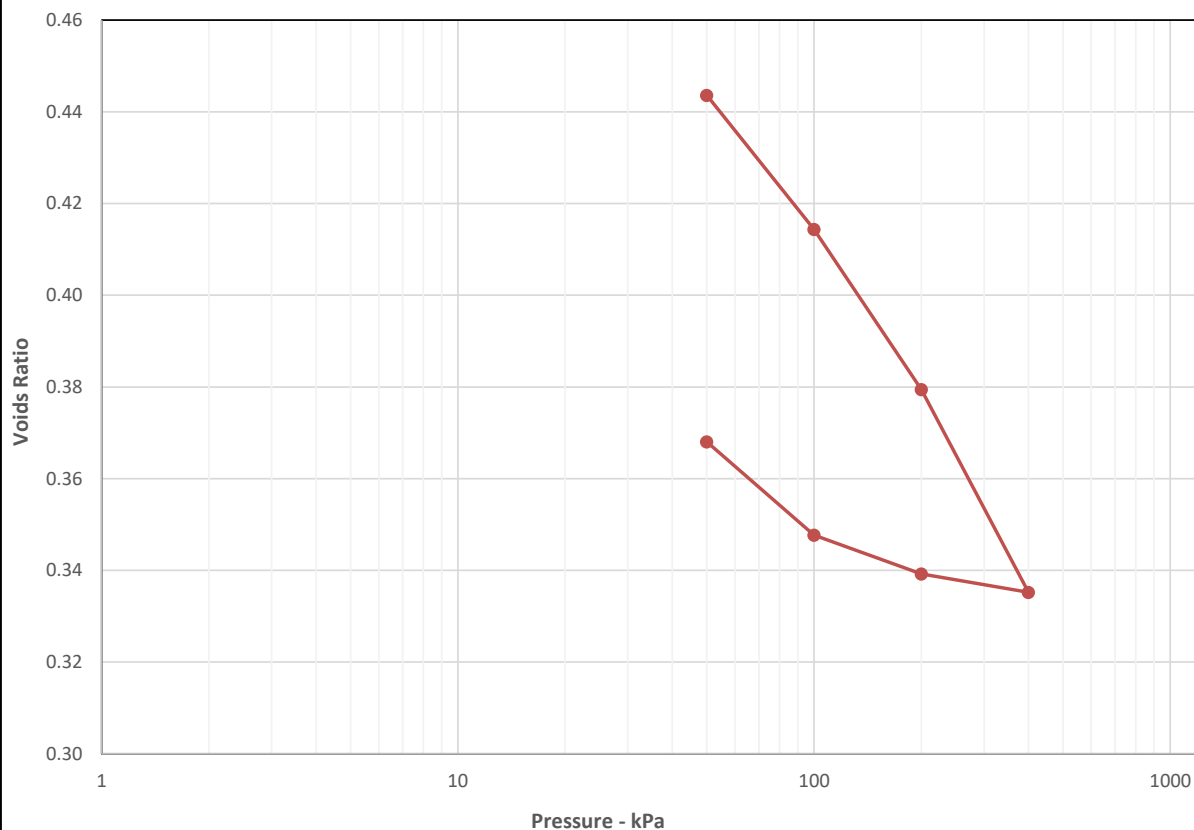
Cv Calculated Using T90
Particle Density Assumed Unless Stated Otherwise

Sample Type

U

Date Tested

17/06/2021



Initial Sample Conditions		Pressure Range			Mv m2/MN	Cv m2/yr	Pressure Range			Mv m2/MN	Cv m2/yr
Moisture Content (%)	21	0	-	50	1.0	8.8		-			
Bulk Density (Mg/m3)	2.12	50	-	100	0.41	2.3		-			
Dry Density (Mg/m3)	1.75	100	-	200	0.25	9.3		-			
Voids Ratio	0.5165	200	-	400	0.16	3.9		-			
Degree of saturation	110.3	400	-	200	0.015	3.8		-			
Height (mm)	19.8	200	-	100	0.063	2.2		-			
Diameter (mm)	75.51	100	-	50	0.3	5.3		-			
Particle Density (Mg/m3)	2.65		-					-			

Operators	Checked	05/07/2021	Richard John	
Wayne W	Approved	06/07/2021	Paul Evans	





ONE DIMENSIONAL CONSOLIDATION TEST
BS1377:Part 5:1990, clause 3

Contract Number

54502

Borehole/Trialpit No.

RC-BH103

Site Name

Newport Quinn SDD RFP

Sample No.

Soil Description

Reddish brown gravelly silty CLAY

Depth Top (m)

3.20

Depth Base (m)

3.80

Lab Temperature

20°C

Sample Location

Top

Remarks

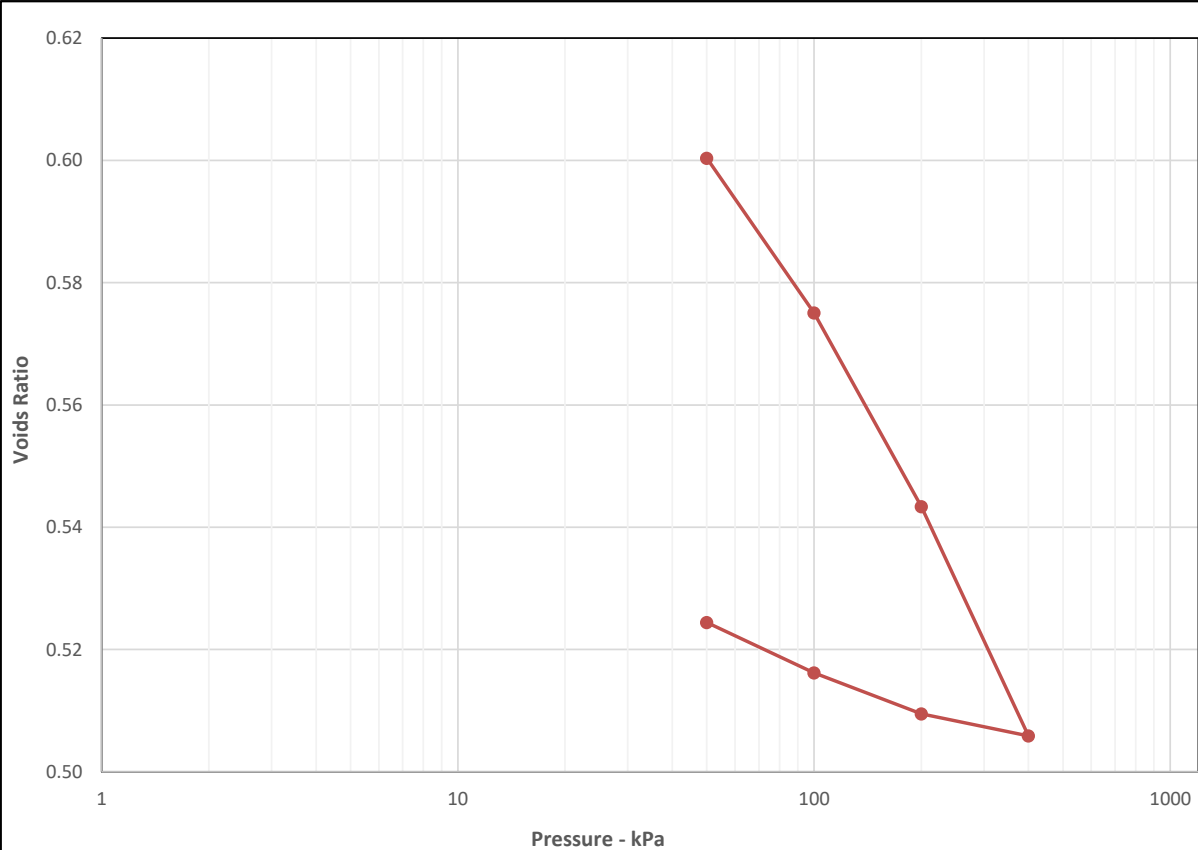
Cv Calculated Using T90
Particle Density Assumed Unless Stated Otherwise

Sample Type

U

Date Tested

17/06/2021



Initial Sample Conditions		Pressure Range			Mv m2/MN	Cv m2/yr	Pressure Range			Mv m2/MN	Cv m2/yr
Moisture Content (%)	27	0	-	50	1.0	2.5		-			
Bulk Density (Mg/m3)	2.00	50	-	100	0.32	1.1		-			
Dry Density (Mg/m3)	1.57	100	-	200	0.2	1.5		-			
Voids Ratio	0.6830	200	-	400	0.12	1.4		-			
Degree of saturation	103.8	400	-	200	0.012	8.6		-			
Height (mm)	19.61	200	-	100	0.044	5.8		-			
Diameter (mm)	74.92	100	-	50	0.11	6.2		-			
Particle Density (Mg/m3)	2.65		-					-			

Operators	Checked	05/07/2021	Richard John	
Wayne W	Approved	06/07/2021	Paul Evans	





**Single Stage Unconsolidated-Undrained Triaxial
Test
BS 1377 : 1990 Part 7 : 8**

Contract Number 54502

Borehole/Pit No. CP-BH101

Site Name Newport Quinn SDD RFP

Sample No.

Soil Description Brown fine to medium gravelly silty CLAY

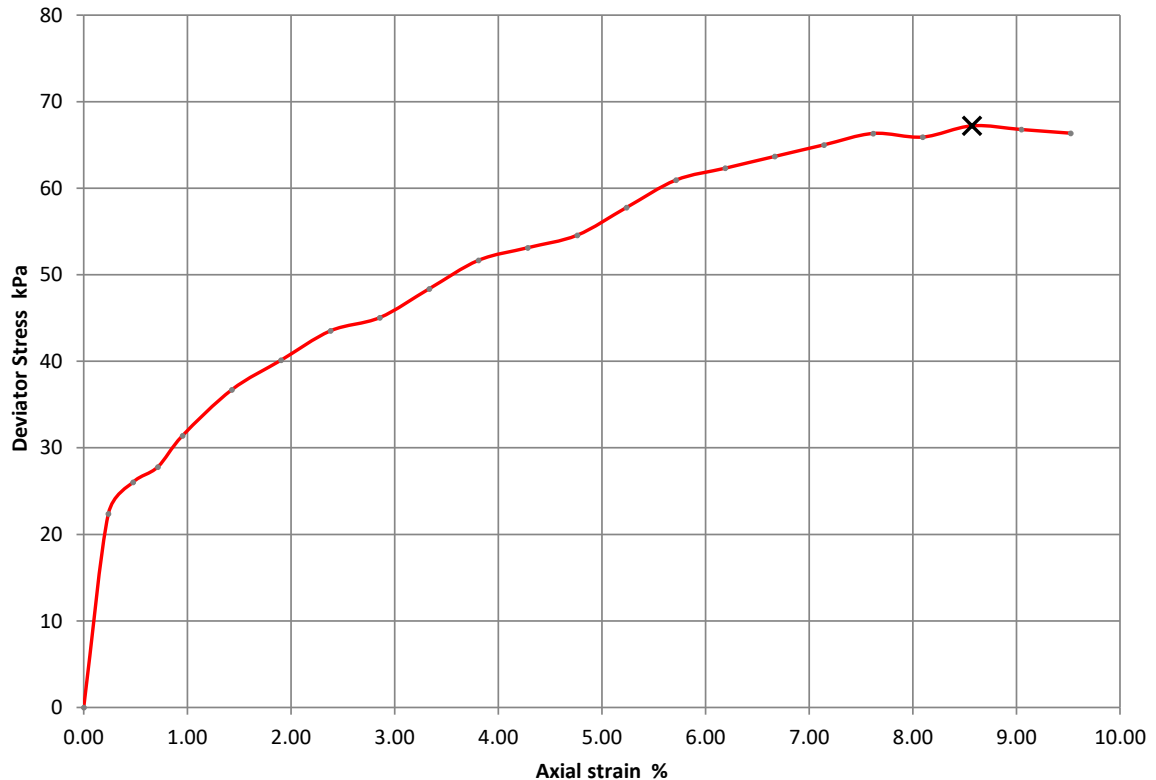
Depth Top (m) 3.00

Depth Base (m) 3.45

Date Tested 26/06/2021

Sample Type UT

Technician Daniel B



Moisture Content (%)	30
Bulk Density (Mg/m ³)	1.77
Dry Density (Mg/m ³)	1.36
Specimen Length (mm)	210
Specimen Diameter (mm)	105
Cell Pressure (kPa)	60
Deviator Stress (kPa)	67
Undrained Shear Strength (kPa)	34
Failure Strain (%)	9
Mode Of Failure	Brittle
Membrane Used/Thickness	Rubber/0.3mm
Rate of Strain (%/min)	1.43

Specimen Post Test



Sample Split



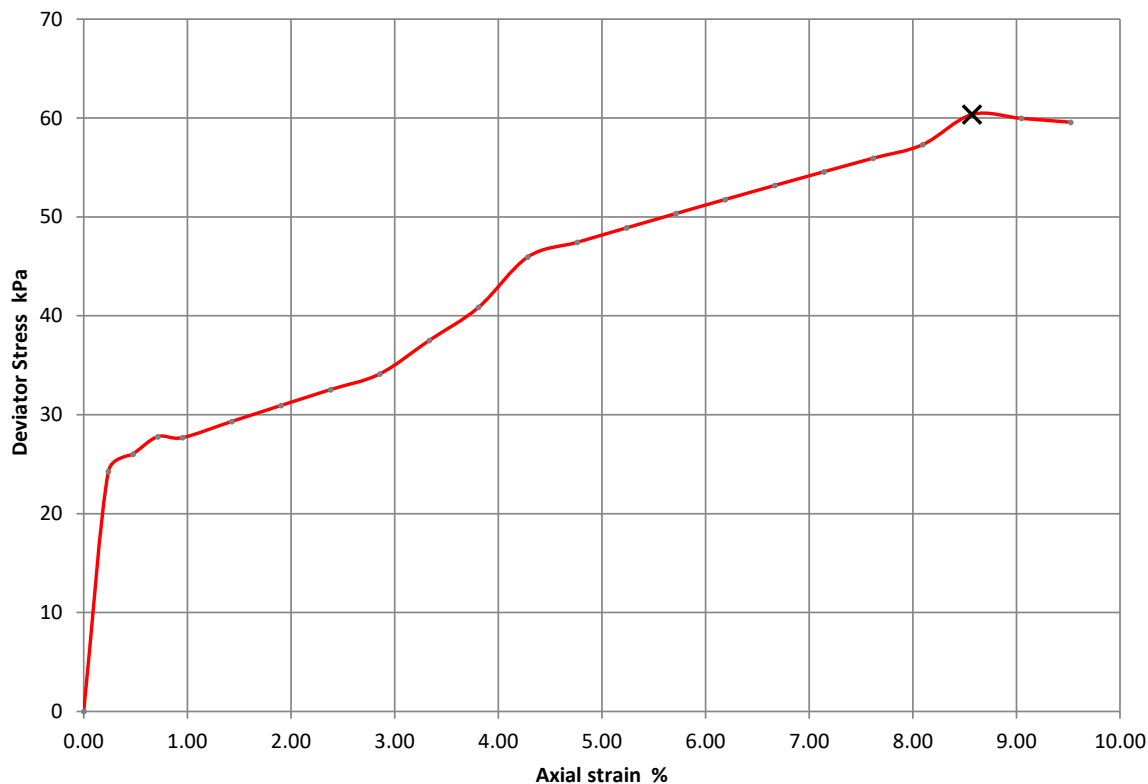
Checked	05/07/2021	Richard John	
Approved	06/07/2021	Paul Evans	





**Single Stage Unconsolidated-Undrained Triaxial
Test
BS 1377 : 1990 Part 7 : 8**

Contract Number	54502
Borehole/Pit No.	CP-BH101
Site Name	Newport Quinn SDD RFP
Soil Description	Brown fine to medium gravelly sandy silty CLAY
Depth Top (m)	5.00
Depth Base (m)	5.45
Date Tested	26/06/2021
Sample Type	UT
Technician	Daniel B



Moisture Content (%)	25
Bulk Density (Mg/m^3)	1.81
Dry Density (Mg/m^3)	1.46
Specimen Length (mm)	210
Specimen Diameter (mm)	105
Cell Pressure (kPa)	100
Deviator Stress (kPa)	60
Undrained Shear Strength (kPa)	30
Failure Strain (%)	9
Mode Of Failure	Plastic
Membrane Used/Thickness	Rubber/0.3mm
Rate of Strain (%/min)	1.43

Specimen Post Test



Sample Split



Checked	05/07/2021	Richard John	
Approved	06/07/2021	Paul Evans	





Single Stage Unconsolidated-Undrained Triaxial Test
BS 1377 : 1990 Part 7 : 8

Contract Number 54502

Borehole/Pit No. CP-BH102

Site Name Newport Quinn SDD RFP

Sample No.

Soil Description Brown silty CLAY

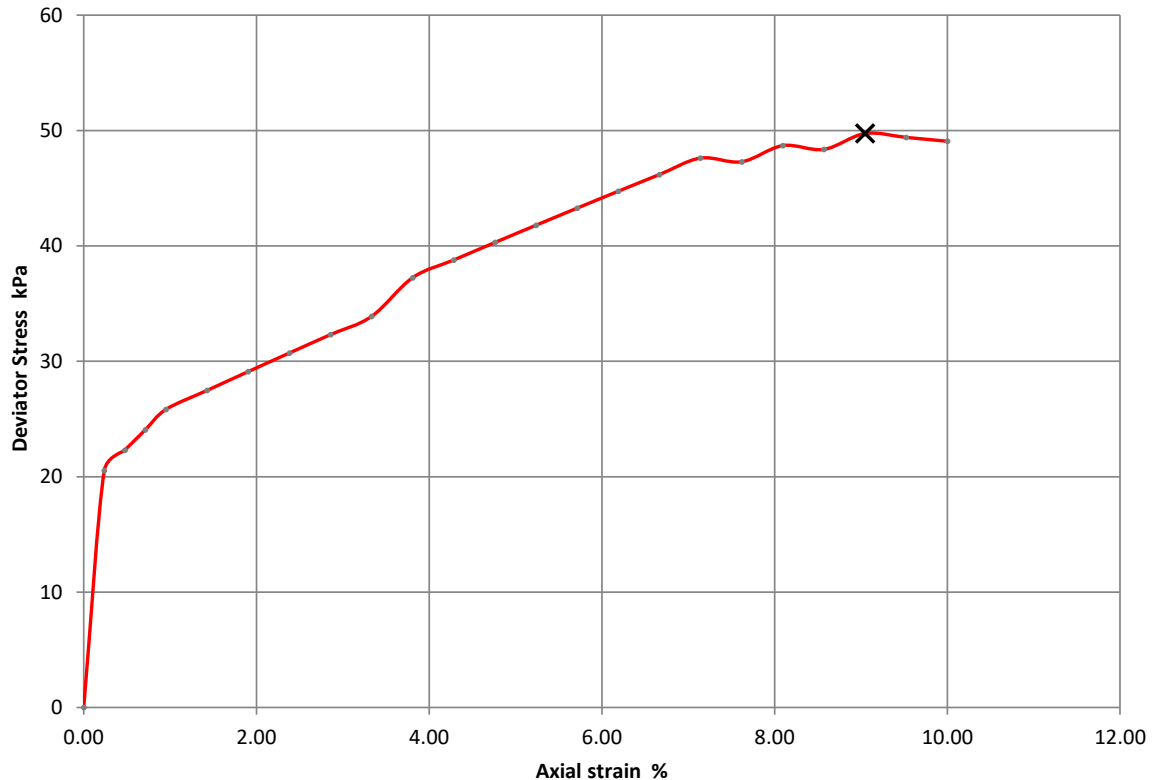
Depth Top (m) 6.50

Depth Base (m) 6.95

Date Tested 26/06/2021

Sample Type UT

Technician Daniel B

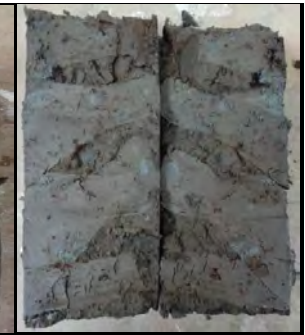


Moisture Content (%)	51
Bulk Density (Mg/m ³)	1.94
Dry Density (Mg/m ³)	1.28
Specimen Length (mm)	210
Specimen Diameter (mm)	105
Cell Pressure (kPa)	30
Deviator Stress (kPa)	50
Undrained Shear Strength (kPa)	25
Failure Strain (%)	9
Mode Of Failure	Plastic
Membrane Used/Thickness	Rubber/0.3mm
Rate of Strain (%/min)	1.43

Specimen Post Test



Sample Split



Checked	05/07/2021	Richard John	
Approved	06/07/2021	Paul Evans	





**Single Stage Unconsolidated-Undrained Triaxial
Test
BS 1377 : 1990 Part 7 : 8**

Contract Number 54502

Borehole/Pit No. RC-BH102

Site Name Newport Quinn SDD RFP

Sample No.

Soil Description Brown silty CLAY

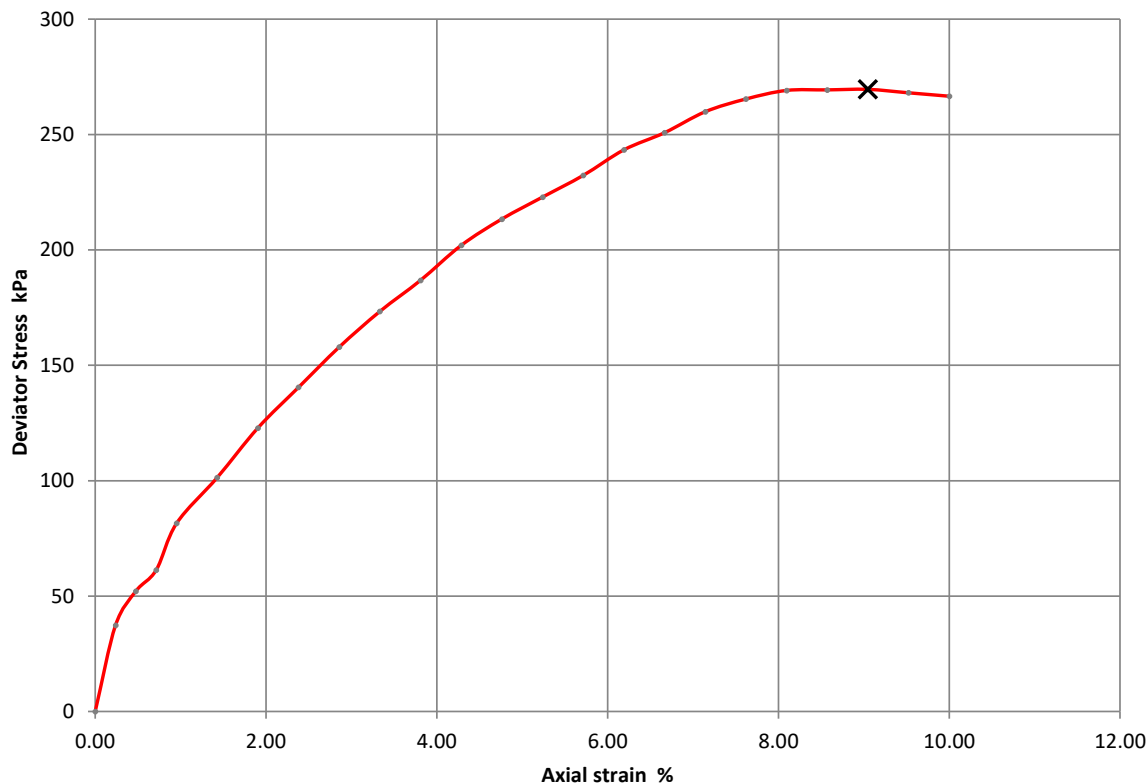
Depth Top (m) 3.20

Depth Base (m) 3.80

Date Tested 26/06/2021

Sample Type UT

Technician Daniel B



Moisture Content (%)	16
Bulk Density (Mg/m ³)	2.08
Dry Density (Mg/m ³)	1.80
Specimen Length (mm)	210
Specimen Diameter (mm)	105
Cell Pressure (kPa)	60
Deviator Stress (kPa)	270
Undrained Shear Strength (kPa)	135
Failure Strain (%)	9
Mode Of Failure	Brittle
Membrane Used/Thickness	Rubber/0.3mm
Rate of Strain (%/min)	1.43

Specimen Post Test



Sample Split



Checked	05/07/2021	Richard John	
Approved	06/07/2021	Paul Evans	





**Single Stage Unconsolidated-Undrained Triaxial
Test
BS 1377 : 1990 Part 7 : 8**

Contract Number 54502

Borehole/Pit No. RC-BH103

Site Name Newport Quinn SDD RFP

Sample No.

Soil Description Brown silty CLAY

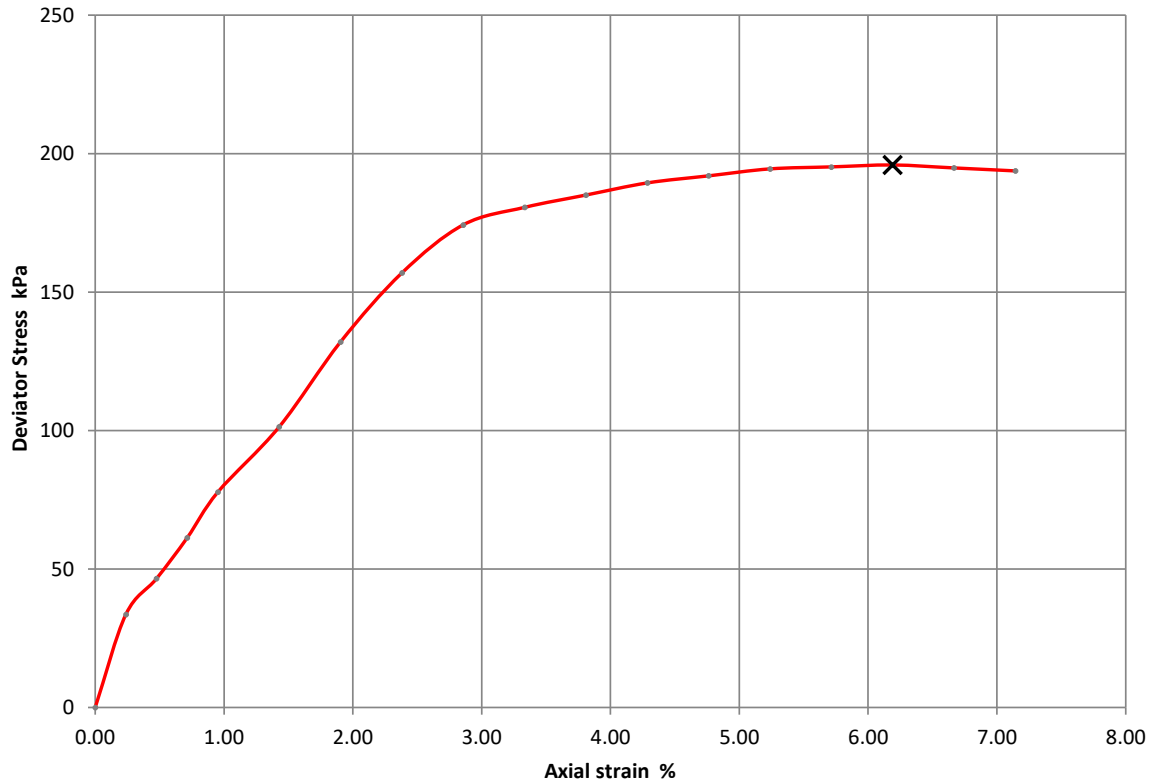
Depth Top (m) 3.20

Depth Base (m) 3.80

Date Tested 26/06/2021

Sample Type UT

Technician Daniel B



Moisture Content (%)	16
Bulk Density (Mg/m ³)	2.21
Dry Density (Mg/m ³)	1.91
Specimen Length (mm)	210
Specimen Diameter (mm)	105
Cell Pressure (kPa)	60
Deviator Stress (kPa)	196
Undrained Shear Strength (kPa)	98
Failure Strain (%)	6
Mode Of Failure	Brittle
Membrane Used/Thickness	Rubber/0.3mm
Rate of Strain (%/min)	1.43

Specimen Post Test



Sample Split



Checked	05/07/2021	Richard John	
Approved	06/07/2021	Paul Evans	



LABORATORY TEST CERTIFICATE

10 Queenslie Point
Queenslie Industrial Estate
120 Stepps Road
Glasgow
G33 3NQ

Certificate No : 21/753 - 01

To : Colin Dodd

Tel: 0141 774 4032

Client : **Geotechnics Limited**
The Geotechnical Centre
Unit 1 Borders Industrial Park
River Lane, Saltney
Chester
CH4 8RJ

email: info@mattest.org
Website: www.mattest.org

Dear Sirs,

LABORATORY TESTING OF ROCK

Introduction

We refer to samples taken from Newport Quinn SDD RFP and delivered to our laboratory on 24th June 2021.

Material & Source

Sample Reference	:	See Report Plates
Sampled By	:	Client
Sampling Certificate	:	Not Supplied
Location	:	See Report Plates
Description	:	Rock Cores
Date Sampled	:	Not Supplied
Date Tested	:	24th June 2021 Onwards
Source	:	PN214233 - Newport Quinn SDD RFP

Test Results;


As Detailed On Page 2 to Page 5 inclusive

Comments;

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation
This report should not be reproduced except in full without the written approval of the laboratory
All remaining samples for this project will be disposed of 28 days after issue of this test certificate

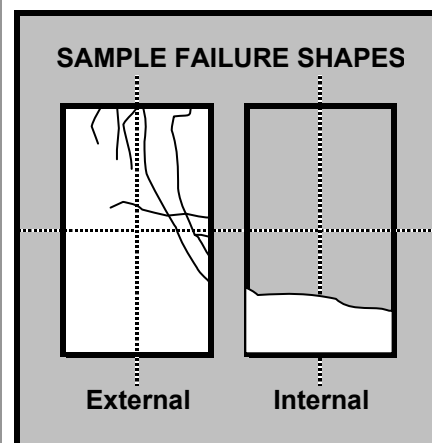
Remarks;

Approved for Issue

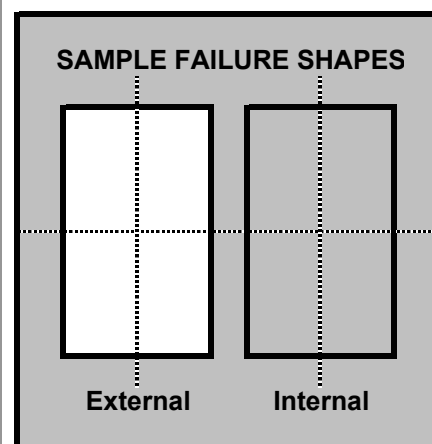

T McLelland (Director)

Date 01/07/2021

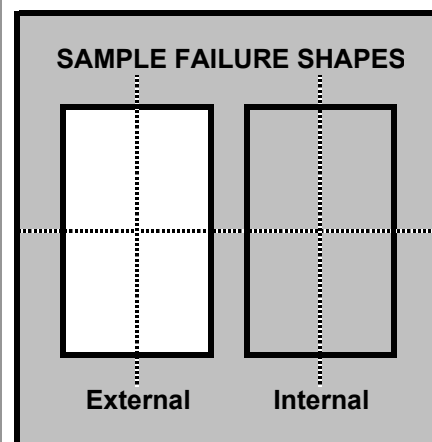
BOREHOLE		RC-BH102
SAMPLE		C
DEPTH	m	12.62-12.88
SAMPLE DIAMETER	mm	85.71
SAMPLE HEIGHT	mm	180.38
TEST CONDITION		As Received
RATE OF LOADING	kN/s	0.1
TEST DURATION	min.sec	3.08
DATE OF TESTING		29/06/2021
LOAD FRAME USED		50kN
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		Unknown
FAILURE LOAD	kN	20.8
UNCONFINED COMPRESSIVE STRENGTH	MPa	3.60
WATER CONTENT (ISRM Suggested Methods)	%	7.6
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	2.29
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	2.13



BOREHOLE		
SAMPLE		
DEPTH	m	
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)	%	
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	



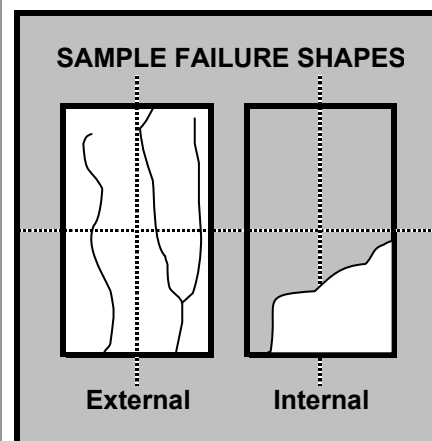
BOREHOLE		
SAMPLE		
DEPTH	m	
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)	%	
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	



Tested in accordance with ASTM D7012 - 14

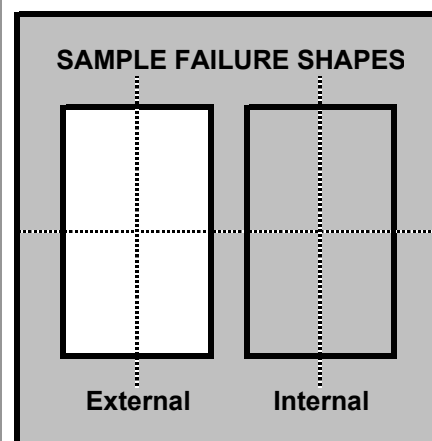
SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

BOREHOLE		RC-BH103
SAMPLE		C
DEPTH	m	5.18-5.40
SAMPLE DIAMETER	mm	86.07
SAMPLE HEIGHT	mm	103.22
TEST CONDITION		As Received
RATE OF LOADING	kN/s	0.05
TEST DURATION	min.sec	2.08
DATE OF TESTING		29/06/2021
LOAD FRAME USED		50kN
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		Unknown
FAILURE LOAD	kN	6.1
UNCONFINED COMPRESSIVE STRENGTH	MPa	1.05
WATER CONTENT (ISRM Suggested Methods)	%	11.3
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	2.30
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	2.06

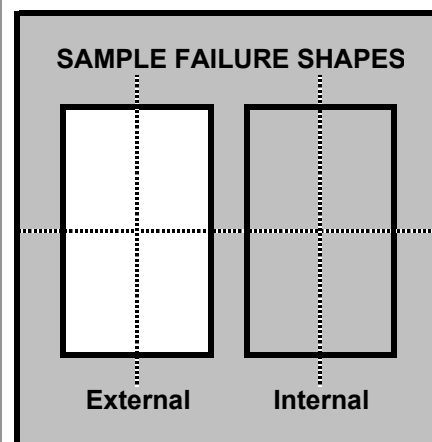


Test specimen does not meet specified length / diameter ratio requirements

BOREHOLE		
SAMPLE		
DEPTH	m	
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)	%	
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	



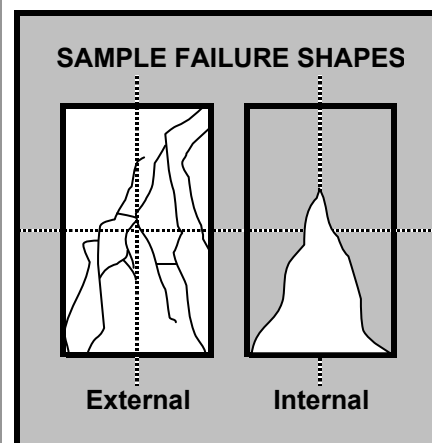
BOREHOLE		
SAMPLE		
DEPTH	m	
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)	%	
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	



Tested in accordance with ASTM D7012 - 14

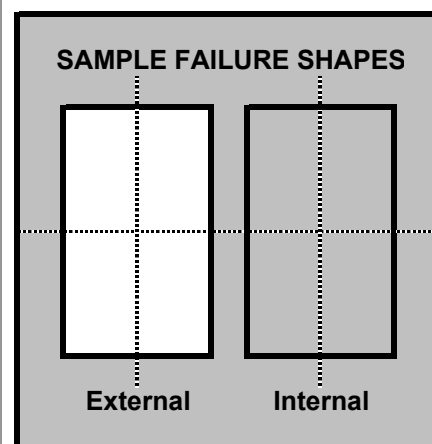
SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

BOREHOLE		RC-BH104
SAMPLE		C
DEPTH	m	9.98-10.18
SAMPLE DIAMETER	mm	85.56
SAMPLE HEIGHT	mm	148.88
TEST CONDITION		As Received
RATE OF LOADING	kN/s	0.1
TEST DURATION	min.sec	4.21
DATE OF TESTING		29/06/2021
LOAD FRAME USED		50kN
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		Unknown
FAILURE LOAD	kN	23.9
UNCONFINED COMPRESSIVE STRENGTH	MPa	4.16
WATER CONTENT (ISRM Suggested Methods)	%	6.3
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	2.41
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	2.27

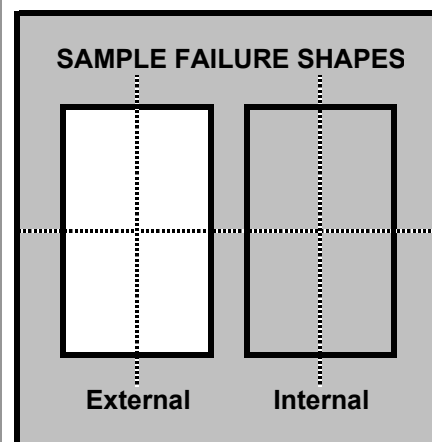


Test specimen does not meet specified length / diameter ratio requirements

BOREHOLE		
SAMPLE		
DEPTH	m	
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)	%	
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	



BOREHOLE		
SAMPLE		
DEPTH	m	
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)	%	
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	



Tested in accordance with ASTM D7012 - 14

SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

BOREHOLE		RC-BH105
SAMPLE		C
DEPTH	m	8.06-8.34
SAMPLE DIAMETER	mm	86.63
SAMPLE HEIGHT	mm	181.72
TEST CONDITION		As Received
RATE OF LOADING	kN/s	0.01
TEST DURATION	min.sec	2.01
DATE OF TESTING		29/06/2021
LOAD FRAME USED		50kN
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		Unknown
FAILURE LOAD	kN	1.6
UNCONFINED COMPRESSIVE STRENGTH	MPa	0.271
WATER CONTENT (ISRM Suggested Methods)	%	17.2
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	2.07
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	1.77

SAMPLE FAILURE SHAPES

External Internal

BOREHOLE		
SAMPLE		
DEPTH	m	
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)	%	
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	

SAMPLE FAILURE SHAPES

External Internal

BOREHOLE		
SAMPLE		
DEPTH	m	
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)	%	
BULK DENSITY (ISRM Suggested Methods)	Mg/m ³	
DRY DENSITY (ISRM Suggested Methods)	Mg/m ³	

SAMPLE FAILURE SHAPES

External Internal

Tested in accordance with ASTM D7012 - 14

SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

APPENDIX 10

Laboratory Test Results – Contamination (Soil) and Waste Acceptance Criteria



Certificate of Analysis

Certificate Number 21-11311

Issued: 09-Jun-21

Client Geotechnics LTD
The Geotechnical Centre
Unit 1B Borders Ind. Park
River Lane
Saltney
Chester
CH4 8RJ

Our Reference 21-11311

Client Reference PN214233

Order No ON28458

Contract Title Newport

Description 7 Soil samples.

Date Received 28-May-21

Date Started 28-May-21

Date Completed 09-Jun-21

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. 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 except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick
Contracts Manager



Summary of Chemical Analysis

Soil Samples

Our Ref 21-11311

Client Ref PN214233

Contract Title Newport

Lab No	1854280	1854281	1854282	1854283	1854284	1854285	1854286
Sample ID	WS-BH102	WS-BH110	WS-BH110	WS-BH108	WS-BH104	CP-BH102	CP-BH102
Depth	0.50	2.70	3.80	1.00	1.00	0.50	2.20
Other ID							
Sample Type	ES	ES	ES	ES	ES	ES	ES
Sampling Date	24/05/2021	25/05/2021	25/05/2021	25/05/2021	25/05/2021	24/05/2021	24/05/2021
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	5.4	7.8	2.4	2.4	3.1	2.8
Barium	DETSC 2301#	1.5	mg/kg	50	540	750	170	380	540
Beryllium	DETSC 2301#	0.2	mg/kg	0.7	0.6	1.0	< 0.2	0.4	0.4
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	< 0.2	0.6	< 0.2	0.4	3.4	6.4
Cadmium	DETSC 2301#	0.1	mg/kg	0.1	0.8	< 0.1	< 0.1	0.4	0.6
Chromium	DETSC 2301#	0.15	mg/kg	15	16	29	10	670	1600
Copper	DETSC 2301#	0.2	mg/kg	13	18	11	6.3	130	120
Lead	DETSC 2301#	0.3	mg/kg	16	21	12	5.7	26	37
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nickel	DETSC 2301#	1	mg/kg	24	17	30	3.2	27	24
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	4.0	7.3
Vanadium	DETSC 2301#	0.8	mg/kg	17	19	40	9.1	180	270
Zinc	DETSC 2301#	1	mg/kg	55	90	56	19	190	210
Inorganics									
pH	DETSC 2008#		pH	9.7	9.3	8.6	8.6	7.5	11.1
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	0.2	< 0.1	< 0.1	< 0.1
Total Organic Carbon	DETSC 2084#	0.5	%	< 0.5	< 0.5	0.8	5.7	2.2	0.6
Ammonia Aqueous Extract as N	DETSC 2119	10	mg/l	< 10			< 10		< 10
Ammoniacal Nitrogen as NH4	DETSC 2119	0.5	mg/kg	5.0	11	65	2.8	1.3	1.0
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	20
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C10-C44	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	21
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4	74
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4	43
Aromatic C10-C44	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	110
Ali/Aro C10-C44	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	130
C5-C10 Gasoline Range Organics (GRO)	DETSC 3321*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

Summary of Chemical Analysis

Soil Samples

Our Ref 21-11311

Client Ref PN214233

Contract Title Newport

	Lab No						
	1854280	1854281	1854282	1854283	1854284	1854285	1854286
Sample ID	WS-BH102	WS-BH110	WS-BH110	WS-BH108	WS-BH104	CP-BH102	CP-BH102
Depth	0.50	2.70	3.80	1.00	1.00	0.50	2.20
Other ID							
Sample Type	ES	ES	ES	ES	ES	ES	ES
Sampling Date	24/05/2021	25/05/2021	25/05/2021	25/05/2021	25/05/2021	24/05/2021	24/05/2021
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Test	Method	LOD	Units				
C10-C24 Diesel Range Organics (DRO)	DETSC 3311#	10	mg/kg	< 10	< 10	< 10	< 10
PAHs							
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	0.05
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	0.09
Pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	0.08
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	0.03
Chrysene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	0.04
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	0.06
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	0.03
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	< 0.10	< 0.10	< 0.10	0.35
PCBs							
PCB 28 + PCB 31	DETSC 3401#	0.01	mg/kg		< 0.01	< 0.01	< 0.01
PCB 52	DETSC 3401#	0.01	mg/kg		< 0.01	< 0.01	< 0.01
PCB 101	DETSC 3401#	0.01	mg/kg		< 0.01	< 0.01	< 0.01
PCB 118	DETSC 3401#	0.01	mg/kg		< 0.01	< 0.01	< 0.01
PCB 153	DETSC 3401#	0.01	mg/kg		< 0.01	< 0.01	< 0.01
PCB 138	DETSC 3401#	0.01	mg/kg		< 0.01	< 0.01	< 0.01
PCB 180	DETSC 3401#	0.01	mg/kg		< 0.01	< 0.01	< 0.01
PCB 7 Total	DETSC 3401#	0.01	mg/kg		< 0.01	< 0.01	< 0.01
Phenols							
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3

Summary of Chemical Analysis

Soil VOC/SVOC Samples

Our Ref 21-11311

Client Ref PN214233

Contract Title Newport

Lab No	1854281	1854282	1854285
Sample ID	WS-BH110	WS-BH110	CP-BH102
Depth	2.70	3.80	0.50
Other ID			
Sample Type	ES	ES	ES
Sampling Date	25/05/2021	25/05/2021	24/05/2021
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
VOCs						
Vinyl Chloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1 Dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Trans-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Cis-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
2,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Bromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Chloroform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1,1-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Carbon tetrachloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Benzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Trichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Dibromomethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Bromodichloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
cis-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Toluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
trans-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1,2-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Tetrachloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,3-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Dibromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dibromoethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Chlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Ethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
m+p-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
o-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Styrene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Bromoform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Isopropylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Bromobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2,3-trichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
n-propylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
2-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,3,5-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
4-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Tert-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2,4-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01

Summary of Chemical Analysis

Soil VOC/SVOC Samples

Our Ref 21-11311

Client Ref PN214233

Contract Title Newport

Lab No	1854281	1854282	1854285
.Sample ID	WS-BH110	WS-BH110	CP-BH102
Depth	2.70	3.80	0.50
Other ID			
Sample Type	ES	ES	ES
Sampling Date	25/05/2021	25/05/2021	24/05/2021
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
sec-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
p-isopropyltoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,3-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,4-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
n-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dibromo-3-chloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2,4-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Hexachlorobutadiene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2,3-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
MTBE	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
SVOCs						
Phenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Aniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2-Chlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzyl Alcohol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Bis(2-chloroisopropyl)ether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
3&4-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,4-Dimethylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Bis-(dichloroethoxy)methane	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,4-Dichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
1,2,4-Trichlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
4-Chloro-3-methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2-Methylnaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Hexachlorocyclopentadiene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,4,6-Trichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,4,5-Trichlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2-Chloronaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,4-Dinitrotoluene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
3-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
4-Nitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Dibenzofuran	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,6-Dinitrotoluene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,3,4,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Diethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
4-Chlorophenylphenylether	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
4-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2-Methyl-4,6-Dinitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Diphenylamine	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
4-Bromophenylphenylether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1

Summary of Chemical Analysis

Soil VOC/SVOC Samples

Our Ref 21-11311

Client Ref PN214233

Contract Title Newport

Lab No	1854281	1854282	1854285
Sample ID	WS-BH110	WS-BH110	CP-BH102
Depth	2.70	3.80	0.50
Other ID			
Sample Type	ES	ES	ES
Sampling Date	25/05/2021	25/05/2021	24/05/2021
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
Hexachlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Pentachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Di-n-butylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Butylbenzylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Bis(2-ethylhexyl)phthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Di-n-octylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
1,4-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Dimethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
1,3-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
1,2-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,3,5,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Azobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Carbazole	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1

Summary of Asbestos Analysis

Soil Samples

Our Ref 21-11311
 Client Ref PN214233
 Contract Title Newport

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1854280	WS-BH102 0.50	SOIL	NAD	none	Emma Stacey
1854281	WS-BH110 2.70	SOIL	NAD	none	Emma Stacey
1854282	WS-BH110 3.80	SOIL	NAD	none	Emma Stacey
1854283	WS-BH108 1.00	SOIL	NAD	none	Emma Stacey
1854284	WS-BH104 1.00	SOIL	NAD	none	Emma Stacey
1854285	CP-BH102 0.50	SOIL	NAD	none	Emma Stacey

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 21-11311
Client Ref PN214233
Contract Newport

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1854280	WS-BH102 0.50 SOIL	24/05/21	GJ 250ml, GJ 60ml, PT 1L	Ammonia Aqueous Extract (3 days)	Ammoniacal Nitrogen as NH4
1854281	WS-BH110 2.70 SOIL	25/05/21	GJ 250ml, GJ 60ml, PT 1L		Ammoniacal Nitrogen as NH4
1854282	WS-BH110 3.80 SOIL	25/05/21	GJ 250ml, GJ 60ml, PT 1L		Ammoniacal Nitrogen as NH4
1854283	WS-BH108 1.00 SOIL	25/05/21	GJ 250ml, GJ 60ml, PT 1L		Ammoniacal Nitrogen as NH4
1854284	WS-BH104 1.00 SOIL	25/05/21	GJ 250ml, GJ 60ml, PT 1L		Ammoniacal Nitrogen as NH4
1854285	CP-BH102 0.50 SOIL	24/05/21	GJ 250ml, GJ 60ml, PT 1L	Ammonia (3 days)	Ammoniacal Nitrogen as NH4
1854286	CP-BH102 2.20 SOIL	24/05/21	GJ 250ml, GJ 60ml, PT 1L	Ammonia Aqueous Extract (3 days)	

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report



Certificate of Analysis

Certificate Number 21-11553

Issued: 14-Jun-21

Client Geotechnics LTD
The Geotechnical Centre
Unit 1B Borders Ind. Park
River Lane
Saltney
Chester
CH4 8RJ

Our Reference 21-11553

Client Reference PN214233

Order No ON29740

Contract Title Newport

Description 7 Soil samples, 1 Leachate sample.

Date Received 01-Jun-21

Date Started 01-Jun-21

Date Completed 14-Jun-21

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. 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 except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick
Contracts Manager



Summary of Chemical Analysis

Soil Samples

Our Ref 21-11553
 Client Ref PN214233
 Contract Title Newport

Lab No	1855645	1855646	1855647	1855648	1855649	1855650	1855651
Sample ID	WS-BH103	WS-BH103	WS-BH105	WS-BH106	WS-BH107	CP-BH105	WS-BH101
Depth	1.00	2.40	1.10	1.00	0.50	0.50	0.80
Other ID							
Sample Type	ES	ES	ES	ES	ES	ES	ES
Sampling Date	26/05/2021	26/05/2021	26/05/2021	26/05/2021	26/05/2021	27/05/2021	27/05/2021
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units							
Metals										
Arsenic	DETSC 2301#	0.2	mg/kg	7.3		2.8	7.8	6.1	5.5	5.7
Barium	DETSC 2301#	1.5	mg/kg	160		210	710	220	2200	2200
Beryllium	DETSC 2301#	0.2	mg/kg	0.4		0.7	0.6	0.6	< 0.2	0.3
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	0.9		< 0.2	< 0.2	< 0.2	0.5	3.6
Cadmium	DETSC 2301#	0.1	mg/kg	0.6		< 0.1	2.3	0.1	4.3	6.1
Chromium	DETSC 2301#	0.15	mg/kg	110		23	16	13	5.4	100
Copper	DETSC 2301#	0.2	mg/kg	20		13	17	12	17	22
Lead	DETSC 2301#	0.3	mg/kg	18		9.5	48	8.8	110	130
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05		< 0.05	< 0.05	0.05	0.06	0.07
Nickel	DETSC 2301#	1	mg/kg	24		23	20	22	4.2	9.0
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5		< 0.5	< 0.5	< 0.5	< 0.5	0.9
Vanadium	DETSC 2301#	0.8	mg/kg	27		30	24	19	5.0	22
Zinc	DETSC 2301#	1	mg/kg	86		45	210	54	280	500
Inorganics										
pH	DETSC 2008#		pH	10.3		7.6	8.1	8.1	9.1	10.1
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1		< 0.1	< 0.1	< 0.1	< 0.1	0.2
Total Organic Carbon	DETSC 2084#	0.5	%	< 0.5		< 0.5	< 0.5	< 0.5	7.1	2.8
Ammonia Aqueous Extract as N	DETSC 2119	10	mg/l		< 10					
Ammoniacal Nitrogen as NH4	DETSC 2119	0.5	mg/kg	2.2		16	3.1	3.2	1.9	3.3
Petroleum Hydrocarbons										
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5		< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2		< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5		< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4		< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	< 3.4		< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C10-C44	DETSC 3072*	10	mg/kg	< 10		< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	42		< 0.9	28	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	30		< 0.5	18	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	15		< 0.6	8.2	< 0.6	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	22		< 1.4	10	< 1.4	< 1.4	< 1.4
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	9.4		< 1.4	4.1	< 1.4	< 1.4	< 1.4
Aromatic C10-C44	DETSC 3072*	10	mg/kg	130		< 10	61	< 10	< 10	< 10
Ali/Aro C10-C44	DETSC 3072*	10	mg/kg	130		< 10	64	< 10	< 10	< 10

Summary of Chemical Analysis

Soil Samples

Our Ref 21-11553

Client Ref PN214233

Contract Title Newport

Lab No	1855645	1855646	1855647	1855648	1855649	1855650	1855651
Sample ID	WS-BH103	WS-BH103	WS-BH105	WS-BH106	WS-BH107	CP-BH105	WS-BH101
Depth	1.00	2.40	1.10	1.00	0.50	0.50	0.80
Other ID							
Sample Type	ES	ES	ES	ES	ES	ES	ES
Sampling Date	26/05/2021	26/05/2021	26/05/2021	26/05/2021	26/05/2021	27/05/2021	27/05/2021
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units							
C5-C10 Gasoline Range Organics (GRO)	DETSC 3321*	0.1	mg/kg	< 0.1		< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
C10-C24 Diesel Range Organics (DRO)	DETSC 3311#	10	mg/kg	< 10		< 10	< 10	< 10	< 10	14
PAHs										
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03		< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03		< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03		< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03		< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.04		< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03		< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.06		< 0.03	< 0.03	< 0.03	< 0.03	0.04
Pyrene	DETSC 3303#	0.03	mg/kg	0.05		< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.03		< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Chrysene	DETSC 3303	0.03	mg/kg	0.03		< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.04		< 0.03	< 0.03	< 0.03	< 0.03	0.04
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03		< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03		< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03		< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03		< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03		< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	0.21		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PCBs										
PCB 28 + PCB 31	DETSC 3401#	0.01	mg/kg	< 0.01			< 0.01			
PCB 52	DETSC 3401#	0.01	mg/kg	< 0.01			< 0.01			
PCB 101	DETSC 3401#	0.01	mg/kg	< 0.01			< 0.01			
PCB 118	DETSC 3401#	0.01	mg/kg	< 0.01			< 0.01			
PCB 153	DETSC 3401#	0.01	mg/kg	< 0.01			< 0.01			
PCB 138	DETSC 3401#	0.01	mg/kg	< 0.01			< 0.01			
PCB 180	DETSC 3401#	0.01	mg/kg	< 0.01			< 0.01			
PCB 7 Total	DETSC 3401#	0.01	mg/kg	< 0.01			< 0.01			
Phenols										
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3		< 0.3	< 0.3	< 0.3	< 0.3	< 0.3

Summary of Chemical Analysis

Soil VOC/SVOC Samples

Our Ref 21-11553

Client Ref PN214233

Contract Title Newport

Lab No	1855645	1855648
Sample ID	WS-BH103	WS-BH106
Depth	1.00	1.00
Other ID		
Sample Type	ES	ES
Sampling Date	26/05/2021	26/05/2021
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
VOCs					
Vinyl Chloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,1 Dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Trans-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,1-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Cis-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
2,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Bromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Chloroform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,1,1-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,1-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Carbon tetrachloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Benzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,2-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Trichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Dibromomethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Bromodichloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
cis-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Toluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
trans-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,1,2-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Tetrachloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,3-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Dibromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,2-dibromoethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Chlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Ethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
m+p-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
o-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Styrene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01
Bromoform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Isopropylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Bromobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,2,3-trichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
n-propylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
2-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,3,5-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
4-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01

Summary of Chemical Analysis

Soil VOC/SVOC Samples

Our Ref 21-11553

Client Ref PN214233

Contract Title Newport

Lab No	1855645	1855648
Sample ID	WS-BH103	WS-BH106
Depth	1.00	1.00
Other ID		
Sample Type	ES	ES
Sampling Date	26/05/2021	26/05/2021
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
Tert-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,2,4-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
sec-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
p-isopropyltoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,3-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,4-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
n-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,2-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,2-dibromo-3-chloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,2,4-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Hexachlorobutadiene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,2,3-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
MTBE	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01
SVOCs					
Phenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
Aniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
2-Chlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
Benzyl Alcohol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
2-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
Bis(2-chloroisopropyl)ether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
3&4-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
2,4-Dimethylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
Bis-(dichloroethoxy)methane	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
2,4-Dichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
1,2,4-Trichlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
4-Chloro-3-methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
2-Methylnaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
Hexachlorocyclopentadiene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
2,4,6-Trichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
2,4,5-Trichlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
2-Chloronaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
2-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
2,4-Dinitrotoluene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
3-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
4-Nitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
Dibenzofuran	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
2,6-Dinitrotoluene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
2,3,4,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
Diethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
4-Chlorophenylphenylether	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1

Summary of Chemical Analysis

Soil VOC/SVOC Samples

Our Ref 21-11553

Client Ref PN214233

Contract Title Newport

Lab No	1855645	1855648
Sample ID	WS-BH103	WS-BH106
Depth	1.00	1.00
Other ID		
Sample Type	ES	ES
Sampling Date	26/05/2021	26/05/2021
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
4-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
2-Methyl-4,6-Dinitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
Diphenylamine	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
4-Bromophenylphenylether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
Hexachlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
Pentachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
Di-n-butylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
Butylbenzylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
Bis(2-ethylhexyl)phthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
Di-n-octylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
1,4-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
Dimethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
1,3-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
1,2-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
2,3,5,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
Azobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
Carbazole	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1

WASTE ACCEPTANCE CRITERIA TESTING ANALYTICAL REPORT

Our Ref 21-11553
Client Ref PN214233
Contract Title Newport
Sample Id WS-BH106 1.00

Sample Numbers 1855648 1855652
Date Analysed 14/06/2021

Test Results On Waste		
Determinand and Method Reference	Units	Result
DETSC 2084# Total Organic Carbon	%	< 0.5
DETSC 2003# Loss On Ignition	%	1.8
DETSC 3321# BTEX	mg/kg	< 0.04
DETSC 3401# PCBs (7 congeners)	mg/kg	< 0.01
DETSC 3311# TPH (C10 - C40)	mg/kg	< 10
DETSC 3301 PAHs	mg/kg	< 1.6
DETSC 2008# pH	pH Units	8.1
DETSC 2073* Acid Neutralisation Capacity (pH4)	mol/kg	< 1.0
DETSC 2073* Acid Neutralisation Capacity (pH7)	mol/kg	< 1.0

WAC Limit Values		
Inert Waste	SNRHW	Hazardous Waste
3	5	6
n/a	n/a	10
6	n/a	n/a
1	n/a	n/a
500	n/a	n/a
100	n/a	n/a
n/a	>6	n/a
n/a	TBE	TBE
n/a	TBE	TBE

Test Results On Leachate		
Determinand and Method Reference	Conc in Eluate ug/l	Amount Leached* mg/kg
	10:1	LS10
DETSC 2306 Arsenic as As	0.22	< 0.01
DETSC 2306 Barium as Ba	51	0.51
DETSC 2306 Cadmium as Cd	0.058	< 0.02
DETSC 2306 Chromium as Cr	< 0.25	< 0.1
DETSC 2306 Copper as Cu	0.46	< 0.02
DETSC 2306 Mercury as Hg	< 0.010	< 0.002
DETSC 2306 Molybdenum as Mo	< 1.1	< 0.1
DETSC 2306 Nickel as Ni	< 0.50	< 0.1
DETSC 2306 Lead as Pb	0.26	< 0.05
DETSC 2306 Antimony as Sb	< 0.17	< 0.05
DETSC 2306 Selenium as Se	< 0.25	< 0.03
DETSC 2306 Zinc as Zn	8.6	0.086
DETSC 2055 Chloride as Cl	750	< 100
DETSC 2055* Fluoride as F	< 100	< 0.1
DETSC 2055 Sulphate as SO4	3500	< 100
DETSC 2009* Total Dissolved Solids	29000	290
DETSC 2130 Phenol Index	< 100	< 1
DETSC 2085 Dissolved Organic Carbon	< 2000	< 50

WAC Limit Values		
Limit values for LS10 Leachate		
Inert Waste	SNRHW	Hazardous Waste
0.5	2	25
20	100	300
0.04	1	5
0.5	10	70
2	50	100
0.01	0.2	2
0.5	10	30
0.4	10	40
0.5	10	50
0.06	0.7	5
0.1	0.5	7
4	50	200
800	15,000	25,000
10	150	500
1000	20,000	50,000
4000	60,000	100,000
1	n/a	n/a
500	800	1000

Additional Information

DETSC 2008 pH	8.0
DETSC 2009 Conductivity uS/cm	41.6
* Temperature*	21.0

Mass of Sample Kg*	0.100
Mass of dry Sample Kg*	0.094

Stage 1

Volume of Leachant L2*	0.935
Volume of Eluate VE1*	0.9

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive
Hazardous Waste

Disclaimer: The WAC limit values are provided for guidance only. DETS does not accept responsibility for errors or omissions. Values are correct at time of issue.

* DETS are accredited for the testing of leachates and not the leachate preparation stage which is unaccredited.

Summary of Asbestos Analysis

Soil Samples

Our Ref 21-11553

Client Ref PN214233

Contract Title Newport

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1855645	WS-BH103 1.00	SOIL	NAD	none	Emma Stacey
1855647	WS-BH105 1.10	SOIL	NAD	none	Emma Stacey
1855648	WS-BH106 1.00	SOIL	NAD	none	Emma Stacey
1855649	WS-BH107 0.50	SOIL	NAD	none	Emma Stacey
1855650	CP-BH105 0.50	SOIL	NAD	none	Emma Stacey
1855651	WS-BH101 0.80	SOIL	NAD	none	Emma Stacey

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 21-11553
Client Ref PN214233
Contract Newport

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1855645	WS-BH103 1.00 SOIL	26/05/21	GJ 250ml, GJ 60ml, PT 1L	Ammonia (3 days)	Ammoniacal Nitrogen as NH ₄
1855646	WS-BH103 2.40 SOIL	26/05/21	GJ 250ml, GJ 60ml, PT 1L	Ammonia Aqueous Extract (3 days)	
1855647	WS-BH105 1.10 SOIL	26/05/21	GJ 250ml, GJ 60ml, PT 1L	Ammonia (3 days)	Ammoniacal Nitrogen as NH ₄
1855648	WS-BH106 1.00 SOIL	26/05/21	GJ 250ml, GJ 60ml, PT 1L	Ammonia (3 days)	Ammoniacal Nitrogen as NH ₄
1855649	WS-BH107 0.50 SOIL	26/05/21	GJ 250ml, GJ 60ml, PT 1L	Ammonia (3 days)	Ammoniacal Nitrogen as NH ₄
1855650	CP-BH105 0.50 SOIL	27/05/21	GJ 250ml, GJ 60ml, PT 1L	Ammonia (3 days)	Ammoniacal Nitrogen as NH ₄
1855651	WS-BH101 0.80 SOIL	27/05/21	GJ 250ml, GJ 60ml, PT 1L	Ammonia (3 days)	Ammoniacal Nitrogen as NH ₄
1855652	WS-BH106 1.00 LEACHATE	26/05/21	GJ 250ml, GJ 60ml, PT 1L		

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report



Certificate of Analysis

Certificate Number 21-11935

Issued: 16-Jun-21

Client Geotechnics LTD
The Geotechnical Centre
Unit 1B Borders Ind. Park
River Lane
Saltney
Chester
CH4 8RJ

Our Reference 21-11935

Client Reference PN214233

Order No ON29764

Contract Title Newport

Description 10 Soil samples, 1 Leachate sample.

Date Received 04-Jun-21

Date Started 07-Jun-21

Date Completed 16-Jun-21

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. 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 except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick
Contracts Manager



Summary of Chemical Analysis

Soil Samples

Our Ref 21-11935
Client Ref PN214233
Contract Title Newport

Lab No	1858724	1858725	1858726	1858727	1858728	1858729
Sample ID	CP-BH101	CP-BH101	WS-BH111	WS-BH108	WS-BH109	WS-BH109
Depth	4.20	1.00	1.00	0.50	6.00	1.00
Other ID						
Sample Type	ES	ES	ES	ES	ES	ES
Sampling Date	27/05/2021	27/05/2021	27/05/2021	25/05/2021	27/05/2021	27/05/2021
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg		3.9	5.2	5.9		2.5
Barium	DETSC 2301#	1.5	mg/kg		130	350	190		720
Beryllium	DETSC 2301#	0.2	mg/kg		0.6	0.6	0.4		1.2
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg		< 0.2	4.5	< 0.2		0.4
Cadmium	DETSC 2301#	0.1	mg/kg		0.2	1.1	0.1		0.2
Chromium	DETSC 2301#	0.15	mg/kg		15	280	13		34
Copper	DETSC 2301#	0.2	mg/kg		8.6	62	9.1		12
Lead	DETSC 2301#	0.3	mg/kg		7.4	57	12		12
Mercury	DETSC 2325#	0.05	mg/kg		< 0.05	< 0.05	< 0.05		< 0.05
Nickel	DETSC 2301#	1	mg/kg		16	38	11		37
Selenium	DETSC 2301#	0.5	mg/kg		< 0.5	2.3	< 0.5		< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg		16	63	18		41
Zinc	DETSC 2301#	1	mg/kg		38	220	39		69
Inorganics									
pH	DETSC 2008#		pH		6.3	11.5	7.9		6.3
Cyanide, Total	DETSC 2130#	0.1	mg/kg		0.2	< 0.1	< 0.1		0.4
Total Organic Carbon	DETSC 2084#	0.5	%		1.8	1.1	0.5		1.2
Ammonia Aqueous Extract as N	DETSC 2119	10	mg/l	< 10				< 10	
Ammoniacal Nitrogen as NH4	DETSC 2119	0.5	mg/kg		24	2.3	3.0		71
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg		< 0.01	< 0.01	< 0.01		< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg		< 0.01	< 0.01	< 0.01		< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg		< 0.01	< 0.01	< 0.01		< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg		< 1.5	4.3	< 1.5		< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg		< 1.2	9.8	< 1.2		< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg		< 1.5	12	< 1.5		< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg		< 3.4	55	< 3.4		< 3.4
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg		< 3.4	27	< 3.4		< 3.4
Aliphatic C10-C44	DETSC 3072*	10	mg/kg		< 10	97	< 10		< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg		< 0.01	< 0.01	< 0.01		< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg		< 0.01	< 0.01	< 0.01		< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg		< 0.01	< 0.01	< 0.01		< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg		< 0.9	< 0.9	< 0.9		< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg		< 0.5	< 0.5	< 0.5		< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg		< 0.6	< 0.6	< 0.6		< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg		< 1.4	< 1.4	< 1.4		< 1.4
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg		< 1.4	< 1.4	< 1.4		< 1.4
Aromatic C10-C44	DETSC 3072*	10	mg/kg		< 10	< 10	< 10		< 10
Ali/Aro C10-C44	DETSC 3072*	10	mg/kg		< 10	97	< 10		< 10
C5-C10 Gasoline Range Organics (GRO)	DETSC 3321*	0.1	mg/kg		< 0.1	< 0.1	< 0.1		< 0.1
C10-C24 Diesel Range Organics (DRO)	DETSC 3311#	10	mg/kg		< 10	< 10	< 10		< 10

Summary of Chemical Analysis

Soil Samples

Our Ref 21-11935

Client Ref PN214233

Contract Title Newport

Lab No	1858724	1858725	1858726	1858727	1858728	1858729
Sample ID	CP-BH101	CP-BH101	WS-BH111	WS-BH108	WS-BH109	WS-BH109
Depth	4.20	1.00	1.00	0.50	6.00	1.00
Other ID						
Sample Type	ES	ES	ES	ES	ES	ES
Sampling Date	27/05/2021	27/05/2021	27/05/2021	25/05/2021	27/05/2021	27/05/2021
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg		< 0.03	0.03	< 0.03		0.04
Acenaphthylene	DETSC 3303#	0.03	mg/kg		< 0.03	< 0.03	< 0.03		< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg		< 0.03	< 0.03	< 0.03		< 0.03
Fluorene	DETSC 3303	0.03	mg/kg		< 0.03	< 0.03	< 0.03		< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg		< 0.03	0.08	< 0.03		< 0.03
Anthracene	DETSC 3303	0.03	mg/kg		< 0.03	< 0.03	< 0.03		< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg		< 0.03	0.09	0.04		< 0.03
Pyrene	DETSC 3303#	0.03	mg/kg		< 0.03	0.07	0.04		< 0.03
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg		< 0.03	0.04	< 0.03		< 0.03
Chrysene	DETSC 3303	0.03	mg/kg		< 0.03	0.03	< 0.03		< 0.03
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg		< 0.03	0.04	< 0.03		< 0.03
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg		< 0.03	< 0.03	< 0.03		< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg		< 0.03	< 0.03	< 0.03		< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg		< 0.03	< 0.03	< 0.03		< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg		< 0.03	< 0.03	< 0.03		< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg		< 0.03	< 0.03	< 0.03		< 0.03
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg		< 0.10	0.32	< 0.10		< 0.10
PCBs									
PCB 28 + PCB 31	DETSC 3401#	0.01	mg/kg				< 0.01		
PCB 52	DETSC 3401#	0.01	mg/kg				< 0.01		
PCB 101	DETSC 3401#	0.01	mg/kg				< 0.01		
PCB 118	DETSC 3401#	0.01	mg/kg				< 0.01		
PCB 153	DETSC 3401#	0.01	mg/kg				< 0.01		
PCB 138	DETSC 3401#	0.01	mg/kg				< 0.01		
PCB 180	DETSC 3401#	0.01	mg/kg				< 0.01		
PCB 7 Total	DETSC 3401#	0.01	mg/kg				< 0.01		
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg		< 0.3	< 0.3	< 0.3		< 0.3

Summary of Chemical Analysis

Soil Samples

Our Ref 21-11935

Client Ref PN214233

Contract Title Newport

Lab No	1858730	1858731	1858732	1858733
Sample ID	RC-BH103	RC-BH103	RC-BH104	RC-BH104
Depth	1.00	2.10	1.00	3.00
Other ID				
Sample Type	ES	ES	ES	ES
Sampling Date	28/05/2021	28/05/2021	28/05/2021	01/06/2021
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
Metals							
Arsenic	DETSC 2301#	0.2	mg/kg	6.1	4.9	6.4	
Barium	DETSC 2301#	1.5	mg/kg	270	230	84	
Beryllium	DETSC 2301#	0.2	mg/kg	0.6	0.7	0.5	
Boron, Water Soluble	DETSC 2311#	0.2	mg/kg	3.1	0.2	0.4	
Cadmium	DETSC 2301#	0.1	mg/kg	0.3	< 0.1	< 0.1	
Chromium	DETSC 2301#	0.15	mg/kg	480	31	22	
Copper	DETSC 2301#	0.2	mg/kg	53	12	11	
Lead	DETSC 2301#	0.3	mg/kg	24	12	8.2	
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	< 0.05	
Nickel	DETSC 2301#	1	mg/kg	23	52	22	
Selenium	DETSC 2301#	0.5	mg/kg	2.8	< 0.5	< 0.5	
Vanadium	DETSC 2301#	0.8	mg/kg	120	29	22	
Zinc	DETSC 2301#	1	mg/kg	140	69	51	
Inorganics							
pH	DETSC 2008#		pH	11.4	7.9	8.3	
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	
Total Organic Carbon	DETSC 2084#	0.5	%	2.8	< 0.5	< 0.5	
Ammonia Aqueous Extract as N	DETSC 2119	10	mg/l				< 10
Ammoniacal Nitrogen as NH4	DETSC 2119	0.5	mg/kg	4.2	2.6	2.1	
Petroleum Hydrocarbons							
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	26	
Aliphatic C35-C44	DETSC 3072*	3.4	mg/kg	< 3.4	< 3.4	< 3.4	
Aliphatic C10-C44	DETSC 3072*	10	mg/kg	< 10	< 10	24	
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4	
Aromatic C35-C44	DETSC 3072*	1.4	mg/kg	< 1.4	< 1.4	< 1.4	
Aromatic C10-C44	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	
Ali/Aro C10-C44	DETSC 3072*	10	mg/kg	< 10	< 10	24	
C5-C10 Gasoline Range Organics (GRO)	DETSC 3321*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	
C10-C24 Diesel Range Organics (DRO)	DETSC 3311#	10	mg/kg	< 10	< 10	< 10	

Summary of Chemical Analysis

Soil Samples

Our Ref 21-11935

Client Ref PN214233

Contract Title Newport

Lab No	1858730	1858731	1858732	1858733
Sample ID	RC-BH103	RC-BH103	RC-BH104	RC-BH104
Depth	1.00	2.10	1.00	3.00
Other ID				
Sample Type	ES	ES	ES	ES
Sampling Date	28/05/2021	28/05/2021	28/05/2021	01/06/2021
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
PAHs							
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	
Phenanthrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	
Fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	
Pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	
Chrysene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	< 0.10	< 0.10	< 0.10	
PCBs							
PCB 28 + PCB 31	DETSC 3401#	0.01	mg/kg	< 0.01			
PCB 52	DETSC 3401#	0.01	mg/kg	< 0.01			
PCB 101	DETSC 3401#	0.01	mg/kg	< 0.01			
PCB 118	DETSC 3401#	0.01	mg/kg	< 0.01			
PCB 153	DETSC 3401#	0.01	mg/kg	< 0.01			
PCB 138	DETSC 3401#	0.01	mg/kg	< 0.01			
PCB 180	DETSC 3401#	0.01	mg/kg	< 0.01			
PCB 7 Total	DETSC 3401#	0.01	mg/kg	< 0.01			
Phenols							
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	

Summary of Chemical Analysis

Soil VOC/SVOC Samples

Our Ref 21-11935

Client Ref PN214233

Contract Title Newport

Lab No	1858727	1858730
Sample ID	WS-BH108	RC-BH103
Depth	0.50	1.00
Other ID		
Sample Type	ES	ES
Sampling Date	25/05/2021	28/05/2021
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
VOCs					
Vinyl Chloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,1 Dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Trans-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,1-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Cis-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
2,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Bromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Chloroform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,1,1-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,1-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Carbon tetrachloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Benzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,2-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Trichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Dibromomethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Bromodichloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
cis-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Toluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
trans-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,1,2-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Tetrachloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,3-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Dibromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,2-dibromoethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Chlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Ethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
m+p-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
o-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Styrene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01
Bromoform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Isopropylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Bromobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,2,3-trichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
n-propylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
2-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,3,5-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
4-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Tert-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,2,4-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01

Summary of Chemical Analysis

Soil VOC/SVOC Samples

Our Ref 21-11935

Client Ref PN214233

Contract Title Newport

Lab No	1858727	1858730
Sample ID	WS-BH108	RC-BH103
Depth	0.50	1.00
Other ID		
Sample Type	ES	ES
Sampling Date	25/05/2021	28/05/2021
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
sec-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
p-isopropyltoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,3-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,4-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
n-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,2-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,2-dibromo-3-chloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,2,4-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
Hexachlorobutadiene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
1,2,3-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01
MTBE	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01
SVOCs					
Phenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
Aniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
2-Chlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
Benzyl Alcohol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
2-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
Bis(2-chloroisopropyl)ether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
3&4-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
2,4-Dimethylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
Bis-(dichloroethoxy)methane	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
2,4-Dichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
1,2,4-Trichlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
4-Chloro-3-methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
2-Methylnaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
Hexachlorocyclopentadiene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
2,4,6-Trichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
2,4,5-Trichlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
2-Chloronaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
2-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
2,4-Dinitrotoluene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
3-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
4-Nitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
Dibenzofuran	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
2,6-Dinitrotoluene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
2,3,4,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
Diethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
4-Chlorophenylphenylether	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
4-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
2-Methyl-4,6-Dinitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
Diphenylamine	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
4-Bromophenylphenylether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1

Summary of Chemical Analysis

Soil VOC/SVOC Samples

Our Ref 21-11935

Client Ref PN214233

Contract Title Newport

Lab No	1858727	1858730
Sample ID	WS-BH108	RC-BH103
Depth	0.50	1.00
Other ID		
Sample Type	ES	ES
Sampling Date	25/05/2021	28/05/2021
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
Hexachlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
Pentachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
Di-n-butylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
Butylbenzylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
Bis(2-ethylhexyl)phthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
Di-n-octylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
1,4-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
Dimethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
1,3-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
1,2-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
2,3,5,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1
Azobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1
Carbazole	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1

Summary of Asbestos Analysis Soil Samples

Our Ref 21-11935

Client Ref PN214233

Contract Title Newport

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1858725	CP-BH101 1.00	SOIL	NAD	none	Jordan Farley
1858726	WS-BH111 1.00	SOIL	NAD	none	Jordan Farley
1858727	WS-BH108 0.50	SOIL	NAD	none	Jordan Farley
1858729	WS-BH109 1.00	SOIL	NAD	none	Jordan Farley
1858730	RC-BH103 1.00	SOIL	NAD	none	Jordan Farley
1858731	RC-BH103 2.10	SOIL	NAD	none	Jordan Farley
1858732	RC-BH104 1.00	SOIL	NAD	none	Jordan Farley

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

WASTE ACCEPTANCE CRITERIA TESTING ANALYTICAL REPORT

Our Ref 21-11935
Client Ref PN214233
Contract Title Newport
Sample Id CP-BH101 1.00

Sample Numbers 1858725 1858734
Date Analysed 16/06/2021

Test Results On Waste		
Determinand and Method Reference	Units	Result
DETSC 2084# Total Organic Carbon	%	1.8
DETSC 2003# Loss On Ignition	%	4.1
DETSC 3321# BTEX	mg/kg	< 0.04
DETSC 3401# PCBs (7 congeners)	mg/kg	< 0.01
DETSC 3311# TPH (C10 - C40)	mg/kg	< 10
DETSC 3301 PAHs	mg/kg	< 1.6
DETSC 2008# pH	pH Units	6.3
DETSC 2073* Acid Neutralisation Capacity (pH4)	mol/kg	< 1.0
DETSC 2073* Acid Neutralisation Capacity (pH7)	mol/kg	< 1.0

WAC Limit Values		
Inert Waste	SNRHW	Hazardous Waste
3	5	6
n/a	n/a	10
6	n/a	n/a
1	n/a	n/a
500	n/a	n/a
100	n/a	n/a
n/a	>6	n/a
n/a	TBE	TBE
n/a	TBE	TBE

Test Results On Leachate		
Determinand and Method Reference	Conc in Eluate ug/l	Amount Leached* mg/kg
	10:1	LS10
DETSC 2306 Arsenic as As	0.76	< 0.01
DETSC 2306 Barium as Ba	2.1	< 0.1
DETSC 2306 Cadmium as Cd	< 0.030	< 0.02
DETSC 2306 Chromium as Cr	< 0.25	< 0.1
DETSC 2306 Copper as Cu	< 0.40	< 0.02
DETSC 2306 Mercury as Hg	< 0.010	< 0.002
DETSC 2306 Molybdenum as Mo	< 1.1	< 0.1
DETSC 2306 Nickel as Ni	< 0.50	< 0.1
DETSC 2306 Lead as Pb	< 0.090	< 0.05
DETSC 2306 Antimony as Sb	< 0.17	< 0.05
DETSC 2306 Selenium as Se	< 0.25	< 0.03
DETSC 2306 Zinc as Zn	< 1.3	< 0.01
DETSC 2055 Chloride as Cl	760	< 100
DETSC 2055* Fluoride as F	< 100	< 0.1
DETSC 2055 Sulphate as SO4	2500	< 100
DETSC 2009* Total Dissolved Solids	8000	80
DETSC 2130 Phenol Index	< 100	< 1
DETSC 2085 Dissolved Organic Carbon	< 2000	< 50

WAC Limit Values		
Limit values for LS10 Leachate		
Inert Waste	SNRHW	Hazardous Waste
0.5	2	25
20	100	300
0.04	1	5
0.5	10	70
2	50	100
0.01	0.2	2
0.5	10	30
0.4	10	40
0.5	10	50
0.06	0.7	5
0.1	0.5	7
4	50	200
800	15,000	25,000
10	150	500
1000	20,000	50,000
4000	60,000	100,000
1	n/a	n/a
500	800	1000

Additional Information	
DETSC 2008 pH	8.2
DETSC 2009 Conductivity uS/cm	11.4
* Temperature*	21.0
Mass of Sample Kg*	0.120
Mass of dry Sample Kg*	0.096
Stage 1	
Volume of Leachant L2*	0.936
Volume of Eluate VE1*	0.9

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive
Hazardous Waste

Disclaimer: The WAC limit values are provided for guidance only. DETS does not accept responsibility for errors or omissions. Values are correct at time of issue.

* DETS are accredited for the testing of leachates and not the leachate preparation stage which is unaccredited.

Information in Support of the Analytical Results

Our Ref 21-11935

Client Ref PN214233

Contract Newport

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1858724	CP-BH101 4.20 SOIL	27/05/21	GJ 250ml, GJ 60ml, PT 1L	Ammonia Aqueous Extract (3 days)	
1858725	CP-BH101 1.00 SOIL	27/05/21	PT 1L	Ammonia (3 days), pH + Conductivity (7 days)	Aliphatics/Aromatics, BTEX, Naphthalene, Ammoniacal Nitrogen as NH ₄ , PAH FID, PAH MS, PCB, EPH/TPH
1858726	WS-BH111 1.00 SOIL	27/05/21	GJ 250ml, GJ 60ml, PT 1L	Ammonia (3 days), pH + Conductivity (7 days)	Ammoniacal Nitrogen as NH ₄
1858727	WS-BH108 0.50 SOIL	25/05/21	GJ 250ml, GJ 60ml, PT 1L	Ammonia (3 days), pH + Conductivity (7 days), VOC (7 days)	Ammoniacal Nitrogen as NH ₄
1858728	WS-BH109 6.00 SOIL	27/05/21	GJ 250ml, GJ 60ml, PT 1L	Ammonia Aqueous Extract (3 days)	
1858729	WS-BH109 1.00 SOIL	27/05/21	GJ 250ml, GJ 60ml, PT 1L	Ammonia (3 days), pH + Conductivity (7 days)	Ammoniacal Nitrogen as NH ₄
1858730	RC-BH103 1.00 SOIL	28/05/21	PT 1L	Ammonia (3 days)	Aliphatics/Aromatics, BTEX, Naphthalene, Ammoniacal Nitrogen as NH ₄ , PAH MS, PCB, SVOC, EPH/TPH
1858731	RC-BH103 2.10 SOIL	28/05/21	PT 1L	Ammonia (3 days)	Aliphatics/Aromatics, BTEX, Naphthalene, Ammoniacal Nitrogen as NH ₄ , PAH MS, EPH/TPH
1858732	RC-BH104 1.00 SOIL	28/05/21	PT 1L	Ammonia (3 days)	Aliphatics/Aromatics, BTEX, Naphthalene, Ammoniacal Nitrogen as NH ₄ , PAH MS, EPH/TPH
1858733	RC-BH104 3.00 SOIL	01/06/21	PT 1L		
1858734	CP-BH101 1.00 LEACHATE	27/05/21	PT 1L		

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Information in Support of the Analytical Results

Our Ref 21-11935
Client Ref PN214233
Contract Newport

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.
Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.
The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-
Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report

APPENDIX II

Laboratory Test Results - Contamination (Groundwater)



Certificate of Analysis

Certificate Number 21-12390

Issued: 21-Jun-21

Client Geotechnics LTD
The Geotechnical Centre
Unit 1B Borders Ind. Park
River Lane
Saltney
Chester
CH4 8RJ

Our Reference 21-12390

Client Reference PN214233

Order No ON29853

Contract Title Newport

Description 10 Water samples.

Date Received 11-Jun-21

Date Started 11-Jun-21

Date Completed 21-Jun-21

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. 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 except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick
Contracts Manager



2139

Summary of Chemical Analysis

Water Samples

Our Ref 21-12390

Client Ref PN214233

Contract Title Newport

Lab No	1861291	1861292	1861293	1861294	1861295	1861296
Sample ID	RC-BH105	RC-BH104	CP-BH103	RC-BH103	CP-BH102	CP-BH101
Depth	2.20	2.50	1.25	2.20	3.05	1.95
Other ID						
Sample Type	WATER	WATER	WATER	WATER	WATER	WATER
Sampling Date	10/06/2021	10/06/2021	10/06/2021	10/06/2021	10/06/2021	10/06/2021
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
Metals									
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	0.31	0.81	0.61	0.86	1.2	1.3
Barium, Dissolved	DETSC 2306	0.26	ug/l	180	360	97	270	200	580
Beryllium, Dissolved	DETSC 2306*	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Boron, Dissolved	DETSC 2306*	12	ug/l	47	30	46	76	150	43
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	0.22	< 0.03	0.17	< 0.03	0.04	0.07
Calcium, Dissolved	DETSC 2306	0.09	mg/l	77	70	32	76	63	120
Chromium, Dissolved	DETSC 2306	0.25	ug/l	0.61	1.1	1.2	0.71	1.3	0.63
Copper, Dissolved	DETSC 2306	0.4	ug/l	3.2	2.5	1.1	0.6	3.0	0.5
Lead, Dissolved	DETSC 2306	0.09	ug/l	5.6	0.11	0.69	< 0.09	0.27	0.14
Manganese, Dissolved	DETSC 2306	0.22	ug/l	1300	66	72	12	1000	1200
Mercury, Dissolved	DETSC 2306	0.01	ug/l	0.03	0.04	0.02	0.01	0.06	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	3.6	1.4	1.0	< 0.5	4.1	7.2
Selenium, Dissolved	DETSC 2306	0.25	ug/l	1.0	0.65	2.8	1.0	12	1.1
Vanadium, Dissolved	DETSC 2306	0.6	ug/l	< 0.6	2.0	1.2	3.6	2.6	< 0.6
Zinc, Dissolved	DETSC 2306	1.3	ug/l	2.3	3.6	3.5	2.9	12	53
Inorganics									
pH	DETSC 2008		pH	7.0	7.3	7.4	7.5	7.3	6.6
Dissolved Organic Carbon	DETSC 2085	2	mg/l	< 2.0	3.4	< 2.0	< 2.0	12	14
Ammoniacal Nitrogen as N	DETSC 2207	0.015	mg/l	0.030	0.10	0.040	0.060	2.8	2.2
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C10-C44	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	24
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	24
Aliphatic C35-C44	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C35-C44	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C10-C44	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ali/Aro C10-C44	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	24
PAHs									
Naphthalene	DETSC 3304	0.05	ug/l	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Summary of Chemical Analysis

Water Samples

Our Ref 21-12390

Client Ref PN214233

Contract Title Newport

Lab No	1861291	1861292	1861293	1861294	1861295	1861296
Sample ID	RC-BH105	RC-BH104	CP-BH103	RC-BH103	CP-BH102	CP-BH101
Depth	2.20	2.50	1.25	2.20	3.05	1.95
Other ID						
Sample Type	WATER	WATER	WATER	WATER	WATER	WATER
Sampling Date	10/06/2021	10/06/2021	10/06/2021	10/06/2021	10/06/2021	10/06/2021
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	DETSC 3304	0.01	ug/l	0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01
Anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	DETSC 3304	0.01	ug/l	0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01
Pyrene	DETSC 3304	0.01	ug/l	0.06	0.01	0.06	< 0.01	0.01	< 0.01
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
PAH Total	DETSC 3304	0.2	ug/l	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Phenols									
Phenol - Monohydric	DETSC 2130	100	ug/l	< 100	< 100	< 100	< 100	< 100	< 100

Summary of Chemical Analysis

Water Samples

Our Ref 21-12390

Client Ref PN214233

Contract Title Newport

Lab No	1861297	1861298	1861299	1861300
Sample ID	WS-BH110	WS-BH109	RC-BH102	WS-BH103
Depth	2.65	2.55	2.60	1.90
Other ID				
Sample Type	WATER	WATER	WATER	WATER
Sampling Date	10/06/2021	10/06/2021	10/06/2021	10/06/2021
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
Metals							
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	6.5	8.9	0.96	0.78
Barium, Dissolved	DETSC 2306	0.26	ug/l	84	530	130	180
Beryllium, Dissolved	DETSC 2306*	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Boron, Dissolved	DETSC 2306*	12	ug/l	170	81	270	77
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	0.04	< 0.03	< 0.03	< 0.03
Calcium, Dissolved	DETSC 2306	0.09	mg/l	50	210	28	62
Chromium, Dissolved	DETSC 2306	0.25	ug/l	1.3	1.1	1.2	3.6
Copper, Dissolved	DETSC 2306	0.4	ug/l	3.2	< 0.4	1.2	1.4
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.57	0.10	0.33	< 0.09
Manganese, Dissolved	DETSC 2306	0.22	ug/l	26	3000	25	170
Mercury, Dissolved	DETSC 2306	0.01	ug/l	0.34	0.02	< 0.01	< 0.01
Nickel, Dissolved	DETSC 2306	0.5	ug/l	2.8	7.4	1.1	3.3
Selenium, Dissolved	DETSC 2306	0.25	ug/l	15	5.0	0.75	0.45
Vanadium, Dissolved	DETSC 2306	0.6	ug/l	38	2.6	2.0	1.5
Zinc, Dissolved	DETSC 2306	1.3	ug/l	1.4	1.6	3.7	3.2
Inorganics							
pH	DETSC 2008		pH	10.2	7.5	8.0	7.6
Dissolved Organic Carbon	DETSC 2085	2	mg/l	24	72	2.2	4.0
Ammoniacal Nitrogen as N	DETSC 2207	0.015	mg/l	6.3	3.6	0.34	0.050
Petroleum Hydrocarbons							
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C10-C44	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C35-C44	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C35-C44	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C10-C44	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Ali/Aro C10-C44	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
PAHs							
Naphthalene	DETSC 3304	0.05	ug/l	0.12	< 0.05	< 0.05	< 0.05

Summary of Chemical Analysis

Water Samples

Our Ref 21-12390

Client Ref PN214233

Contract Title Newport

Lab No	1861297	1861298	1861299	1861300
Sample ID	WS-BH110	WS-BH109	RC-BH102	WS-BH103
Depth	2.65	2.55	2.60	1.90
Other ID				
Sample Type	WATER	WATER	WATER	WATER
Sampling Date	10/06/2021	10/06/2021	10/06/2021	10/06/2021
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01	0.02	< 0.01	< 0.01
Fluorene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	DETSC 3304	0.01	ug/l	0.07	< 0.01	< 0.01	0.02
Anthracene	DETSC 3304	0.01	ug/l	0.01	0.02	< 0.01	0.02
Fluoranthene	DETSC 3304	0.01	ug/l	0.06	< 0.01	< 0.01	0.03
Pyrene	DETSC 3304	0.01	ug/l	0.15	0.02	< 0.01	0.06
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	0.04	< 0.01	0.04
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01	0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
PAH Total	DETSC 3304	0.2	ug/l	0.44	< 0.20	< 0.20	0.22
Phenols							
Phenol - Monohydric	DETSC 2130	100	ug/l	< 100	< 100	< 100	< 100

Information in Support of the Analytical Results

Our Ref 21-12390

Client Ref PN214233

Contract Newport

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1861291	RC-BH105 2.20 WATER	10/06/21	GB 1L, GV, PB 1L		
1861292	RC-BH104 2.50 WATER	10/06/21	GB 1L, GV, PB 1L		
1861293	CP-BH103 1.25 WATER	10/06/21	GB 1L, GV, PB 1L		
1861294	RC-BH103 2.20 WATER	10/06/21	GB 1L, GV, PB 1L		
1861295	CP-BH102 3.05 WATER	10/06/21	GB 1L, GV, PB 1L		
1861296	CP-BH101 1.95 WATER	10/06/21	GB 1L, GV, PB 1L		
1861297	WS-BH110 2.65 WATER	10/06/21	GB 1L, GV, PB 1L		
1861298	WS-BH109 2.55 WATER	10/06/21	GB 1L, GV, PB 1L		
1861299	RC-BH102 2.60 WATER	10/06/21	GB 1L, GV, PB 1L		
1861300	WS-BH103 1.90 WATER	10/06/21	GB 1L, GV, PB 1L		

Key: G-Glass P-Plastic B-Bottle V-Vial

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report

APPENDIX 12

Summary of Analytical Soil Data


	Below Detection Limits
	Exceeded GAC/SDV
	Exceeded cMCL/SMCLs
	Assessment criteria for sM, Subhazard and Subhazard are not based on human health. Subhazard criteria assumes DS-1 ACCEC classification for concrete.

Notes











- Generic Qualitative Assessment Criteria have been used where appropriate based on the current CLEA 1.06 Model (default values, send only 25 SDOs). Where no CLEA generic qualitative value has been calculated no assessment has been made. The results presented show maximum and mean concentrations. This is to provide a reasonable prediction of the range of data rather than to provide any detailed statistical appraisal.
- Results lower than detection limit are shaded in grey.
- When the test result is recorded as less than the detection limit, the result used for the analysis is the detection limit.
- Cumulative hazard in the absence of a DOAC based on current CLEA 1.06 Model; the Annual Sol Value for Cumulative hazard has been used.
- For metals, where an SDV has been published, this value has been used. Note that the published SDV do not include the residential without land use scenario. CLEA v1.06 has therefore been used to derive GACs for this scenario. For organics, CLEA v1.06 has been used as the SDV assumes 6% SPM.
- cMCL based on advanced toxicology and exposure assumptions
- cMCL for leachate assumes 6% SPM

APPENDIX 13

Cross Sections Showing Water Strikes

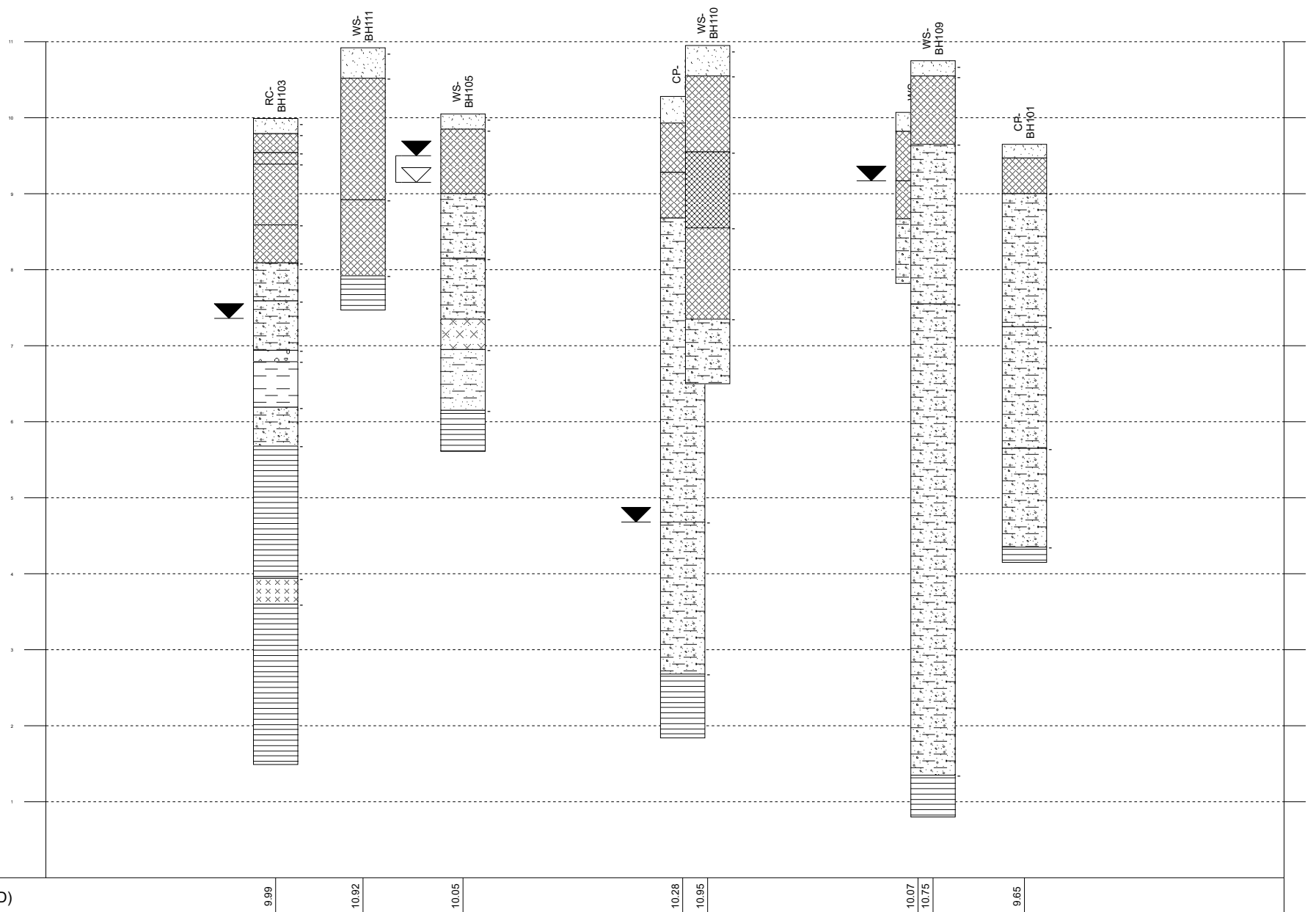
Project: NEWPORT QUINN SDD RFP	Title: Section Line	Unit 1B Borders Industrial Park River Lane Saltney Chester CH4 8RJ	Phone: 01244 671117 Email: mail@geotechnics.co.uk www.geotechnics.co.uk	 GEOTECHNICS geotechnical and geoenvironmental specialists
	Vertical Scale: 1:73			
Project No.: PN214233	Horizontal Scale: 1:1590			
Client: Pinnacle Consulting Engineers Limited	Engineer: Pinnacle Consulting Engineers Limited			


Legend Key

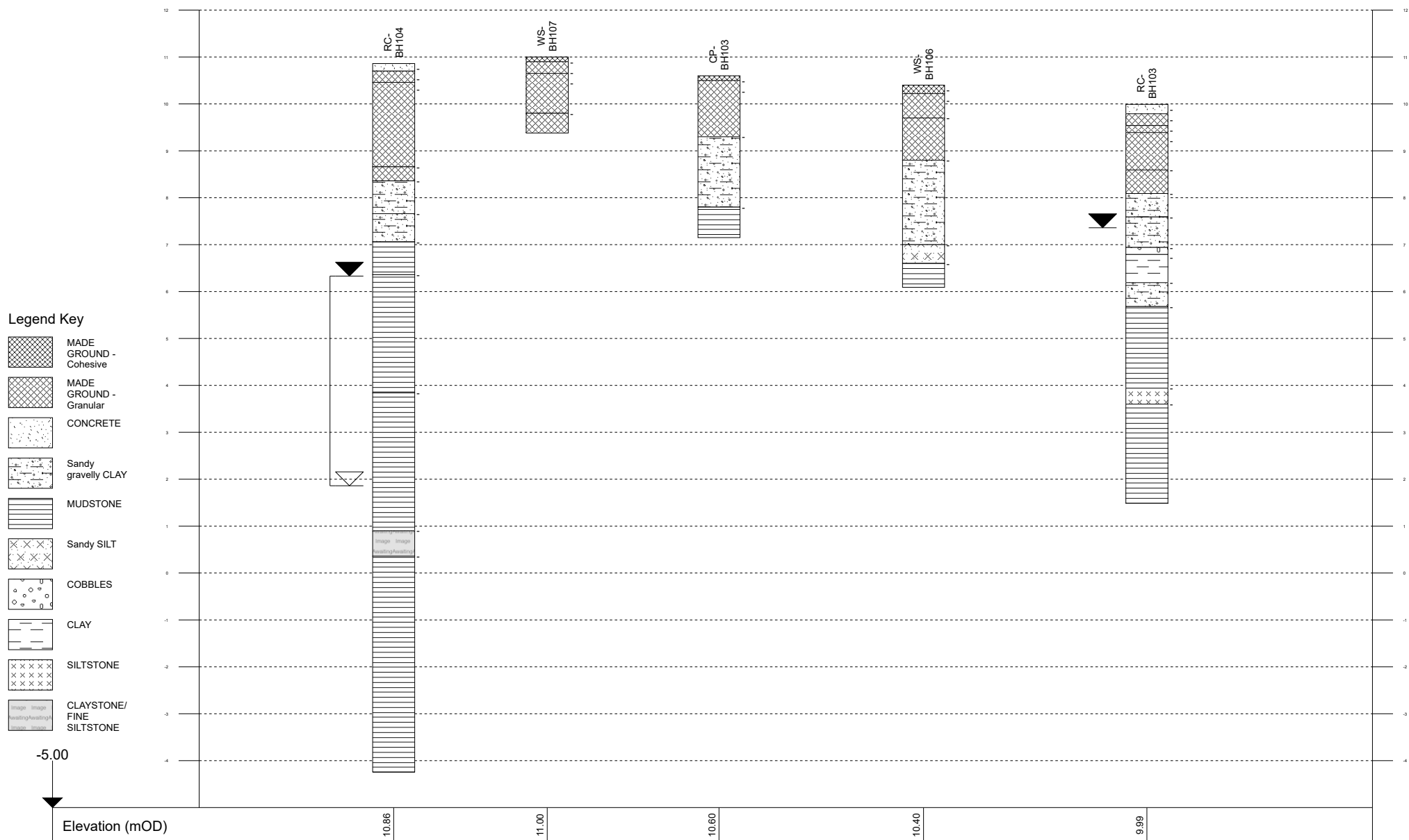
	CONCRETE
	MADE GROUND - Granular
	Sandy gravelly CLAY
	MADE GROUND - Cohesive
	MUDSTONE
	Sandy SILT
	Sandy CLAY
	COBBLES
	CLAY
	SILTSTONE

0.00

Elevation (mOD)



Project:	NEWPORT QUINN SDD RFP	Title:	Section Line	Unit 1B Borders Industrial Park River Lane Saltney Chester CH4 8RJ	Phone: 01244 671117 Email: mail@geotechnics.co.uk www.geotechnics.co.uk	 geotechnical and geoenvironmental specialists
		Vertical Scale:	1:112			
Project No.:	PN214233	Horizontal Scale:	1:1830			
Client:	Pinnacle Consulting Engineers Limited	Engineer:	Pinnacle Consulting Engineers Limited			



APPENDIX I4

Summary of Analytical Groundwater Data

Summary of Water Analysis - Tier I Screening



Sample Location	Units	Minimum Reporting Value	Drinking Water Standard (or closest value)	EQS Freshwater	Estuaries and coastal waters	Preliminary Investigation									
						Made Ground				Natural					
						CP-BH103	WS-BH110	WS-BH109	WS-BH103	RC-BH105	RC-BH104	RC-BH103	CP-BH102	CP-BH101	RC-BH102
Water Quality - Field Testing															
pH	pH Units	-	-	-	-	7.4	10.2	7.5	7.6	7	7.3	7.5	7.3	6.6	8
Metals															
Arsenic	ug/l	-	10	50	25	0.61	6.5	8.9	0.78	0.31	0.81	0.86	1.2	1.3	0.96
Cadmium	ug/l	0.1	50	See notes	0.2	0.17	0.04	0.03	0.03	0.22	0.03	0.03	0.04	0.07	0.03
Chromium (Total)	ug/l	-	50	Sum of III and VI		1.2	1.3	1.1	3.6	0.61	1.1	0.71	1.3	0.63	1.2
Chromium (III)	ug/l	-	50	4.7	-										
Chromium (VI)	ug/l	-		3.4	0.6										
Copper	ug/l	-	2000	1*	3.76 (where DOC <1 mg/l) 3.76+((DOC?-0.5) where DOC >1 mg/l)	1.1	3.2	0.4	1.4	3.2	2.5	0.6	3.0	0.5	1.2
Iron	ug/l	-	200	1000	1000										
Lead	ug/l	-	10	1.2)	1.3	0.69	0.57	0.1	0.09	5.6	0.11	0.09	0.27	0.14	0.33
Manganese	ug/l	-	50	123*	-	72	26	3000	170	1300	66	12	1000	1200	25
Mercury	ug/l	0.01	1	0.07	0.07	0.02	0.34	0.02	0.01	0.03	0.04	0.01	0.06	0.01	0.01
Nickel	ug/l	-	20	4*	8.6	1	2.8	7.4	3.3	3.6	1.4	0.5	4.1	7.2	1.1
Selenium	ug/l	-	10	-	-	2.8	15	5	0.45	1	0.65	1	12	1.1	0.75
Zinc	ug/l	-	3000~	10.9*	6.8	3.5	1.4	1.6	3.2	2.3	3.6	2.9	12	53	3.7
Calcium	ug/l	-	250	-	-	32	50	210	62	77	70	76	63	120	28
Inorganic															
Ammoniacal Nitrogen as N	mg/l	-	50	1	1	0.040	6.3	3.6	0.050	0.03	0.1	0.06	2.8	2.2	0.34
Organics															
Phenol	ug/l	0.5	-	7.7	7.7	100	100	100	100	100	100	100	100	100	100
Dissolved Organic Carbon	mg/l	-	-	-	-	2	24	72	4.0	2	3.4	2	12	14	2.2
PAH															
Naphthalene	ug/l	-	-	2	2	0.05	0.12	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Acenaphthylene	ug/l	-	-	-	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Acenaphthene	ug/l	-	-	-	-	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Fluorene	ug/l	-	-	-	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Phenanthrene	ug/l	-	-	-	-	0.01	0.07	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01
Anthracene	ug/l	-	-	0.1	0.1	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
Fluoranthene	ug/l	-	-	0.0063	0.0063	0.01	0.06	0.01	0.03	0.01	0.01	0.01	0.01	0.01	0.01
Pyrene	ug/l	-	-	-	-	0.06	0.15	0.02	0.06	0.06	0.01	0.01	0.01	0.01	0.01
Benzo[a]anthracene	ug/l	-	-	-	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Chrysene	ug/l	-	-	-	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Benzo[b]fluoranthene	ug/l	-	0.10	BaP	BaP	0.01	0.01	0.04	0.04	0.01	0.01	0.01	0.01	0.01	0.01
Benzo[k]fluoranthene	ug/l	-	0.10	BaP	BaP	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Benzo[a]pyrene	ug/l	-	0.01	0.00017	0.00017	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Indeno[1,2,3-cd]pyrene	ug/l	-	0.10	BaP	BaP	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
dibenzo[a,h]anthracene	ug/l	-	-	-	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Benzo[ghi]perylene	ug/l	-	-	BaP	BaP	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

TPH																
Aliphatic >C5 - C6	ug/l	-	10	10	10	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Aliphatic >C6 - C8	ug/l	-	10	10	10	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Aliphatic >C8 - C10	ug/l	-	10	10	10	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Aliphatic >C10 - C12	ug/l	-	10	10	10	1	1	1	1	1	1	1	1	1	1	1
Aliphatic >C12 - C16	ug/l	-	10	10	10	1	1	1	1	1	1	1	1	1	1	1
Aliphatic >C16 - C21	ug/l	-	10	10	10	1	1	1	1	1	1	1	1	1	1	1
Aliphatic >C21 - C34	ug/l	-	10	10	10	1	1	1	1	1	1	1	1	24	1	1
Aliphatic (C5 - C34)	ug/l	-	10	10	10	1	1	1	1	1	1	1	1	1	1	1
Aromatic >C5 - C7	ug/l	-	10	10	10	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Aromatic >C7 - C8	ug/l	-	10	10	10	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Aromatic >C8 - C10	ug/l	-	10	10	10	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Aromatic >C10 - C12	ug/l	-	10	10	10	1	1	1	1	1	1	1	1	1	1	1
Aromatic >C12 - C16	ug/l	-	10	10	10	1	1	1	1	1	1	1	1	1	1	1
Aromatic >C16 - C21	ug/l	-	10	10	10	1	1	1	1	1	1	1	1	1	1	1
Aromatic >C21 - C35	ug/l	-	10	10	10	1	1	1	1	1	1	1	1	1	1	1
Aromatic >C35 - C40	ug/l	-	10	10	10	1	1	1	1	1	1	1	1	1	1	1

Note:

	Fail: Above UK EQS
	Fail: Above UK DWS
	Result below Detection Limit

EQS for cadmium is dependent on hardness 40 mg/l 0.08ug/l, 40 to 50mg/l 0.08ug/l, 50 to 100 mg/l 0.09ug/l, 100-200mg/l 0.15ug/l, >500mg/l 0.25ug/l

* EQS for substances based on CaCO3 Hardness and second stage assessment with m-BAT tool required if exceeded

Total of 4 Drinking Water Standard PAHs: Benzo[b]fluoranthene, Benzo[k]fluoranthene, Indeno[1,2,3-cd]pyrene, Benzo[ghi]perylene

~ The Surface Waters (Abstraction for Drinking Water) (Classification) Regulations 1996

~ Drinking Water Inspectorate(2006) DWI1/10/18 (odour threshold)

+ WHO Guidelines for drinking water quality - 4th ed

} - bioavailable

APPENDIX 15

Output from Metal Bio-Availability Assessment Tool

ID	Location	Waterbody	Date	Measured Cu Concentration (dissolved) (µg l ⁻¹)	Measured Zn Concentration (dissolved) (µg l ⁻¹)	Measured Mn Concentration (dissolved) (µg l ⁻¹)	Measured Ni Concentration (dissolved) (µg l ⁻¹)	pH	DOC	Ca	Site-specific PNEC Dissolved Copper (µg l ⁻¹)	BioF	Bioavailable Copper Concentration (µg l ⁻¹)	Risk Characterisation Ratio	Site-specific PNEC Dissolved Zinc (µg l ⁻¹)	BioF	Bioavailable Zinc Concentration (µg l ⁻¹)	Risk Characterisation Ratio	Site-specific PNEC Dissolved Manganese (µg l ⁻¹)	BioF	Bioavailable Manganese Concentration (µg l ⁻¹)	Risk Characterisation Ratio	Site-specific PNEC Dissolved Nickel (µg l ⁻¹)	BioF	Bioavailable Nickel Concentration (µg l ⁻¹)	Risk Characterisation Ratio
1	CP-BH103	Perched	10/06/2021	1.1	3.5	72	1	7.4	2	32	8.07	0.12	0.14	0.14	16.64	0.88	2.29	0.21	399.21	0.31	22.18	0.19	8.90	0.45	0.45	0.11
2	WS-BH110	Perched	10/06/2021	3.2	1.4	26	2.8	10.2	24	59	2.1	0.17	0.17	0.17	92.26	0.12	0.17	0.02	123.00	1.00	26.00	0.21	4.00	1.00	2.60	0.30
3	WS-BH109	Perched	10/06/2021	0.4	1.6	3000	7.4	7.5	72	210	56.88	0.02	0.01	0.01	68.42	0.18	0.25	0.02	577.88	8.21	636.43	5.19	38.08	0.11	0.78	0.19
4	WS-BH103	Perched	10/06/2021	1.4	3.3	170	3.3	7.6	4.0	62	16.36	0.08	0.09	0.09	24.14	0.45	1.45	0.13	265.90	0.46	78.64	0.64	13.78	0.29	0.96	0.24
5	RC-BH105	Groundwater	10/06/2021	3.2	2.3	1300	3.6	7	2	77	7.45	0.13	0.43	0.43	19.04	0.57	1.32	0.12	1521.55	0.08	105.09	0.85	17.95	0.22	0.80	0.20
6	RC-BH104	Groundwater	10/06/2021	2.5	3.6	66	1.4	7.3	3.4	70	14.58	0.07	0.17	0.17	22.01	0.50	1.78	0.16	853.26	0.14	9.54	0.08	16.50	0.24	0.34	0.08
7	RC-BH103	Groundwater	10/06/2021	0.6	2.9	12	0.5	7.5	7	74	7.81	0.13	0.08	0.08	18.75	0.58	1.68	0.15	577.98	0.21	2.55	0.03	12.99	0.31	0.15	0.04
8	CP-BH102	Groundwater	10/06/2021	3.0	12	1000	4.1	7.3	12	63	53.41	0.02	0.08	0.08	44.66	0.24	2.93	0.27	489.16	8.25	251.45	2.04	25.13	0.16	0.63	0.16
9	CP-BH1-1	Groundwater	10/06/2021	0.5	53	1200	7.2	6.6	14	120	19.55	0.05	0.03	0.03	54.88	6.34	17.66	1.61	3122.88	0.04	47.36	0.38	36.88	0.11	0.78	0.20
10	RC-BH102	Groundwater	10/06/2021	1.2	3.7	25	1.1	8	2.2	28	6.10	0.16	0.20	0.20	17.17	0.83	2.35	0.22	123.00	1.00	25.00	0.20	5.06	0.79	0.87	0.22

APPENDIX I6

Environmental Notes

1.0 LEGISLATION OVERVIEW

This report includes hazard identification and environmental risk assessment in line with the risk-based methods referred to in relevant UK legislation and guidance. Government environmental policy is based upon a “suitable for use approach,” which is relevant to both the current use of land and also to any proposed future use. The contaminated land regime is the statutory regime for remediation of contaminated land that causes an unacceptable level of risk and is set out in Part 2A of the Environmental Protection Act 1990 (“EPA 1990”). The main objective of introducing the Part IIA regime is to provide an improved system for the identification and remediation of land where contamination is causing unacceptable risks to human health or the wider environment given the current use and circumstances of the land. Part IIA provides a statutory definition of contaminated land under Section 78A(2) as:

“any land which appears to the Local Authority in whose area it is situated to be in such a condition, by reason of substances in, on, or under the land, that:

- (a) Significant harm is being caused or there is a significant possibility of such harm being caused; or
- (b) Pollution of controlled waters is being, or is likely to be, caused.”

In order to assist in establishing if there is a “significant possibility of significant harm” there must be a “contaminant linkage” for potential harm to exist. That means there must be a source(s) of contamination, sensitive receptors present and a connection or pathway between the two. This combination of contaminant-pathway-receptor is termed a “contaminant linkage or CPR linkage.”

Part IIA of The Environmental Protection Act 1990 is supported by a substantial quantity of guidance and other Regulations. Key implementing legislation of the Part 2A regime includes the Contaminated Land (Wales) (Amendment) Regulations 2012 (SI 2012/283 (W.47)) as amended by the overarching legislation for the contaminated land regime, which implements the provisions of Part IIA of the Environmental Protection Act 1990 (as inserted by section 57 of the Environment Act 1995), came into force on 14th July 2000 together with Revised Contaminated Land Statutory Guidance was published by the Welsh Government in 2012. Part IIA defines the duties of Local Authorities in dealing with it. Part IIA places contaminated land responsibility as a part of planning and redevelopment process rather than Local Authority direct action except in situations of very high pollution risk. Powers were transferred to the National Assembly of Wales by the National Assembly for Wales (Transfer of Functions) Order 1999.

In the planning process guidance is provided by Planning

Policy Wales of February 2021 which requires that a site which has been developed shall not be capable of being determined “contaminated land” under Part IIA. In practice, Planning Authorities require sites being developed to have a lower level of risk post development than the higher level of risk that is required in order to determine a site as being contaminated in accordance with Part IIA. This is to ensure that there is a suitable zone of safety below the level for Part IIA determination and prevent recently developed sites becoming reclassified as contaminated land if there are future legislative or technical changes (e.g. a substance is subsequently found to be more toxic than previously assessed this increases its hazard).

The criteria for assessing concentrations of contaminants and hence determining whether a site represents a hazard are based on a range of techniques, models and guidance. Within this context it is relevant to note that Government objectives are:

- (a) to identify and remove unacceptable risks to human health and the environment;
- (b) to seek to bring damaged land back into beneficial use;
- (c) to seek to ensure that the cost burdens faced by individuals, companies and society as a whole are proportionate, manageable and economically sustainable.

These three objectives underlie the “suitable for use” approach to risk management and remediation of contaminated land. The “suitable for use” approach focuses on the risks caused by land contamination. The approach recognises that the risks presented by any given level of contamination will vary greatly according to the use of the land and a wide range of other factors, such as the underlying geology of the site. Risks therefore should be assessed on a site-by-site basis.

The “suitable for use” approach then consists of three elements:

- (a) ensuring that land is suitable for its current use - in other words, identifying any land where contamination is causing unacceptable risks to human health and the environment, assessed on the basis of the current use and circumstances of the land, and returning such land to a condition where such risks no longer arise (“remediating” the land); the contaminated land regime provides the regulatory mechanisms to achieve this;
- (b) ensuring that land is made suitable for any new use, as planning permission is given for that new use - in other words, assessing the potential risks from contamination, on the basis of the proposed future use and circumstances, before official permission is given for the development and, where necessary to avoid unacceptable risks to human health and the

environment, remediating the land before the new use commences; this is the role of the town and country planning and building control regimes; and

(c) limiting requirements for remediation to the work necessary to prevent unacceptable risks to human health or the environment in relation to the current use or future use of the land for which planning permission is being sought - in other words, recognising that the risks from contaminated land can be satisfactory assessed only in the context of specific uses of the land (whether current or proposed), and that any attempt to guess what might be needed at some time in the future for other uses is likely to result either in premature work (thereby running the risk of distorting social, economic and environmental priorities) or in unnecessary work (thereby wasting resources).

The mere presence of contaminants does not therefore necessarily warrant action, and consideration must be given to the scale of risk involved for the use that the site has, and will have in the future. Please note that Geotechnics Limited Reports do not address risk associated with potential contamination by botanical agents such as Japanese Knotweed.

To determine potential risk and uncertainty, reference is made to the currently accepted UK methodology as defined by the source-pathway-receptor model of land contamination and as further detailed in Section 4 below. Please note that reports do not address potential contamination by botanical agents such as Japanese Knotweed.

2.0 LEGAL FRAMEWORK

Land contamination is an increasingly important material consideration within the overall planning regime. The Planning Authority is required to consider the potential implications of contamination both when it is developing structure or local plans and when it is considering individual applications for planning permission. Where contamination is suspected or known to exist at a site, a Planning Authority may require investigations to be undertaken, for example, before granting planning permission. Alternatively it may include conditions on the permission itself requiring appropriate investigation and, if necessary, remediation. Part IIA of the Environmental Protection Act 1990 has created a regime within which the identification and remediation of contaminated land can be undertaken regarding current land use and legacy contamination. This is then further refined through the use of guidance on specific aspects of the process produced by various authorising bodies.

Section 78A(2) of the Act defines contaminated land for the purposes of Part IIA as:

“any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substance in, on or under the land that:

- a) significant harm is being caused or there is a significant possibility of such harm being caused; or
- b) significant pollution of controlled waters is being, or is likely to be caused.”

Part IIA is intended to complement the Planning Regime and both of these are intended to embody a “suitable for use approach”. In the context of Part IIA, action is necessary only where there are unacceptable risks to health or the environment, taking in to account the current use of the land and its environmental setting.

Environmental reports should provide an assessment of the contamination conditions considered likely to be found at the site in the context of the legal framework discussed above. Hence, this assessment is based solely on our current knowledge and understanding of the site as determined by the information made available to us by the Client or acquired on their behalf as well as our understanding of the proposed development, legal and other guidance available at the time of writing.

3.0 OVERALL METHODOLOGY

The work presented in this report has been carried out in general accordance with recognised best practice as detailed in guidance documents such as in the on-line Environment Agency Land Contamination Risk Management (LCRM) (adopted in Wales), and BS10175:2011+A2 2017. Important aspects of the risk assessment process are transparency and justification. The particular rationale behind the risk assessments presented is given in this appendix.

The first stage of a two-staged investigation and assessment of a site is the Preliminary Investigation (BS 10175:2011), often referred to as the Phase I Study, comprising desk study and walk-over survey, which culminates in the Preliminary Risk Assessment and development of the Preliminary Conceptual Site Model (CSM). A CSM is developed which identifies potential geotechnical and geo-environmental hazards and the qualitative degree of risk associated with them. From the geo-environmental perspective, the Hazard Identification process uses professional judgement to evaluate all the hazards in terms of potential contaminant linkages (of contaminant source-pathway-receptor). Potential contaminant linkages are potentially unacceptable risks in terms of the current contaminated land regime legal framework and require either remediation or further assessment. These are

normally addressed via intrusive ground investigation and generic risk assessment.

The second stage is the Ground Investigation, Generic Risk Assessment and Geotechnical Interpretation. This represents the further assessment mentioned above. The scope of the Ground Investigation is based on the findings of the Preliminary Risk Assessment and is designed to reduce uncertainty in the geotechnical and geoenvironmental hazard identification. The Ground Investigation comprises fieldwork, laboratory testing and usually also on-site monitoring. The Ground Investigation may include the Exploratory, Main and Supplementary Investigations described in BS 10175:2011+A2 2017. The results of the Ground Investigation reduces uncertainty in the geotechnical and geoenvironmental risks. Depending on the findings more detailed investigations or assessments may be required.

4.0 PRELIMINARY RISK ASSESSMENT

Current practice recommends that the determination of potential liabilities that could arise from land contamination be carried out using the process of risk assessment, whereby “risk” is defined as:

- “(a) The probability, or frequency, or occurrence of a defined hazard; and
(b) The magnitude (including the seriousness) of the consequences.”

The UK’s approach to the assessment of environmental risk is set out in by the Department of the Environment Transport and the Regions (2000) publication “A Guide to Risk Assessment and Risk Management for Environmental Protection” (also called Greenleaves II). This established an iterative, systematic staged process which comprises:

- (a) Hazard identification;
- (b) Hazard assessment;
- (c) Risk estimation;
- (d) Risk evaluation;
- (e) Risk assessment.

At each stage during the development process, the above steps are repeated as more detailed information becomes available for the site.

For an environmental risk to be present, all three of the following elements must be present:

- Source/Contaminant: hazardous substance that has the potential to cause adverse impacts;
- Receptor: target that may be affected by contamination: examples include human occupants/users of site, water resources (rivers or groundwater), or structures;
- Pathway: a viable route whereby a hazardous

substance may come into contact with the receptor.

The absence of one or more of each component (contaminant, pathway, receptor) would prevent a contaminant linkage being established and there would be no significant environmental risk.

The identification of potential contaminant linkages is based on a Conceptual Model of the site, which is subject to continual refinement as additional data becomes available. As part of a Preliminary Risk Assessment (Desk Study and site walk over) a Preliminary Conceptual Site Model (PCSM) is formed. Based on the PCSM, potential contaminant linkages can be assessed. If the PCSM and hazard assessment indicate that a contaminant linkage is not of significance then no further assessment or action is required for this linkage. For each significant and potential linkage a risk assessment is carried out. The linkages which potentially pose significant risks may require a variety of responses ranging from immediate remedial action or risk management or, more commonly, further investigation and risk assessment. This next stage is termed a Phase II Main Site Investigation and should provide additional data to allow refinement of the Conceptual Site Model and assess the level of risk from each contaminant linkage.

5.0 GENERIC RISK ASSESSMENT

In the following sections the current UK guidance on risks to the following receptors are discussed: human health, plant life and controlled waters

5.1 Human Health

The overall methodology for assessing the risk to human health from potential contaminants in soil is set out in the Environment Agency’s guidance “Using Soil Guideline Values” SC050021/SGV Introduction, March 2009 and using the CLEA 1.06 model software (and CLEA 1.071 for nickel). The generic assessment criteria are in accordance with the following:

- Science Report SC050021/SR2: Human health toxicological assessment of contaminants in soil;
- Science Report SC050021/SR3: Updated technical background to the CLEA model;
- Science Report SC050021/SR4: CLEA Software (Version 1.071, 2014) & Handbook;
- Toxicological reports and SGV technical notes;
- Toxicological data published by LQM/CIEH (2009) and CL:AIRE/EIC/AGS (2009)
- DEFRA Development of Category 4 Screening Levels for assessment of land affected by contamination - SP1010 (December 2013).

- LQM/CIEH Suitable 4 Use Levels (S4ULs) for Human Health Risk Assessment
- Toxicology review published by the European Food Safety Authority for nickel (2015)

In March 2014 six 'proposed' Category 4 Screening Levels (pC4SL) were issued by Defra. These screening values are considered to be within Category 4 as defined in the Contaminated Land Statutory Guidance and indicate safe levels for new developments passing through the planning system. The SGV for lead has been withdrawn, and the pC4SL for lead has been derived using current best practice. In January 2015 LQM/CIEH published S4ULs for 89 contaminants in accordance with the C4SL methodology.

Note that groundwater contamination may pose a risk to human health and GAC values for volatile contaminants for exposure via inhalation were published by SoBRA.

The CLEA model has been developed to calculate an estimated tolerable daily soil intake (TDSI) for site users given a set 'default' exposure pathways. Ten human exposure pathways are covered in the CLEA model as presented below:

- **Ingestion**
 - ingestion of outdoor soil;
 - ingestion of indoor dust;
 - ingestion of home grown vegetables;
 - ingestion of soil attached to home grown vegetables.
- **Dermal Contact**
 - dermal contact with outdoor soil;
 - dermal contact with indoor dust.
- **Inhalation**
 - inhalation of outdoor dust;
 - inhalation of indoor dust;
 - inhalation of outdoor soil vapour;
 - inhalation of indoor soil vapour.

It should be noted that there are other potential exposure pathways on some sites not included in the CLEA model e.g. certain organic compounds can pass through plastic water pipes into drinking water supply. The presence and/or significance of each of the above exposure pathways are dependent on the type of land use being considered and the nature of the contaminant under scrutiny. Accordingly, the CLEA model considers for principle 'default' land use types and makes a series of 'default' assumptions with regard to human exposure frequency, duration and critical human target groups for each land use considered:

- residential land use;
- allotments;
- commercial and industrial land use.
-

The land use categories defined in the CLEA are detailed below.

Residential: This land use category assumes that people live in a variety of dwellings including terraced, detached and semi-detached houses up to two storeys high. The structure of buildings varies. Default parameters for building materials and building design are included in CLEA documents to calculate the relevant multi-layer diffusion coefficients for vapour intrusion and to model indoor vapour intrusion. The CLEA model assumes that regardless of the style of housing the residents will have access to either a private garden or community open space nearby, and that soil tracked into the home will form indoor dust. It allows for the ingestion pathways from home grown vegetables.

Allotments: The CLEA model incorporates an assessment of land provided by local authorities specifically for people to grow fruit and vegetables for their own consumption. Consumption of such fruit and vegetables present several exposure pathways; plants absorb contaminants mainly via water uptake through roots, the contaminants move to edible portions of plants via translocation and contaminated soil particles become trapped in the skin and between leaves. At present the model fails to account for exposure through the consumption of animals, and their products (e.g. eggs), which have been reared on contaminated land.

Commercial/Industrial: Although there are a wide variety of workplaces and work-related activities, the CLEA assessment of this land-use assumes that work occurs in a permanent, three-storey structure, where employees spend most time indoors, conducting office-based or light physical work. The model assumes employees sit outside during breaks for most of the year. Limitations in applying this land-use to different industries is detailed in EA publication "Updated technical background to the CLEA model" (2011). The generic model assumes that the site would not be covered by hard standing. Risk of exposure to contaminants would be clearly less where commercial land is essentially all buildings and hard standing.

Based on the assumptions of each land use and the associated applicable exposure pathways, a 'Soil Guideline Value' (SGV) may be calculated for each contaminant under consideration for a particular land use in order to determine whether certain contaminant soil concentrations pose a significant risk to human health. The primary purpose of the CLEA SGVs are as 'trigger values' – indicators to a risk assessor that soil concentrations below this level require no further

assessment as it can be assumed that the soil is suitable for the proposed use. Where soil concentrations occur above the SGV then further assessment of the results is required. The Contaminated Land (England) (Amendment) Regulations 2012 and Contaminated Land Statutory Guidance (DEFRA, 2012) which came into force in early April 2012 provides new clarity on the assessment of risk where soil concentrations exceed the SGV. The guidance introduces a four stage classification system relating to concentration of contaminants and the assessed risk which indicates appropriate actions. Category 1 and 2 sites are classified as “Contaminated Land” as defined in Part IIA of The Environmental Protection Act (1990). Category 3 and 4 sites are not considered as “Contaminated Land” in accordance with the Act. This can be explained using the figure on the following page.

There are also difficulties in establishing soil concentrations of contaminants beyond which risks from exposure to these contaminants would be ‘unacceptable’ and that they would lead to “significant possibility of significant harm” as defined in Part IIA of The Environmental Protection Act (1990) and determine that the land is “contaminated.” This ultimately requires detailed ‘toxicological’ information of the health effects of individual contaminants and also a scientific judgement on what constitutes an ‘unacceptable’ risk. It is for local authorities or the Environment Agency to determine whether a particular site is contaminated land and it is for local Planning Authorities to determine whether land affected by contamination can be redeveloped.

Given the SGVs have been derived only for a limited number of contaminants and there was little prospect of further SGVs being published, two professional groupings have produced Generic Assessment Criteria (GACs) in accordance with the CLEA model for a large number of additional contaminants. These GACs were recognised in the new Contaminated Land Statutory Guidance (DEFRA, 2012) and have been produced as follows:

LQM/CIEH : 2009 Nathaniel CP, McCaffrey C, Ashmore MH, Cheng NPS GROUP, Gillett A, Ogden R & Scott D : 2009 . The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment (2nd edition). Land Quality Press, Nottingham.

CL:AIRE/EIC/AGS: 2009 : Soil Generic Assessment Criteria (GAC) for Human Health Risk Assessment. Contaminated Land: Applications in Real Environments, Environment Industries Commission & Association of Geotechnical and Environmental Specialists. December 2009.

Category 4 Screening Levels and LQM/CIEH Suitable 4 Use Levels

For new developments progressing through the planning regime, it is desirable that the soil concentrations are within Category 4 where there is a

valid contaminant linkage. The upper boundary between Category 4 and 3 is not defined in the guidance. This boundary can also be better defined by carrying out a Detailed Quantified Risk Assessment (DQRA) and this is discussed later in this appendix.

In December 2013 Defra issued the findings of a research project undertaken by CL:AIRE to set out the framework by which potential Category 4 Screening Levels (pC4SL) may be derived. The report was not designed to produce ‘final’ C4SL as the steering group producing the report believes that final C4SL should be set by a ‘relevant authority’ (e.g. Defra), the toxicological framework proposed has not been reviewed by the Committee on Toxicity and the document has yet to be subject to peer review.

In March 2014, appendices to the main Defra report were published detailing the derivation of pC4SL for 6 contaminants and other appendices regarding a review of the CIEH/CL:AIRE statistics guidance and sensitivity analysis. For each contaminant, a range of pC4SL have been produced relating to modifying toxicological parameters only, modifying exposure parameters only or by modifying both. It should be noted that the pC4SL produced for lead (the SGV was withdrawn in 2011) has undertaken a relatively large toxicological review in relation to modelling blood lead concentrations. pC4SL have been produced for:

- Arsenic;
- Benzene;
- Benzo(a)pyrene (as a surrogate marker for PAHs);
- Cadmium;
- Chromium (VI); and
- Lead

As previously discussed the values were initially published as ‘potential’ C4SL but have become ‘final’ following DEFRA having issued a policy decision letter indicating that they are to be used in the planning regime (letter of 3rd September 2014). It is considered that the pC4SL provide a simple test for deciding whether land is suitable for use without any remediation. The pC4SL represent a new set of screening levels that are more pragmatic (but strongly precautionary) compared to the existing soil guideline values (SGVs and the other GACs calculate in accordance with the existing CLEA methodology). The pC4SL provide cautious estimates of contaminant concentrations in soil that are still considered to present an acceptable level of risk, within the context of Part 2A, by combining information on toxicology, exposure assessment and normal levels of exposure to these contaminants. pC4SL values should not be seen as ‘SPOH values.’ Exceeding a pC4SL means that further investigation is required, not that the land is necessarily contaminated. In January 2015, LQM

published Suitable 4 Use Levels (S4ULs) for a further 89 contaminants using the Defra C4SL methodology. In a similar manner to the pC4SLs, no authoritative review has been undertaken although the approach and quality of the work undertaken is widely accepted as being of high quality.

Lead

The SGV for lead was withdrawn in 2011 and is not used in this report. The pC4SL for lead provides a technically robust and conservative assessment tool using significantly updated toxicological modelling in line with current scientific understanding of lead toxicology.

Nickel

The SGV for nickel was withdrawn in 2015 and is not used in this report. In-house GACs for nickel have been produced using the updated toxicological review by the EFSA and the CLEA 1.071 software.

Public Open Space

The Defra report (December 2013) has also introduced exposure scenarios for two other commonly occurring land uses which require assessment (under the planning and Part 2A regimes) on a relatively frequent basis. These exposure scenarios are:

- Public Open Space – Space Near Residential Housing (POS_{resi}); and
- Public Open Space – Public Park (POS_{park}).

Potential use of pC4SL relating to Public Open Space (POS) require care due to the significant variability in exposure characteristics. For example, POS may include:

- Children's play areas, public parks where children practise sport several times a week and teenagers only once a week;
- Grassed areas adjacent to residential properties which are rarely used;
- Dedicated sports grounds where exposure is only to players and groundworkers; and
- Nature reserves or open ground with low level activity (for example, dog walking).

Within the Defra report (December 2013) the following exposure scenarios have been modelled as these are considered the most important for potential exposure for the critical receptor i.e. young children:

- Green open space close to housing, including tracking back of soil (POS_{resi}); and
- Park-type scenario where distance is considered sufficient to discount tracking back of soil (POS_{park}).

5.2 Phytotoxic Risks

Generic assessment of phytotoxicity is by comparison with guideline values presented in the British Standard

for Topsoil and the Department for the Environment Sewage Sludge Code of Practice.

5.3 Controlled Waters

Risks to controlled waters (groundwater and surface waters) from contaminants are assessed in accordance with the EA documents "The Environment Agency's Approach to Groundwater Protection" (2017) and Remedial Targets Methodology (RTM, 2006). Pollutant inputs from contaminated land sites are considered as passive inputs under the European Water Framework Directive (2000/60/EC) (WFD) and its daughter Directives, and as such are regulated under the Environment Agency's 'limit' pollution objective. Acceptable water quality targets (WQT) are defined for protection of human health (based on Drinking Water Standards (DWS)) and for protection of aquatic ecosystems (Environmental Quality Standards (EQS)). The risk posed to controlled waters from total soil concentrations cannot be directly assessed. The risk is assessed either by comparison of results of leachate tests carried out on soil samples, or from the direct testing of samples of groundwater to screening criteria. Leachate testing generally forms a conservative assessment and is not appropriate for organic contaminants.

Tools available for Risk Assessment of Controlled Waters

In order for a developer of a potentially contaminated site to fulfil their obligations under the legislation, a site assessment would be required to be undertaken in order to identify any potential risks to controlled waters and to derive suitable clean-up criteria if necessary to ensure the protection of controlled waters. A number of tools are available for this purpose.

Three main stages apply to any risk assessment of controlled waters, these are:

- i) Risk Screening (devise Conceptual Site Model, making reference to groundwater vulnerability maps, site setting etc)
- ii) Generic Risk Assessment (using the EA Remedial Targets Methodology – Tier 1 - Comparison of groundwater data with relevant standards)
- iii) Detailed Quantitative Risk Assessment (Consideration of aquifer properties and site specific parameters, using the EA Remedial Targets Methodology - Tiers 2 & 3)

The process is summarised below (Taken from the Environment Agency GP3 consultation document, 2006):

When assessing groundwater impact the Environment Agency advocate the application of their framework methodology “Remedial Targets Methodology – Hydrogeological Risk Assessment for Land Contamination” Environment Agency (2006). The methodology has four tiers of assessment:

Tier 1 utilises either a soil concentration (calculation of pore water concentrations based on partitioning calculations), leaching test or pore-water concentration of perched water as a source concentration input and these are contrasted directly to water quality standards. No dilution or attenuation is considered at Level 1.

Tier 2 (groundwater) considers dilution of the contaminant within the underlying receiving groundwater or surface water body. To determine a dilution factor the infiltration rate of pore water and the discharge of groundwater beneath the source must be determined. Level 2 Assessment is comprises a comparison between measured groundwater concentrations with to water quality standards.

Tier 3 considers natural attenuation in the form of dispersion, retardation and degradation of the contaminant. As the levels are progressed, the assessment becomes increasingly more detailed and less conservative as the data requirements are increased with each successive tier. The Environment Agency has released Excel Worksheets to carry out basic calculations using a conservative approach up to Tier 3. However, in this case the conceptual model is a simple one and assumes there is a simple migration of contaminants from the source zone into the aquifer receptor. Using these worksheets requires a sensitivity analysis showing how by varying each parameter, what effect it might have on the outcome of the assessment. Groundwater conceptual models are not always this simple.

Tier 4 is for more complex conceptual models where multiple sources, multiple pathways, multiple receptors and complex water balances can be assessed.

The Environment Agency developed a spreadsheet based code to support the Remedial Target Methodology, and the code is capable of undertaking assessments for Tiers 1 to 3. Tier 4 assessment is not supported by the spreadsheet based code.

A more advanced code, ConSim2, developed on behalf of the Environment Agency to support the Remedial Targets Methodology, allows for the introduction of additional geological horizons and is used mainly to determine the concentrations reaching a receptor and the timescales over which this may happen.

The codes assess only the dissolved phase contaminants. There are many further codes

commercially available for use in controlled waters risk assessment, particularly for more complex situations, however, these should be used with caution and only once agreement has been obtained from the Environment Agency. All have the overall aim of the estimation of risk from contaminant linkages and the protection of controlled waters.

General notes on each stage of the controlled waters risk assessment process

Risk Screening

The understanding of the Conceptual Site Model (CSM) is the key to assessing any site. Using a robust CSM, potential pathways or receptors may be screened out from any further assessment at an early stage. For example if the pathway through the unsaturated zone is blocked by the presence of a significant thickness of low permeability clay. A greater understanding of the CSM is achieved with each tier of risk assessment

Generic Risk Assessment

When undertaking the Generic Hydrogeological Risk Assessment (EA Remedial Targets Methodology Tier 1), comparison of chemical analytical results is made with screening criteria. Published values of screening criteria with which chemical test results can be compared are published in the following guidance:

There is a hierarchy of screening criteria which is as follows:

- Environmental Quality Standards (EQS) for freshwaters based on The EC Dangerous Substances Directive (76/464/EEC and Daughter Directives);
- Surface Waters (Abstraction for Drinking Water)(Classification) Regulations (1996)
- Surface Waters (Fishlife) (Classification) Regulations (1997)
- UK Drinking Water Standards (DWS) (Water Supply (Water Quality) Regulations 2000);
- Dutch Ministry of Housing, Spatial Planning and Environment (2001) Intervention Values and Target Values – soil quality standards;
- World Health Organisation Guidelines for Drinking Water (2004)

Aquifer Designations

The Environment Agency / Natural Resources Wales have classified different types of aquifer from which groundwater can be extracted. The aquifer designations reflect the importance of aquifers in terms of groundwater as a resource (drinking water supply) but also their role in supporting surface water flows and wetland ecosystems. The aquifer designation data is based on geological mapping provided by the British Geological Survey.

The maps are split into two different types of aquifer

designation:

- Superficial (Drift) – permeable unconsolidated (loose) deposits.
- Bedrock (Solid)– solid permeable formations e.g. sandstone, chalk, limestone.

The aquifer designations displayed on the Environment Agency maps are as follows:

- Principal Aquifers (formerly termed Major Aquifers) – These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as a major aquifer.
- Secondary Aquifers (formerly termed Minor Aquifers) – These include a wide range of rock layers or drift deposits with an equally wide range of water permeability and storage. Secondary aquifers are subdivided into two types:
 - Secondary A - permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers;
 - Secondary B - predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.
 - Secondary Undifferentiated - has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.
- Unproductive Strata (formerly termed Non-Aquifer) – These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Hazardous and Non Hazardous Substances

The Groundwater (England and Wales) Regulations 2009 control the disposal to the hydrogeological environment of potentially polluting substances which are divided into Hazardous Substances and Non-hazardous Contaminants (this roughly approximates to the former List 1 and List 2 substances).

Hazardous Substances are the most damaging and toxic and must be prevented from directly or indirectly entering the groundwater environment. Hazardous Substances include mineral oils and hydrocarbons, pesticides, biocides, herbicides, solvents and some metals. Discharge of Hazardous Substances to Controlled Waters must be prevented.

Non-hazardous Pollutants are any contaminants other than Hazardous Substances. Non-hazardous Pollutants are potentially toxic but are less harmful than Hazardous Substances, but their direct discharge to groundwater is generally not permitted and any indirect discharge to groundwater must be limited and be controlled by technical precautions in order to prevent pollution. Non-hazardous Pollutants include ammonia and nitrites, many metals and fluorides.

APPENDIX 17

Investigation Techniques and General Notes

INTRODUCTION

The following brief review of Ground Investigation techniques, generally used as part of most Site Investigations in the UK, summarises their methodology, advantages and limitations. Detailed descriptions of the techniques are available and can be provided on request. This review should be read in conjunction with the accompanying General Notes.

TRIAL PITS

The trial pit is amongst the simplest yet most effective means of identifying shallow ground conditions on a site. Its advantages include simplicity, speed, potential accuracy and cost-effectiveness. The trial pit is most commonly formed using a back-acting excavator which can typically determine ground conditions to some 4 metres below ground level. Hand excavation is often used to locate, expose and detail existing foundations, features or services. In general, it is difficult to extend pits significantly below the water table in predominantly granular soils, where flows can cause instability. Unless otherwise stated, the trial pits will not have been provided with temporary side support during their construction. Under such circumstances, entrance into the pit is not permitted and hence observations will have been made from the ground surface and samples taken from the excavator bucket.

Where access for personnel is required to allow close observation of the exposed strata, the taking of samples and the carrying out of in situ tests, the sides of the trial pits (Observation Pits in BS 5930:2015) will be made safe using temporary supports or the sides battered back to a stable angle. Some limited access to such Trial Pits (Observation Pits) at depths less than 1m may be allowed in stable conditions or where the sides are benched or battered back to a safe angle.

Trends in strata type, level and thickness can be determined, shear surfaces identified and the behaviour of plant, excavation sides and excavated materials can be related to the construction process. They are particularly valuable in land slip investigations. Some types of in situ test can be undertaken in such pits and large disturbed or block samples obtained.

CABLE PERCUSSION BORING

The light Cable Percussion technique of soft ground boring, typically at a diameter of 150mm, is a well-established simple and flexible method of boring vertical holes and generally allows data to be obtained in respect of strata conditions other than rock. A tubular cutter (for cohesive soils) or shell with a flap valve (for granular soils) is repeatedly lifted and dropped using a winch and rope operating from an "A" frame. Soil which enters these tools is regularly removed and either sampled for subsequent examination or test, or laid to one side for later removal off site and licensed disposal or, if permitted by the Client, use as backfill. Steel casing will have been used to prevent collapse of the borehole sides where necessary. A degree of disturbance of soil and mixing of layers is inevitable and the presence of very thin layers of different soils within a particular stratum may not be identified. Changes in strata type can only be detected on recognition of a change in soil samples at the surface, after the interface has been passed. For the foregoing reasons, depth measurements should not be considered to be more accurate than 0.10 metre. The technique can determine ground conditions to depths in excess of 30 metres under suitable circumstances and usually causes less surface disturbance than trial pitting.

In cohesive soils cylindrical samples are retrieved by driving or pushing in 100mm nominal diameter tubes. In soft soils, piston sampling or vane testing may be undertaken. In granular soils and often in cohesive materials, in situ Standard Penetration Tests (SPTs) are performed. The SPT records the number of standard blows required to drive a 50mm diameter open or cone ended probe for 300mm after an initial 150mm penetration. A modified method of recording is used in denser strata. Small disturbed samples are obtained throughout.

ROTARY DRILLING

Rotary Drilling to produce cores by rotating an annular diamond-impregnated tube or barrel into the ground is the technique most appropriate to the forming of site investigation boreholes through rock or other hard strata. It has the advantage of being able to be used vertically or at an angle. Core diameters of less than 100mm are most common for site investigation purposes. Core is normally retrieved in plastic lining tubes. A flushing fluid such as air, water or foam is used to cool the bit and carry cuttings to the surface. Depths in excess of 60 metres can be achieved under suitable circumstances using rotary techniques, with minimal surface disturbance.

Examination of cores allows detailed rock description and generally enables angled discontinuity surfaces to be observed. However, vertical holes do not necessarily reveal the presence of vertical or near-vertical fissures or joint discontinuities. The core type and/or techniques used will depend on the ground conditions. Where open hole rotary drilling is employed, descriptions of strata result from examination at the surface of small particles ejected from the borehole in the flushing medium. In consequence, no indication of fissuring, bedding, consistency or degree of weathering can be obtained.

DYNAMIC SAMPLING

This technique involves the driving of an open-ended tube into the ground and retrieval of the soil which enters the tube. It was previously called window or windowless sampling. The term "window sample" arose from the original device which had a "window" or slot cut into the side of the tube through which samples were taken. This was superseded by the use of a thin-walled plastic liner to retrieve the soil sample from within a sampler (windowless sampling) which has a solid wall. Line diameters range from 36 to 86mm. Such samples can be used for qualitative logging, selection of samples for classification and chemical analysis and for obtaining a rudimentary assessment of strength.

Driving devices can be hand-held or machine mounted and the drive tubes are typically in 1m lengths. Depending on the type of rig used, the hole formed can be cased to prevent collapse of the borehole sides. Where the type of rig does not allow the insertion of casing, the success of this technique can be limited when soils and groundwater conditions are such that the sides of the hole collapse on withdrawal of the sampler. Obstructions within the ground, the density of the material or its strength can also limit the depth and rate of penetration of this light-weight investigation technique. Nevertheless, it is a valuable tool where access is constrained such as within buildings or on embankments. Depths of up to 10m can be achieved in suitable circumstances depending on the rig type but depths of 5m to 6m are more common.

EXPLORATORY HOLE RECORDS

The data obtained by these techniques are generally presented on Trial Pit, Borehole, Drillhole or Dynamic Sample Records. The descriptions of strata result from information gathered from a number of sources which may include published geological data, preliminary field observations and descriptions, in situ test results, laboratory test results and specimen descriptions. A key to the symbols and abbreviations used accompanies the records. The descriptions on the exploratory hole records accommodate but may not necessarily be identical to those on any preliminary records or the laboratory summaries.

The records show ground conditions at the exploratory hole locations. The degree to which they can be used to represent conditions between or beyond such holes, however, is a matter for geological interpretation rather than factual reporting and the associated uncertainties must be recognised.

DYNAMIC PROBING

This technique typically measures the number of blows of a standard weight falling over a standard height to advance a cone-ended rod over sequential standard distances (typically 100mm). Some devices measure the penetration of the probe per standard blow. It is essentially a profiling tool and is best used in conjunction with other investigation techniques where site-specific correlation can be used to delineate the distribution of soft or loose soils or the upper horizon of a dense or strong layer such as rock.

Both machine-driven and hand-driven equipment is available, the selection depending upon access restrictions and the depth of penetration required. It is particularly useful where access for larger equipment is not available, disturbance is to be minimised or where there are cost constraints. No samples are recovered and some techniques leave a sacrificial cone head in the ground. As with other lightweight techniques, progress is limited in strong or dense soils. The results are presented both numerically and graphically. Depths of up to 10m are commonly achieved in suitable circumstances.

The hand-driven DCP probing device has been calibrated by the Highways Agency to provide a profile of CBR values over a range of depths.

INSTRUMENTATION

The most common form of instrument used in site investigation is either the standpipe or else the standpipe piezometer which can be installed in investigation holes. They are used to facilitate monitoring of groundwater levels and water sampling over a period of time following site work. Normally a standpipe would be formed using rigid plastic tubing which has been perforated or slotted over much of its length whilst a standpipe piezometer would have a filter tip which would be placed at a selected level and the hole sealed above and sometimes below to isolate the zone of interest. Groundwater levels are determined using an electronic "dip meter" to measure the depth to the water surface from ground level. Piezometers can also be used to measure permeability. They are simple and inexpensive instruments for long term monitoring but response times can limit their use in tidal areas and access to the ground surface at each instrument is necessary. Remote reading requires more sophisticated hydraulic, electronic or pneumatic equipment.

Settlement can be monitored using surface or buried target plates whilst lateral movement over a range of depths is monitored using slip indicator or inclinometer equipment.

1. The report is prepared for the exclusive use of the Client named in the document and copyright subsists with Geotechnics Limited. Prior written permission must be obtained to reproduce all or part of the report. It is prepared on the understanding that its contents are only disclosed to parties directly involved in the current investigation, preparation and development of the site.
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3. The report and/or opinion is prepared for the specific purpose stated in the document and in relation to the nature and extent of proposals made available to Geotechnics Limited at that time. Re-consideration will be necessary should those details change. The recommendations should not be used for other schemes on or adjacent to the site without further reference to Geotechnics Limited.
4. The assessment of the significance of the factual data, where called for, is provided to assist the Client and their Engineer and/or Advisers in the preparation of their designs.
5. The report is based on the ground conditions encountered in the exploratory holes together with the results of field and laboratory testing in the context of the proposed development. The data from any commissioned desk study and site reconnaissance are also drawn upon. There may be special conditions appertaining to the site, however, which are not revealed by the investigation and which may not be taken into account in the report.
6. Methods of construction and/or design other than those proposed by the designers or referred to in the report may require consideration during the evolution of the proposals and further assessment of the geotechnical and any geoenvironmental data would be required to provide discussion and evaluations appropriate to these methods.
7. The accuracy of results reported depends upon the technique of measurement, investigation and test used and these values should not be regarded necessarily as characteristics of the strata as a whole (see accompanying notes on Investigation Techniques). Where such measurements are critical, the technique of investigation will need to be reviewed and supplementary investigation undertaken in accordance with the advice of the Company where necessary.
8. The samples selected for laboratory test are prepared and tested in accordance with the relevant Clauses and Parts of BS EN ISO 17892 and BS 1377 Parts 1 to 8, where appropriate, in Geotechnics Limited's UKAS accredited Laboratory, where possible. A list of tests is given.
9. Tests requiring the use of another laboratory having UKAS accreditation where possible are identified.
10. Any unavoidable variations from specified procedures are identified in the report.
11. Specimens are cut vertically, where this is relevant and can be identified, unless otherwise stated
12. All the data required by the test procedures are recorded on individual test sheets but the results in the report are presented in summary form to aid understanding and assimilation for design purposes. Where all details are required, these can be made available.
13. Whilst the report may express an opinion on possible configurations of strata between or beyond exploratory holes, or on the possible presence of features based on either visual, verbal, written, cartographical, photographic or published evidence, this is for guidance only and no liability can be accepted for its accuracy.
14. The Code of Practice for Ground Investigations – BS 5930:2015 calls for man-made soils to be described as Anthropogenic Ground with soils placed in an un-controlled manner classified as Made Ground and soils placed in a controlled manner as Fill. In view of the difficulty in always accurately determining the origin of man-made soils in exploratory holes, Geotechnics Limited classify such materials as Made Ground. Where soils can be clearly identified as being placed in a controlled manner then further classification of the soils as Fill has been added to the Exploratory Hole Records.
15. Classification of man-made soils is based on the inspection of retrieved samples or exposed excavations. Where it is obvious that foreign matter such as paper, plastic or metal is present, classification is clear. Frequently, however, for man-made soils that arise from the adjacent ground or from the backfilling of excavations, their visual characteristics can closely resemble those of undisturbed ground. Other evidence such as site history, exploratory hole location or other tests may need to be drawn upon to provide clarification. For these reasons, classification of soils on the exploratory hole records as either Made Ground or naturally occurring strata, the boundary between them and any interpretation that this gives rise to should be regarded as provisional and subject to re-evaluation in the light of further data.
16. The classification of materials as Topsoil is generally based on visual description and should not be interpreted to mean that the material so described complies with the criteria for Topsoil used in BS 3882:2015. Specific testing would be necessary where such a definition is a requirement.
17. Ground conditions should be monitored during the construction of the works and the report should be re-evaluated in the light of these data by the supervising geotechnical engineers.
18. Any comments on groundwater conditions are based on observations made at the time of the investigation, unless specifically stated otherwise. It should be noted, however, that the observations are subject to the method and speed of boring, drilling or excavation and that groundwater levels will vary due to seasonal or other effects.
19. Any bearing capacities for conventional spread foundations which are given in the report and interpreted from the investigation are for bases at a minimum depth of 1m below finished ground level in naturally occurring strata and at broadly similar levels throughout individual structures, unless otherwise stated. Typically they are based on serviceability criteria taking account of an assessment of the shear strength and/or density data obtained by the investigation. The foundations should be designed in accordance with the good practice embodied in BS 8004:2015 - Foundations, supplemented for housing by NHBC Standards. Foundation design is an iterative process and bearing pressures may need adjustment or other measures may need to be taken in the context of final layouts and levels prior to finalisation of proposals.
20. Unless specifically stated, the investigation does not take account of the possible effects of mineral extraction or of gases from fill or natural sources within, below or outside the site.
21. The costs or economic viability of the proposals referred to in the report, or of the solutions put forward to any problems encountered, will depend on very many factors in addition to geotechnical or geoenvironmental considerations and hence their evaluation is outside the scope of the report.



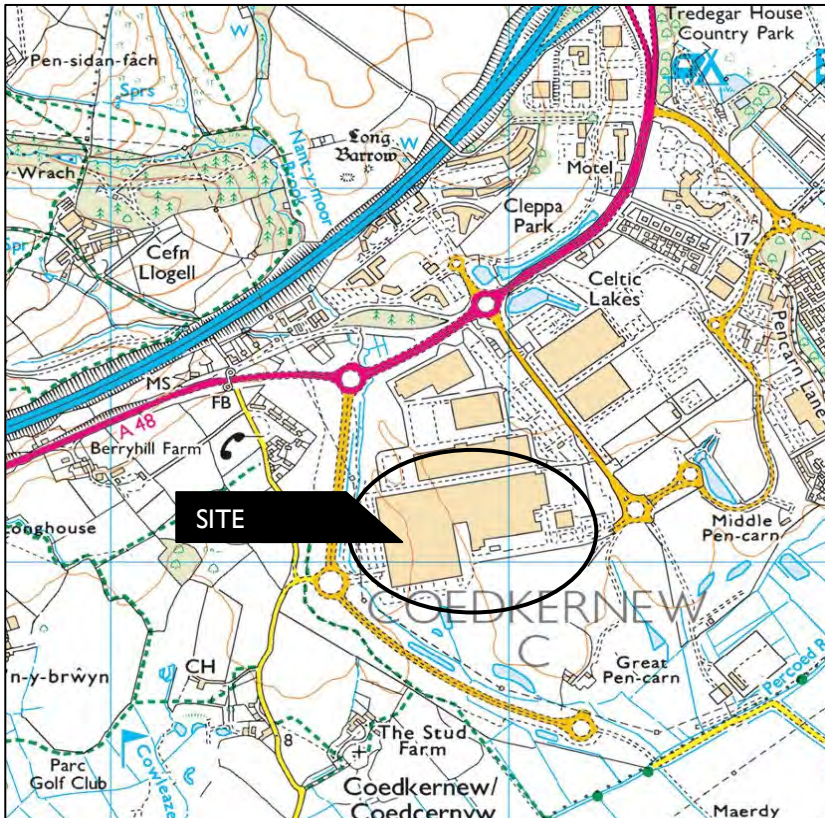
ERM

ANNEX C

GEOTECHNICS FACTUAL AND
INTERPRETATIVE REPORT FOR
PINNACLE ENGINEERING. FORMER
QUINN RADIATOR FACTORY SITE,
NEWPORT, WALES (PN224395-REP004),
FEBRUARY 2023



Ground Investigation



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Factual and Interpretative Report

for
Pinnacle Consulting Engineers Limited

Project Number: PN224395

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For

Factual and Interpretative Report

**Former Quinn Radiator Factory Site,
Newport, Wales**

for
Pinnacle Consulting Engineers Limited

Project No:

PN224395

February 2023

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1.0 INTRODUCTION

A supplementary geotechnical and geo-environmental ground investigation was carried out by Geotechnics Limited at the site of a former radiator manufacturing facility on the outskirts of Newport. The investigation was carried out to the instruction of Pinnacle Consulting Engineers Limited (Pinnacle), the Client.

An initial ground investigation was undertaken by Geotechnics Limited, in August 2021 and reported previously (reference: PN214233 Former Quinn Radiator Factory, Factual and Interpretative Report, September 2021) and this report should be read in consultation with the previous report.

This report describes the work undertaken and presents the data obtained.

2.0 OBJECT AND SCOPE OF THE INVESTIGATION

The object of the investigation was to obtain information on the ground and groundwater conditions relating to the design of the proposed works within the limitations posed by trial hole numbers, locations, depths, methods adopted and the scope of approved in situ and laboratory testing. The Brief for the project is included in Appendix 1. The investigation comprised cable percussive and rotary boreholes, in situ and laboratory testing and reporting. A geotechnical interpretation and evaluation of the data obtained was also commissioned. No geo-environmental interpretation and assessment of the data was instructed by the Client. The investigation supplements the previous 2021 ground investigation.

3.0 PRESENTATION

A description of the site and a summary of the procedures followed during the investigation process are presented in Sections 4 to 6. The factual data so obtained are presented in Appendices 2 to 14 of this report.

A desk study (Phase 1 Desk Study) has been undertaken by Geotechnics Limited (reference: PN214233 Newport Quinn Preliminary Risk Assessment, May 2021) which summarises the site, its history, geology and ground conditions and provides a preliminary risk assessment and geotechnical risk assessment for the site (see also Section 7). An interpretation of the data obtained is presented in Section 8 and an evaluation of its significance in relation to proposals available at the time of preparation of this report is presented in Section 9.

This ground investigation supplements a previous investigation (referred to in this report as the initial phase ground investigation) also undertaken by Geotechnics Limited, in August 2021 and reported previously (reference: PN214233 Former Quinn Radiator Factory, Factual and Interpretative Report, September 2021). The findings are summarised in Section 7. However, the 2021 report should be read in combination with this report for a complete understanding of the ground conditions encountered.

Attention is drawn to the Investigation Techniques and General Notes presented in Appendix 15 to aid an understanding of the procedures followed and the context in which the report should be read.

The report is presented in pdf format and in addition, data in electronic format in accordance with "The Electronic Transfer of Geotechnical Data from Ground Investigations" published by the AGS (the AGS Format) are presented separately.

4.0 THE SITE

4.1 Location

The site is located approximately 5km south-west of the centre of Newport and approximately 1km south of junction 28 on the M4 motorway. The approximate Ordnance Survey National Grid Reference for the centre of the site is ST 278 841 and an extract from the relevant 1:25,000 Scale O.S. Map is included as Appendix I.

4.2 Description

The site is approximately rectangular in shape and covers an area of approximately 16.59 ha. It comprises a disused radiator manufacturing site with associated areas of hardstanding for roads and parking and areas of soft landscaping comprising mostly short field grass, bushes and mature and semi-mature trees around the perimeter. Most of structures remain in situ with the internal manufacturing infrastructure largely removed to allow access for the drilling rigs. The structures include a large L-shaped warehouse type building with another similar but smaller structure to the south and a concrete slab between. A two storey office building is located to the south-east. Asphalt roads and vehicle parking and grassed areas with shrubs and scattered trees are present towards the periphery of the site mainly to the south and east.

The site has an elevation of approximately 10m OD and slopes gently from north-west to south-east.

There are no water features located on-site, but a pond is located approximately 70m south and a drainage ditch is located approximately 20m to the west.

Several storage vessels were observed including oil and propane bottles, former paint storage tanks, liquid oxygen and liquid argon tanks and gas bottles. Numerous service access chambers were observed including storm and foul drains.

5.0 PROCEDURE

5.1 Commissioning

The current phase of work was awarded following submission of a proposal for ground investigation of the site in accordance with the Client's requirements. An initial phase of ground investigation was undertaken in 2021 as referenced above. The scope of the investigation is summarised below and is detailed within the Brief presented as the offer letter in Appendix I.

5.2 General

The procedures followed in this site investigation are based on *BS 5930:2015+ A1:2020 – Code of Practice for Site Investigations* and *BS 10175:2011+A2:2017 - Investigation of Potentially Contaminated Sites*. The soils and rocks encountered have been described in accordance with BS5930:2015+A1:2020, BS EN ISO 14688-1:2018 and BS EN ISO 14689:2018. The Cable Percussive Borehole, Rotary Borehole and Dynamic Sample Borehole positions are shown on the Exploratory Hole Location Plan in Appendix I4.

The Exploratory Hole locations were specified by Geotechnics Limited, and were located to supplement the previous limited initial ground investigation to provide more detailed information across the area of interest and coverage where data was sparse.

The co-ordinates and levels shown on the Exploratory Hole Records were measured using a GPS survey device. Positions within the buildings were surveyed using taped measurements from GPS located positions. The depths quoted on the exploratory hole records are in metres below ground level (bgl).

Prior to the investigation, a survey was carried out by Midland Survey Limited utilising Ground Penetrating Radar (GPR) techniques to check for the presence of buried services at the proposed exploratory hole locations. At each exploratory hole location an inspection pit was excavated using hand tools to a depth of 1.20m below ground level to check for the presence of underground services. Prior to and on completion of the excavation, the location was scanned using a cable avoidance tool (CAT). At those locations where concrete was present at ground level, 300mm diameter coring was used to advance the exploratory hole through the concrete and facilitate the excavation of the inspection pit. Details of the concrete coring is included on the appropriate exploratory hole records.

5.3 Cable Percussion Boreholes

Thirty (30 No.) 150mm diameter boreholes (BH01 to BH30) were sunk by Cable Percussion Tool techniques to depths of between 1.20m to 11.40m bgl. The work was carried out between 27th July and 2nd September 2022.

Three holes (BH04, BH14 and BH17) had to be moved a short distance from the original location due to concrete obstructions being encountered at shallow depth. The revised locations were numbered BH04A, BH14A and BH17A.

Representative disturbed (D and B) and driven open-tube thin-walled (UT) samples of the soils encountered were obtained at regular intervals. Standard Penetration Tests (SPTs) were undertaken at the depths indicated on the borehole records in accordance with BS EN ISO 22476-3:2005+A1:2011 to obtain a measure of the engineering properties of the proved strata. In addition, environmental soil samples (ES) were recovered at the depths indicated on the Borehole Records which are presented in Appendix 3 and 4.

On encountering groundwater, boring operations were suspended for 20 minutes in order to record any rise in water level. Full details of groundwater observations during site work are included on the Borehole Records.

On completion, ten boreholes were continued by rotary coring drilling techniques (see Section 5.4).

On completion, standpipes were installed in several of the boreholes as detailed in Section 5.6. Those boreholes without an installation were backfilled with bentonite and the surface reinstated.

5.4 Rotary Cored (follow-on) Boreholes

Ten (10 No.) boreholes (numbered BH01, BH04A, BH07, BH10, BH14A, BH17A, BH23, BH27, BH28 and BH30) were extended using rotary coring techniques through the base of the cable percussion boreholes which had been left open and cased to facilitate rotary drilling. The rotary core boreholes were 120mm in diameter producing 90mm diameter core and were taken to depths ranging between 19.50m and 21.00m bgl. The work was carried out between the 27th July and the 26th August 2022.

The drilling equipment on this particular contract utilised air mist as the flushing medium.

Rock cores were extruded horizontally in transparent liners and placed into suitable core boxes. Borehole records and photographs of the core are included in Appendices 4 and 5 respectively.

Groundwater observations are included on the Borehole Records where appropriate. It should be noted that the addition of air mist to the borehole as part of the drilling process may have masked the presence of groundwater in the borehole. On completion, standpipes were installed in most of the boreholes (see Section 5.6).

5.5 In Situ Plate Load Tests

Seventeen (17 No.) Plate Load Tests were carried out at the locations marked on the Exploratory Hole Location Plan (see Appendix 14) and numbered PLT1 to PLT5 and PLT7 to PLT18 at depths ranging between 0.15m and 0.45m bgl. Where necessary the concrete floor slab was broken out using a hydraulic breaker attachment to an excavator. The incremental loading tests were carried out in accordance with BS 1377-9:1990 and the Design Manual for Roads and Bridges IAN 73/06 Revision 1 (2009) using a 300mm diameter plate. The reaction for the test was provided by a backhoe excavator (JCB 3CX). The test loads were selected by Geotechnics Limited and the results

are presented in Appendix 6 and summarised in the table below;

Location	Depth (m)	Equivalent CBR (%)	Modulus of Subgrade Reaction (kN/m ²)	Strata Tested (see Results Sheets for full description)
1	0.23	24	90	MG: Reddish brown gravelly slightly silty sand.
2	0.44	4.9	36	MG: Reddish brown gravelly slightly silty sand.
3	0.23	8.1	49	MG: Orangish brown gravelly sand.
4	0.22	27	98	MG: Brown gravelly sand.
5	0.19	19	81	MG: Reddish brown sandy gravel.
7	0.20	104	212	MG: Grey sandy gravel of sandstone and aircrete.
8	0.20	58	151	MG: Brown gravelly sand low cobble content.
9	0.24	9.7	54	MG: Reddish brown gravelly sand.
10	0.20	130	242	MG: Brown gravelly sand.
11	0.21	27	97	MG: Brown slightly gravelly clayey sand.
12	0.15	21	84	MG: Dark brown gravelly sand.
13	0.45	70	169	MG: Yellowish brown very gravelly sand.
14	0.20	99	207	MG: Yellowish brown very gravelly sand.
15	0.20	99	207	MG: Black mottled brown gravelly sand.
16	0.20	3.8	31	MG: Brown gravelly sand low cobble content.
17	0.45	13	65	MG: Dark grey brown gravelly sand, cobbles.
18	0.40	17	74	MG: Dark grey to black slightly gravelly sand.

5.6 Instrumentation and Monitoring

Long-term monitoring of the gas and groundwater levels was made possible by the installation of standpipes as follows:

Exploratory Hole	Standpipe Slotted Pipe & Filter Zone (m)	Strata Monitored
BH01	14.00 to 18.00	Bedrock: Sandstone.
BH03	3.50 to 5.50	Gravel (River Terrace Deposits)
BH04A	15.00 to 17.00	Bedrock: Mudstone.
BH06	1.00 to 2.70	Clay (River Terrace Deposits)
BH07	13.00 to 20.50	Bedrock: Mudstone.
BH09	4.50 to 5.50	Peat.
BH10	5.00 to 6.50	Bedrock: Mudstone/Siltstone.
BH13	4.00 to 5.00	Gravel of mudstone and sandstone (probable weathered bedrock).
BH17A	10.00 to 12.00	Bedrock: Mudstone and sandstone
BH19	4.00 to 5.00	Gravel (River Terrace Deposits)
BH23	9.00 to 13.00	Bedrock: Mudstone.
BH25	3.00 to 4.60	Clay (Alluvium)
BH28	3.00 to 5.00	Clay (River Terrace Deposits)/ Bedrock (Mudstone).
BH30	9.00 to 11.00	Bedrock: Sandstone.

Monitoring of the gas and groundwater levels were undertaken on the 13th (only BH01, BH04A, BH06, BH07), 19th and 26th September 2022.

On each of the manual monitoring rounds a record of the groundwater level in the standpipes was obtained. The following parameters were measured and recorded in each standpipe using a Gas Data Limited GFM435 Gas Analyser.

- Concentrations (% Vol) of CH₄, O₂, CO₂, along with (ppm) H₂S, CO.

- Flow Rate.
- Differential Pressure.
- Barometric Pressure.

The results of the monitoring are presented in Appendix 7.

6.0 LABORATORY TESTING

6.1 Geotechnical

The laboratory testing schedule was formulated by Geotechnics Limited in order to relate to the proposed development plans available at the time of scheduling. The number and type of testing undertaken was constrained by the Client's financial limits, with the investigation being considered as a preliminary phase of the investigation works.

Geotechnics Limited UKAS accredited Laboratory

Unless otherwise stated, the tests were carried out in Geotechnics Limited's UKAS accredited Laboratory (Testing No. 1365 and were undertaken in accordance with the appropriate Standards as indicated below and on the Laboratory Test Certificate in Appendix 8 Any descriptions, opinions and interpretations are outside the scope of UKAS accreditation.

The tests undertaken are summarised as follows:-

Standard	Test Description	Quantity
BS EN ISO 17892-1:2014	Water Content Determination	32
BS EN ISO 17892-12:2018 Cl. 5.3 & 5.5	Determination of Liquid and Plastic Limits	29
BS EN ISO 17892-4:2016 Cl. 5.2	Particle Size Distribution Determination – Sieving Method	18
BS EN ISO 17892-4:2016 Cl. 5.4	Particle Size Distribution Determination – Pipette Method	14
BS EN ISO 17892-8:2018	Shear Strength by Unconsolidated Undrained Triaxial Test – Single Stage.	2
BS 1377:1990 Part 4: 1990 Cl. 3.3	Dry Density/Moisture Content relationship determination. Compaction Test - British Standard (2.5 kg Hammer)	7
BS 1377:1990 Part 4: 1990 Cl. 3.5	Dry Density/Moisture Content relationship determination. Compaction Test - British Standard (4.5 kg Hammer)	7
BS 1377:1990 Part 4: 1990 Cl. 7.2	California Bearing Ratio (CBR) Measurement	13
ASTM D5334-14	Determination of Thermal Conductivity of Soil and Soft Rock by Thermal Needle Probe.	22

Derwentside Environmental Testing Services (DETS) Laboratory

The following testing was carried out at the laboratories of Derwentside Environmental Testing Services (DETS) (UKAS Accredited Laboratory, Number 2139).

BRE Special Digest I Suite

Twenty six specimens, each comprising the following suite of tests;
Total Sulphur, Total Sulphate, Water Soluble Sulphate, pH, Magnesium, Ammonia, Chloride and Nitrate.

In addition, two organic content tests were undertaken.

The results of these tests are presented in Appendix 8.

Professional Soils Laboratory (PSL) Limited Laboratory

The following testing was carried out at the laboratories of Professional Soils Laboratory (PSL) Limited (UKAS Accredited Laboratory, Number 4043).

Standard	Test Description	Quantity
BS EN ISO 17892-5:2017	Incremental Loading Oedometer	1
ISRM Testing Methods	Unconfined Compressive Strength Determination	38
ISRM Testing Methods	Point Load Determination	257

The results of these tests are presented in Appendix 8.

6.2 Contamination

Selected samples of soil and groundwater were tested at the laboratories of Derwentside Environmental Testing Services Limited for a number of determinands in order to quantify potential site contamination. The determinands were selected by Geotechnics Limited were based on potential contaminants identified from the findings of the previous desk study and initial phase ground investigation. The laboratory results are detailed on the results sheets in Appendices 9 and 10 together with the test result as well as the test method, accreditation and detection limit.

7.0 SUMMARY OF PREVIOUS INVESTIGATIONS

7.1 General

A desk study for the site has been undertaken by Geotechnics and the results presented and discussed in report “Preliminary Risk Assessment – Newport Quinn SDD RPF, Newport, Wales”, Report Number PN214233 dated May 2021. The findings of the desk study are also summarised in the report on the previous (initial phase) ground investigation, reference “Factual and Interpretative Report – Newport, Wales, NP10 8FS”, Report Number PN214233, dated September 2021.

Both reports should be read in conjunction with this report. A summary of the pertinent findings of the previous reports is given in the following sections in relation to the geology at the site. The site history, hydrology, hydrogeology, unexploded ordnance and environmental issues are all briefly summarised in the previous factual and interpretative report and discussed in more detail in the desk study and are not repeated in this report.

7.2 Published Geology

Published geological maps indicate that most of the site is underlain by Quaternary River Terrace Deposits comprising mostly sand and gravel deposits. A small area in the central western part of the site is shown to be underlain by Alluvium associated with a former river channel. Made Ground would be expected above the natural superficial deposits, associated with the existing development.

Bedrock geology is shown to be the Devonian St. Maughan’s Formation comprising interbedded mudstones and sandstones. The south-eastern corner of the site is shown to be underlain by Triassic Mercia Mudstone deposits.

7.3 Previous Investigation Data

A summary of the findings of the initial phase of ground investigation referred to above are presented below.

Details of the initial phase investigation are described and interpreted in the previous report which should be read in combination with this report for a complete understanding of the ground conditions. Exploratory holes were generally located at or outside the perimeter of the existing warehouse building due to access restrictions inside the buildings.

The previous investigation comprised four 200mm diameter boreholes (numbered CP-BH101 to CP-BH103 and WS-BH109) sunk by Cable Percussion Tool techniques to depths of 5.50m (CP-BH101), 8.44m (CP-BH102), 3.45m (CP-BH103) and 9.95m (WS-BH109) below ground level. A fifth borehole (CP-BH105) was terminated on a buried obstruction within the inspection pit at a depth of 0.65m below ground level. Proposed borehole CP-BH104 was cancelled due to time constraints. The work was carried out between 24th May and 1st June 2021.

Five boreholes (numbered RC-BH101 to RC-BH105), up to 100mm in diameter, were sunk utilising a combination of dynamic sampling, rotary open-hole and rotary coring techniques to depths ranging between 7.50m and 15.00m below ground level. The work was carried out between 27th May and 8th June 2021.

Ten Dynamic Sample Boreholes (numbered WS-BH101 to WS-BH108, WS-BH110 and WS-BH111) were undertaken to depths ranging between 1.60m and 4.45m below ground level. The work was carried out between 24th and 27th May 2021. Proposed Dynamic Sample Borehole WS-BH109 was carried out using Cable Percussion techniques due to drilling rig availability.

The locations of the boreholes are shown on Exploratory Hole Location Plan in Appendix I4.

On completion, standpipes were installed in 16 of the boreholes for long term monitoring. Laboratory testing was undertaken on recovered samples (see previous report).

Selected samples of soil and groundwater were tested for a number of determinands in order to quantify potential site contamination (see previous report).

The initial ground investigation encountered Made Ground comprising concrete or asphalt at the surface underlain by sand and gravel with some clay, silt, cobbles, clinker, slag and brick fragments. The Made Ground was found to depths ranging between 0.65m and 4.10m bgl. A number of the exploratory holes were terminated in the Made Ground on encountering obstructions. Standard penetration tests (SPT) indicated the granular material to range between loose and very dense and the cohesive material indicative of high strength clay.

Underlying the Made Ground the exploratory holes encountered clay deposits that possibly represent the Alluvium, River Terrace Deposits and the upper weathered zone of the bedrock. The clay deposits were reddish brown or grey mottled brown in colour and contained a proportion of sand and gravel. They were typically firm and in some places stiff. However, some boreholes encountered layers of soft/very soft clay with some pockets of organic matter that probably comprise the Alluvium. In situ testing indicated the material to range between low to very high strength and with occasional obstructions. The small programme of laboratory testing indicated the clays to be low to high strength and medium to high compressibility. A low to medium (rarely high) classification for volume change potential was indicated.

Bedrock comprising mudstone and siltstone was encountered from depths ranging between 2.80m and 9.40m below ground level (7.80 and 1.35m OD). The material typically comprised extremely weak or very weak brownish red mudstone, occasionally interbedded with very weak grey siltstone. The bedrock was proved to a maximum depth of 15.10m below ground level. Laboratory test results indicated the strength to range from a stiff, high strength clay to extremely weak to moderately weak rock.

Groundwater was encountered within Made Ground deposits in three exploratory holes at 0.90m bgl rising to 0.55m bgl in Borehole WS-BH105. Borehole RC-BH105 encountered groundwater at 2.20m bgl which did not rise. Within the River Terrace Deposits (gravel) Boreholes RC-BH103 and CP-BH102 struck groundwater; at 2.63m bgl rising to 2.00m bgl and at 5.60m bgl with no rise. Within the bedrock, groundwater was encountered in one borehole at 9.00m bgl rising to 4.53m bgl.

Groundwater monitoring undertaken on the 16th June 2021 showed that groundwater was present in all but one of

the monitoring wells varying in depth between 0.71m bgl and 3.00m bgl.

Chemical contamination sampling and testing of soil and groundwater and monitoring of permanent ground gases was undertaken to;

- investigate potential hydrocarbons in shallow Made Ground and its potential migration external to the existing warehouse structure,
- investigate potential sources of contaminants near to existing above ground storage tanks and,
- for general site coverage and characterisation.

The findings from the initial investigation can be briefly summarised as follows:-

- The soil testing undertaken as part of an environmental assessment indicated no heavy metals exceeded any generic assessment criteria (GAC) for a commercial end use. No organic contaminants exceeded the relevant GAC. No other inorganic contaminants exceeded the relevant GAC. All samples were negative for the presence of asbestos.
- Concentrations of phytotoxic metals have been recorded in Made Ground in excess of the guideline values for the protection of plants as presented in the Defra Sewage Sludge Code of Practice. Within the Made Ground one sample had marginally elevated values when compared to the relevant GAC. Geotechnics Limited do not consider any additional consideration is required with regards to risk to plants.
- Groundwater samples from the initial investigation were screened against Environmental Quality Standards (EQS) appropriate for the protection of surface water receptors. Exceedances were encountered in both perched groundwater within Made Ground and deeper groundwater. The majority of EQS exceedances show concentrations marginally above the EQS and exceedances were not shown across the whole site. For heavy metals there are no discernible differences between concentrations in perched groundwater in Made Ground and deeper groundwater in Natural deposits. The concentrations present are considered to be typical of regional background concentrations.
- There was no evidence of gross contaminant impact of perched groundwater or natural groundwater from petroleum hydrocarbons and no light non-aqueous phase liquid (LNAPL) was observed during monitoring and/or purging of groundwater prior to sampling.
- No volatile organic compounds (VOCs) or semi-volatile organic compounds (SVOC) were detected above the laboratory limit of detection.
- The permanent ground gas monitoring results confirmed that there are no significant sources of ground gas.
- The findings of the environmental assessment have shown that the only potential concern is from the presence of hexavalent chrome in localised areas of Made Ground, probably related to the presence of slag. Potential risks to construction workers will be mitigated by the appropriate use of personal protective equipment and standard construction hygiene standards. Following development, even if the Made Ground with hexavalent chromium GAC exceedances remains in-situ, the presence of buildings and hardstanding will break the pathway for exposure to future site users.
- The results of assessment of Waste Characterisation indicated Made Ground from CP-BH102 at 0.5m and Made Ground at WS-BH108 at 1.0m were hazardous due to the concentration of chromium. All of the other the materials encountered during the investigation were classified as non-hazardous. Hazardous material that is excavated would need to be removed from site. In accordance with the Waste Regulations, pre-treatment of hazardous materials is required prior to disposal. Due to the limited size of the site it is recommended that hazardous material be taken to a soil treatment centre for pre-treatment where the soils hazardous properties may be reduced. The site must register as a producer of Hazardous Waste with Natural Resources Wales and appropriate Duty of Care Waste Transfer procedures followed.

- All other Made Ground materials on site are therefore likely to be classified as either inert or non-hazardous waste.
- In conclusion the investigation indicated that there were no significant geoenvironmental risks present at the site, with potential risks to construction workers being mitigated via health and safety procedures. It was recommended that one round of confirmatory groundwater sampling using the low-flow purging and sampling technique should be undertaken during any subsequent geotechnical investigation.

8.0 INTERPRETATION

8.1 Ground Conditions

On the basis of the expected geology discussed in the Desk Study and the findings of the exploratory holes the various strata proved in the investigation has been classified into the following divisions:-

- Topsoil
- Made Ground (incl. asphalt (Tarmacadam) and concrete)
- Alluvium (incl. organic clay and peat)
- River Terrace Deposits - Cohesive
- River Terrace Deposits - Granular
- St. Maughan's Formation (Upper Clay Layer)
- St. Maughan's Formation (Mudstone / Siltstone)

The ground profile exposed in the exploratory holes represents the conditions at discrete locations. The degree to which they represent conditions between or beyond the exploratory holes is a matter for conjecture and these can only be interpolated and hence, the uncertainties arising from this should be recognised.

Sections through the site are included in Appendix 12 to give an indication of the ground and groundwater conditions at the site. These sections are indicative only and reference should be made to the Exploratory Hole Records for detailed descriptions of the soils and the groundwater conditions encountered.

The table below provides a brief summary of the ground profiles found in the exploratory holes. Reference should be made to the Exploratory Hole Records for detailed descriptions of the soils encountered.

The ground profile at the site is summarised as follows:-

Stratum	Typical Description	Depth to Top (m bgl)	Level of Top (m OD)	Thickness (m)
Topsoil	Brown slightly gravelly sand with rootlets. (Borehole BH28 only).	GL	10.83	0.15
Made Ground - Concrete	Light to dark grey concrete. (Boreholes BH05, BH06, BH08, BH09, BH10, BH11, BH12, BH13, BH14, BH14A, BH15, BH17, BH17A, BH18, BH19, BH20, BH21, BH24, BH25, BH26, BH30).	GL to 0.02m	10.65 to 9.99	0.15 to 0.45
Made Ground - Asphalt	Black tarmacadam. (Boreholes BH01, BH02, BH03, BH04, BH4A, BH05, BH07, BH22, BH23, BH27 and BH29).	GL	12.68 to 10.18	0.02 to 0.25
Made Ground	Light to dark brown, reddish, yellowish, orangish and greyish brown, slightly clayey gravelly, sand.	GL (BH16) to 0.45 (BH20, BH21)	13.12 to 10.03	0.20 (BH20) to 2.85 (BH28)

	Rarely sandy gravel and rarely sandy gravelly clay. Occasionally with ash, clinker and slag. Occasionally with low cobble content of sandstone, concrete, siltstone, granite and brick fragments. Rarely with blocks of aircrete, Thermolite insulation, wood fragments and occasionally metal (including steel reinforcement bar) fragments.			
Alluvium	Soft to firm, light to dark brown, slightly sandy, slightly gravelly, CLAY occasionally light brown slightly gravelly SAND with a low cobble content. (Boreholes BH09, BH17A, BH26). Soft to firm dark brown mottled grey or brown slightly sandy slightly gravelly pseudo-fibrous PEAT and organic CLAY with wood fragments. (Boreholes BH09 and BH26).	1.20 (BH17A, BH26) to 3.00 (BH09)	9.84 to 8.01	1.50 (BH09) to 6.40 (BH26)
River Terrace Deposits - Cohesive	Soft to firm occasionally stiff to very stiff, brown occasionally mottled grey, orangish and yellowish, sandy, gravelly, CLAY occasionally with low cobble content. (BH01, BH03, BH04A, BH05, BH06, BH07, BH10, BH11, BH14A, BH15, BH16, BH18, BH24, BH25, BH28 and BH29)	0.36 (BH07) to 3.00 (BH10, BH28)	12.32 to 7.83	0.24 (BH27) to 4.00 (BH18)
River Terrace Deposits - Granular	Medium dense to dense brown, occasionally orangish, sandy, clayey, sub-angular to sub-rounded GRAVEL, gravelly SAND occasionally with low cobble content. (BH01, BH02, BH03, BH07, BH08, BH12, BH13, BH15, BH18, BH19, BH20, BH21, BH22, BH23, BH24, BH25, BH27 and BH29)	0.30 (BH22) to 3.00 (BH01, BH02, BH03, BH18)	7.77 to 12.08	0.40 (BH18) to 4.40 (BH07)
St. Maughan's Formation (Upper Clay Layer)	Firm to stiff, occasionally very stiff, reddish brown gravelly sandy CLAY occasionally with a low cobble content. Gravel and cobbles are mudstone, siltstone and sandstone.	2.30 (BH30) to 7.60 (BH26)	9.02 (BH16) to 3.35 (BH26)	1.40 (BH08, BH10, BH25) to 4.73 (BH18)
St. Maughan's Formation (Mudstone / Siltstone)	Extremely weak to medium strong reddish brown MUDSTONE, SILTSTONE and SANDSTONE, generally with closely to very closely spaced horizontal to 60 degree inclined discontinuities. Occasionally interbedded. Mudstone occasionally recovered as gravelly clay.	3.70 (BH29) to 8.00 (BH01)	7.52 (BH29) to 2.86 (BH01)	17.20* (maximum proven; BH28)

*Base of stratum not proven

8.1.1 Topsoil

Topsoil was only encountered in Borehole BH28. The material was described as brown slightly gravelly sand with rootlets and was 0.15m thick.

8.1.2 Made Ground

Made Ground was encountered in all of the exploratory holes. The material varied across the site, both in terms of thickness and composition.

The exploratory holes within the main structure and several immediately adjacent to it proved the concrete floor slab at the surface to be between 0.15m and 0.45m thick.

Borehole BH17 was terminated on a probable concrete obstruction at 1.70m depth which was 1.50m below the base of the main concrete slab. Borehole BH04 was terminated due to a concrete obstruction at 1.54m depth and Borehole BH14 also on a concrete obstruction at 1.20m depth.

Exploratory holes undertaken just to the north of the main warehouse building and within car parking areas or roadways near to the building encountered between 0.02m and 0.25m thick asphalt. A thin skin of asphalt overlay concrete in one hole, Borehole BH05.

Beneath the surface materials, Made Ground was encountered in all exploratory holes and, whilst predominantly granular, is variously described as light to dark brown, reddish, yellowish, orangish and greyish brown, slightly clayey gravelly, sand, sandy gravel and rarely sandy gravelly clay, occasionally with ash, clinker and slag, occasionally with a low cobble content of sandstone, concrete, siltstone, granite and brick fragments, rarely with blocks of aircrete, Thermolite insulation, wood fragments and occasionally with metal fragments and including steel reinforcement bar.

The maximum depth of the base of the material varies from between 0.30m (10.40m OD) and 3.00m (7.83m OD). The greatest depth was found in exploratory holes BH09 and BH10, in the north-western quadrant of the site, BH30 near to the south-western corner and BH28 in the south-eastern part of the site. These also correspond to the lowest elevations at which it was encountered. The initial ground investigation found Made Ground to a maximum depth of 4.10m below ground level (RC-BH105; north-eastern part of the site). These deeper areas of Made Ground indicate the variable nature of its depth and likely represent where softer areas of natural ground may have been excavated and replaced in preparation of the construction of the concrete slab for structures.

One water content test indicated a natural value of 9.5% for a sample of clay, see Figure 1 (Appendix 11).

One particle size distribution test classified the made ground as very sandy clayey gravel, with 22% fine material (<63µm), 34% sand and 44% gravel fractions, see Figure 3.1 (Appendix 11).

The SPT N values were found to be between 15 and 43 indicating a relative density of medium dense to dense. The results have been plotted and are shown on Figure 4.1 (Appendix 11). The N values do not show a clear trend with depth, being variable. Five tests did not achieve the required full penetration and are considered to have encountered gravel or cobbles.

A laboratory CBR test on granular Made Ground provided values of 37% (top) and 58% (bottom) with an average of 48%.

The results of seventeen plate load tests gave equivalent CBR values ranging between 3.8% and 130% with all but 6 of the CBR values being below 27%. The associated Modulus of Subgrade Reaction were between 31 and 242 kN/m².

A table summarising the test results and derived parameters for the Made Ground is presented as Table 1 in Appendix 11.

8.1.3 Alluvium

Below the Made Ground in Boreholes BH09 BH17A, and BH26, soil classified as Alluvium was encountered. It was generally found to comprise soft to firm, light to dark brown, slightly sandy, slightly gravelly, clay occasionally with a slight organic odour. In Borehole BH09 a 1m thick layer of peat from 4.50m bgl was encountered.

The alluvium was encountered from depths ranging between 1.20m and 3.00m bgl (9.84 and 8.01m OD) and was found to be between 1.50m and 6.40m thick. The base was proven at depths ranging from between 3.40m (BH17A)

and 7.60m (BH09). The material was generally present along a north to south trending strip of land in the western third of the site. The soft clay soils found in this area in Boreholes CP-BH101, WS-BH110, and WS-BH130 from the previous investigation and also located in this area may also comprise Alluvium.

The water content was found to be variable and ranged from 10.4 to 141%, see Figure 1 (Appendix 11). The Atterberg Limit test results gave a Plasticity Index (PI) ranging between 17 and 23% and generally classifying the soil as a clay of intermediate plasticity with one result plotting just into the low category and another plotting as silt (see Figure 2, Appendix 11). Modifying the PI to take account of the soil particles greater than 425µm of the sample tested following the procedures in NHBC Standards Chapter 4.2 gives Modified PIs of between 7 and 23% with an average of 15% indicating no volume change to medium volume change potential. The high water content of 141% is indicative of an organic material. A sample of peat was indicated to be non-plastic which is due to the fibrous nature of the material.

The SPT N values were found to be between 0 and 26 and are shown on Figure 4.1 (Appendix 11). Values are scattered and show a slight increase in value down to 3m depth then decrease to 7.00m. Based on the relationship $c_u = f_1 \times N$ (kN/m²) proposed by Stroud & Butler, where $f_1 = 5$ for clay using the mean PI of 19%, the N values are approximately equivalent to undrained shear strengths of 0 to 130 kN/m² (average 59 kN/m²) which are indicative of extremely low to high strength conditions. The SPTs in BH17A at 1.20m (N=15), 2.00m (N=19) and 3.00m (N=26) depth are considered likely to have encountered cobbles which are included in the stratum description.

One compaction test results showed a maximum dry density of 2.19 Mg/m³ and optimum water content of 6.0%. The natural water content of the material indicates it to be wet of optimum.

The organic content of samples from BH09 (4.50m – 5.00 m depth) and BH26 (4.80m depth) was found to be 0.7% and 21% respectively.

Two samples underwent one dimensional consolidation testing by oedometer. A sample of clay with a slightly organic odour from borehole BH09 at 4.00m depth resulted in a coefficient of compressibility m_v of 0.44 m²/MN over a pressure range of 0-40kPa indicating the material to have a high compressibility. A sample of clayey pseudo-fibrous peat from borehole BH09 at 5.00m depth resulted in a coefficient of compressibility m_v of 1.51 m²/MN over a pressure range of 0-50 kN/m² indicating the material to have a very high compressibility. Results obtained during the initial investigation have been reviewed and tests undertaken in Boreholes CP-BH102 and CP-BH103 in the south of the western half of the site (to the south and west of Boreholes BH26) indicated the clay to be medium to high compressibility.

Two specimens were testing in the laboratory for Thermal Conductivity. Results ranged between 2.54 and 2.57 W/(m.k) (average 2.56 W/(m.k)) with associated Thermal Resistivity of 0.39 (m.k)/W. The temperature of the specimens ranged between 19.3 and 20.3 °C (average 20 °C). Bulk density results taken as part of the testing ranged between 1.66 and 2.24 Mg/m³ (2.01 Mg/m³).

A table summarising the test results and derived parameters for the Alluvium is presented as Table 2 in Appendix 11.

8.1.4 River Terrace Deposits

Soils classified as the River Terrace Deposits were encountered in the most of boreholes below the Made Ground. The soils encountered can be divided into two groups; Cohesive soils and Granular Soils.

Cohesive Layer

Cohesive Layers in the River Terrace Deposits comprising soft to firm occasionally stiff to very stiff, brown occasionally mottled grey, orangish and yellowish, sandy, gravelly, clay occasionally with low cobble content were found in Boreholes BH01, BH03, BH04A, BH05, BH06, BH07, BH10, BH11, BH14A, BH15, BH16, BH18, BH24, BH25, BH28 and BH29. It was encountered from depths ranging between 0.36m (BH07) and 3.00m (BH10 and BH28), at elevations ranging between 7.83 and 12.32 m OD, and ranged in thickness between 0.10m and 4.40m. These deposits were found mainly along the northern edge and the northern half of the eastern third of the site.

The water content was found to be variable and ranged between 8 and 41%, see Figure 1 (Appendix 11). The

Atterberg Limit test results gave a Plasticity Index (PI) ranging between 9 and 23% generally classifying the soil as a clay of low to intermediate plasticity with one result plotting just into the high category and another plotting below the 'A-line' as a silt (see Figure 2, Appendix 11). Modifying the PI to take account of the soil particles greater than 425µm of the sample tested following the procedures in NHBC Standards Chapter 4.2 gives Modified PIs of between 4 and 20% indicating a range between no volume change and a low volume change potential.

Three particle size distribution tests showed generally similar curves classifying the material as described above, with between 23 and 59% fine material (<63µm), between 24 and 49% sand and between 17 and 44% gravel fractions (see Figure 3.2, Appendix 11).

The SPT N values were found to be between 11 and 46 and are shown on Figure 4.1 (Appendix 11). Values are scattered and do not show a particular change with depth. Based on the relationship $c_u = f_1 \times N$ (kN/m²) proposed by Stroud & Butler, where $f_1 = 6$ for clay using the mean PI of 15%, the N values are approximately equivalent to undrained shear strengths of 66 to 276 kN/m² which are indicative of medium to very high strength conditions. Twelve tests failed to achieve full penetration and produced. These tests are considered likely to have encountered gravel or possibly cobbles.

One unconsolidated undrained triaxial test gave an undrained shear strength results of 64 kN/m² indicating an undrained strength of medium strength. A plot of shear strength against depth including equivalent undrained shear strength derived from SPT N values is presented on Figure 5 (Appendix 11).

Five compaction test results showed a range of maximum dry density and optimum water content values ranging from 2.03 to 2.20 Mg/m³ and from 7.5 to 9% respectively. The natural water content of the material indicates it to generally be wet of optimum.

Five laboratory CBR tests provided values of between 0.59 and 47% with an average of approximately 8%.

Seven specimens were tested in the laboratory for Thermal Conductivity. Results ranged between 1.24 and 3.37 W/(m.k) (average 2.29 W/(m.k)) with associated Thermal Resistivity ranging between 0.30 and 0.81 (m.k)/W (average 0.48 (m.k)/W). The temperature of the specimens ranged between 19.3 and 20.3 °C (average 19.9 °C). Bulk density results taken as part of the testing ranged between 1.66 and 2.23 Mg/m³ (average 2.08 Mg/m³).

A table summarising the test results and derived parameters for the River Terrace Deposits - Cohesive is presented as Table 3 in Appendix 11.

Granular Layer

Granular Layers in the River Terrace Deposits comprising medium dense to dense brown, occasionally orangish brown, sandy, clayey, sub-angular to sub-rounded gravel, gravelly sand in places, with low cobble content were found in Boreholes BH01, BH02, BH03, BH07, BH08, BH12, BH13, BH15, BH18, BH19, BH20, BH21, BH22, BH23, BH24, BH25, BH27 and BH29. The material was encountered from depths ranging between 0.30m (BH22) and 3.00m (BH01, BH02, BH03 and BH18), at elevations ranging between 7.77 and 12.08 m OD, and ranged in thickness between 0.40m (BH18) and 4.40m (BH07). These granular soils are generally present in the southern part of eastern two thirds of the site, as well as in some boreholes in the western third and the eastern edge. There is also the absence of granular soils from the previous investigation boreholes around the edge of the site

Fourteen particle size distribution tests showed generally similar curves classifying the material as described above, with between approximately 3 and 26% fine material (<63µm), between 7 and 43% sand and between 36 and 81% gravel fractions, with a cobble content of between 0 and 9%. See Figure 3.2 (Appendix 11).

The SPT N values were found to be between 11 and 51 and are shown on Figure 4.1 (Appendix 11). Values are scattered and do not show a particular change with depth. Eighteen tests failed to achieve full penetration with penetrations of 75 to 265 mm being achieved for 50 blows. These tests are considered likely to have encountered gravel or cobbles.

Seven compaction test results showed a range of maximum dry density and optimum water content values ranging from 2.10 to 2.21 Mg/m³ and from 6 to 9% respectively.

Seven laboratory CBR tests provided values of between 1.20 and 55% with an average of approximately 22%.

Ten specimens were tested in the laboratory for Thermal Conductivity. Results ranged between 1.80 and 2.78 W/(m.k) (average 2.37 W/(m.k)) with associated Thermal Resistivity ranging between 0.36 and 0.55 (m.k)/W (average 0.43 (m.k)/W). The temperature of the specimens ranged between 17.8 and 20.6 °C (average 19.8 °C). Bulk density results taken as part of the testing ranged between 1.93 and 2.84 Mg/m³ (2.19 Mg/m³).

A table summarising the test results and derived parameters for the River Terrace Deposits - Granular is presented as Table 4 in Appendix II.

8.1.5 St. Maughan's Formation (Upper Clay Layer)

Clay soil classified as the St. Maughans Formation was encountered below the River Terrace Deposits or the Alluvium in the most of exploratory holes and probably comprises the upper weathered zone of the formation. The material is described as firm to stiff, occasionally very stiff, reddish brown gravelly sandy clay, occasionally with a low cobble content. The gravel and cobbles are mudstone, siltstone and sandstone. It was encountered at depths ranging from between 2.30m and 7.60m (3.35 and 9.02 m OD) and ranged in thickness from 1.40m to 4.73m. The level of the surface is generally at lower elevations in a north west to south east strip of land towards the west site.

Whilst the bedrock below this layer will also be weathered to some degree these clay soils have been separated from the underlying rock strata of the St. Maughan's Formation in order to separate the more highly weathered material which is likely to behave more like a clay than a rock and was able to be penetrated using cable percussive boring techniques.

The water content was found to be variable and ranged between 9.5 and 40%, see Figure 1 (Appendix II). The Atterberg Limit test results gave a Plasticity Index (PI) ranging between 14 and 34% generally classifying the soil as a clay of low to intermediate plasticity and silt of high and very high plasticity, see Figure 2 (Appendix II). Modifying the PI to take account of the soil particles greater than 425µm of the sample tested following the procedures in NHBC Standards Chapter 4.2 gives Modified PIs of between 10 and 31% indicating a low to medium volume change potential.

The SPT N values were found to range between 7 and 50 and are shown on Figure 4.1 (Appendix II). A slight increase in the N value with depth can be seen. A general lower bound line to most of the data shows an increase in N from about 17 at 3m bgl to 33 at 10m bgl with a small number of tests with low N values of less than 11 can be seen indicating the presence of low strength zones within the stratum. Based on the relationship $c_u = f_1 \times N$ (kN/m²) proposed by Stroud & Butler, where $f_1 = 5$ for clay using the mean PI of 22%, the N values are approximately equivalent to undrained shear strengths of 85 to 250 kN/m² for those N values over 11 which are indicative of high and very high strength conditions. The N values less than 11 are approximately equal to undrained shear strengths of 35 to 55 kN/m² indicating zones of low and medium strength. Fourteen test did not achieve full penetration and produced 'Extrapolated N' values of between 78 and 563. These tests are considered likely to have encountered more competent bedrock or gravel and cobble lithorelicts.

One unconsolidated undrained triaxial test gave an undrained shear strength result of 76 kN/m² indicating high strength conditions. A plot of undrained shear strength against depth including the undrained shear strengths derived from the SPT N values is presented on Figure 5 (Appendix II).

One compaction test results showed maximum dry density and optimum water content values of 1.75 Mg/m³ and 18% respectively. The natural water content of the material indicates it to generally be wet of optimum.

Two specimens were tested in the laboratory for Thermal Conductivity. Results ranged between 2.60 and 2.71 W/(m.k) (average 2.66 W/(m.k)) with associated Thermal Resistivity ranging between 0.37 and 0.38 (m.k)/W (average 0.38 (m.k)/W). The temperature of the specimens ranged between 17.8 and 20.6 °C (average 19.1 °C). Bulk density results taken as part of the testing ranged between 1.93 and 2.84 Mg/m³ (average 2.21 Mg/m³).

The range of measured and derived parameters for the clay have been tabulated in Table 4 of Appendix II.

8.1.6 Mudstone / Siltstone (St. Maughan's Formation)

Below the Upper Clay Layer, bedrock comprising mudstone, siltstone and sandstone was encountered. These were described as

- Extremely weak to weak reddish brown MUDSTONE. Discontinuities are horizontal to inclined (10 to 60 degrees), very closely to closely spaced planar to undulating, smooth with occasional black staining.
- Extremely weak to medium strong light grey and reddish brown SILTSTONE with occasional inclusions of grey siltstone. Discontinuities are horizontal to inclined (30 to 40 degrees), very closely to closely spaced, planar to undulating and smooth with occasional black staining.
- Weak to medium strong reddish brown SANDSTONE. Discontinuities are horizontal, closely spaced, planar to undulating, smooth with occasional black staining.

The material is occasionally interbedded and the mudstone is occasionally recovered as gravelly clay.

The rock layers were encountered at depths ranging between 3.70m and 8.00m bgl (2.86m OD and 7.52m OD). The initial ground investigation encountered the deepest bedrock at 9.40m below ground level (1.35m OD) in Borehole WS-BH109 just west of the middle of the southern edge of the site. The maximum depth proven was 21.00m below ground level. The surface of the bedrock is generally at a lower elevation towards the western third of the site.

Seventeen Standard Penetration Test results (Figure 4.1, Appendix 11) did not achieve the required full penetration with a penetration of 40 to 290 for 50 blows. 'Extrapolated N' values of between 78 and 563 have been estimated and are shown on Figure 4.2. The plot shows a general increase in Extrapolated N value with depth. Twelve tests carried out in the upper sections of the bedrock (Boreholes BH01, BH03, BH16, BH19, BH20, BH21, BH23, BH28, BH29 and BH30) were found to range between 26 and 61. These tests were undertaken on weaker, clay layers and non-intact zones within the bedrock and are probably not representative of the mass bedrock strength.

Unconfined Compressive Strength laboratory tests (Figure 7, Appendix 11) carried out indicate the rock strength for the sandstone to range between 5.31 and 13.00 MN/m² (indicating generally weak); for the siltstone 2.03 and 7.72 MN/m² (indicating very weak to weak) and for the mudstone 0.84 and 19.60 MN/m² (indicating extremely weak to weak, occasionally moderately weak). A summary of the results are presented as Table 5 in Appendix 11.

Point load tests were undertaken on samples of the bedrock (mudstone, siltstone and sandstone) and gave $I_{s(50)}$ values ranging between 0.01 and 5.41 MN/m² (Axial 0.03 to 5.41 MN/m², Diametral 0.01 to 4.27 MN/m²). The $I_{s(50)}$ values are shown on Figure 6, Appendix 11. Applying a factor of 20 to the $I_{s(50)}$ values in general accordance with suggestions by Broch and Franklin (1972) provides values ranging between 0.2 and 108.2 MN/m² (indicating extremely weak to very strong) which is generally in accordance with the visual descriptions recorded. Based on the factored values, the sandstone was found to have an estimated strength of between 0.4 and 85 MN/m² (indicating extremely weak to strong), the siltstone between 0.4 and 10 MN/m² (indicating extremely weak to weak) and the mudstone between 0.2 and 108 MN/m² (indicating extremely weak to very strong). The factored point load results correlate fairly well with the UCS test results considering that the UCS tests are likely to have been undertaken on more competent specimens. However, a different correlation factor may be deemed appropriate for design purposes. The factored values and UCS test results are shown plotted against depth on Figure 7, Appendix 11.

Water Content tests carried out produced results ranging from 4.7 to 10.7% for sandstone, 5.8 to 11.8% for siltstone and 3.1 to 22.5% for mudstone.

One specimen was tested in the laboratory for Thermal Conductivity. The result was 1.18 W/(m.k) with associated Thermal Resistivity of 0.85 (m.k)/W. The temperature of the specimen was 19.1 °C. A bulk density result taken as part of the testing was 1.87 Mg/m³.

The range of measured and derived parameters for the bedrock have been tabulated in Table 5 of Appendix 11.

8.2 Groundwater

Groundwater was struck during boring at the depths indicated in the following table together with the level risen to following a 20 minute pause in the drilling operations:-

Exploratory Hole	Depth Struck, m bgl (m OD)	Level after 20mins, m bgl (m OD)	Casing Depth m bgl
BH01	3.00 (7.86)	1.50 (9.36)	3.00
BH02	7.40 (3.48)	3.70 (7.18)	7.00
BH02	8.50 (2.38)	6.10 (4.78)	8.50
BH03	3.50 (7.27)	5.80 (4.97)	3.00
BH04A	4.00 (6.86)	3.90 (6.96)	3.30
BH13	3.45 (7.54)	1.39 (9.60)	3.45
BH17A	5.60 (5.44)	5.50 (5.54)	4.00
BH18	8.45 (2.58)	7.90 (3.13)	-
BH18	10.00 (1.03)	6.00 (5.03)	-
BH23	12.00 (-0.09)	11.00 (0.91)	10.50
BH27	16.00 (-5.82)	6.10 (4.08)	10.10
BH30	10.00 (0.99)	4.30 (6.69)	7.50

It should be noted that the addition of drilling fluid may have masked some groundwater strikes.

The depth to first groundwater strike in each of the above boreholes ranged from 3.00m to 16.00m below ground level, equating to elevations between 7.86m OD and -5.82m OD. The highest standing water level in the boreholes recorded after 20 minutes standing or overnight were measured at 1.39m below ground level (9.60m OD) in Borehole BH13.

Groundwater levels monitored in the morning (start of the shift) following the previous day of drilling are presented as follows:

Exploratory Hole	Date and time	Water depth m bgl (m OD)	Borehole depth m bgl	Stratum at base of hole m bgl	Casing depth m bgl
BH03	02/09/2022	Dry	1.20	Made Ground (Gravel)	-
BH04	10/08/2022	Dry	1.54	Made Ground (Sand)	-
BH05	15/08/2022	Dry	1.20	Made Ground (Gravel)	-
BH06	19/08/2022	Dry	1.20	Made Ground (Sand)	-
BH08	22/08/2022	Dry	1.20	Made Ground (Sand)	-
BH09	30/08/2022	Dry	2.50	Made Ground (Sand)	2.50
BH11	18/08/2022	Dry	5.00	Clay	4.50
BH12	16/08/2022	Dry	1.20	Gravel	-
BH12	17/08/2022	Dry	3.00	Clay (weathered bedrock)	3.00
BH13	09/08/2022	Dry	1.20	Made Ground (Sand)	-
BH13	15/08/2022	Dry	2.30	Sand	2.00
BH13	16/08/2022	5.40	5.50	Gravel (weathered bedrock)	5.50
BH15	02/08/2022	Dry	1.20	Made Ground (Sand)	-
BH16	18/08/2022	Dry	4.10	Clay	4.00
BH17	08/08/2022	Dry	1.70	Made Ground (Clay)	-
BH18	04/08/2022	Dry	6.00	Clay (weathered bedrock)	6.00
BH19	01/09/2022	Dry	1.20	Made Ground (Gravel)	-
BH20	31/8/2022	Dry	1.20	Sand	-

BH21	31/08/2022	Dry	1.20	Made Ground (Sand)	-
BH21	01/09/2022	Dry	3.45	Gravel	3.00
BH22	01/08/2022	Dry	1.20	Gravel	-
BH22	02/08/2022	Dry	2.00	Gravel	2.00
BH24	25/08/2022	Dry	1.20	Made Ground (Sand)	-
BH25	23/08/2022	Dry	1.20	Clay	-
BH26	10/08/2022	Dry	1.20	Made Ground (Sand)	-
BH26	11/08/2022	Dry	3.45	Clay	3.00
BH26	12/08/2022	Dry	8.45	Clay (weathered bedrock)	8.00

As part of the initial phase ground investigation, observations made during progression of exploratory holes and during post-installation monitoring have shown that groundwater occurs both as perched groundwater within Made Ground, and as groundwater in the deeper natural deposits. The table below shows a summary of strata where monitoring wells are installed and the standing groundwater level (m OD) measured on the 17th June 2021:

Exploratory Hole	Slotted pipe and (Filter Zone) (m)	Groundwater Level		Strata Monitored
		Depth (m bgl)	Level (m OD)	
WS-BH102	1.00 to 2.28 (1.00 to 2.28)	-	Dry	Made Ground
WS-BH103	1.00 to 2.50 (1.00 to 2.50)	2.13	7.76	Made Ground
WS-BH104	0.50 to 2.00 (0.50 to 2.25)	1.88	8.19	Made Ground
WS-BH105	0.50 to 1.00 (0.50 to 1.00)	0.62	9.43	Made Ground
WS-BH106	0.50 to 1.50 (0.50 to 1.50)	1.46	8.94	Made Ground
WS-BH109	0.50 to 2.50 (0.50 to 2.50)	1.13	9.62	Made Ground
WS-BH110	2.00 to 4.00 (2.00 to 4.45)	2.84	8.11	Made Ground
WS-BH111	2.00 to 3.00 (2.00 to 3.45)	3.00	7.92	Made Ground
CP-BH103	1.00 to 3.00 (1.00 to 3.45)	1.33	9.27	Made Ground
RC-BH101	1.00 to 3.00 (1.00 to 3.45)	2.54	7.64	Made Ground
RC-BH105	1.00 to 4.00 (1.00 to 4.00)	1.93	8.84	Made Ground
CP-BH101	4.00 to 5.50 (4.00 to 5.50)	2.00	7.65	Superficial deposits
CP-BH102	4.00 to 8.00 (4.00 to 8.44)	3.00	7.28	Superficial deposits
RC-BH102	3.00 to 12.00 (3.00 to 12.00)	2.61	7.74	Bedrock
RC-BH103	2.00 to 8.30 (2.00 to 8.30)	2.21	7.78	Bedrock
RC-BH104	3.00 to 15.00 (3.00 to 15.10)	2.50	8.36	Bedrock

The results of monitoring within the current investigation carried out on the 20th and 26th September, 2022 together with installations from the initial investigation are summarised as follows:

Exploratory Hole	Response Zone (m)	Groundwater Level		Strata Monitored
		Depth (m bgl)	Level (m OD)	
BH01	14.00 to 18.00	2.63 to 2.68	8.23 to 8.18	Bedrock: Sandstone.
BH03	3.50 to 5.50	2.13 to 2.25	8.64 to 8.52	Gravel (River Terrace Deposits)
BH04A	15.00 to 17.00	2.56 to 2.62	8.30 to 8.24	Bedrock: Mudstone.
BH06	1.00 to 2.70	1.77 to 1.80	9.09 to 9.06	Clay (River Terrace Deposits)
BH07	13.00 to 20.50	4.84 to 4.95	7.84 to 7.73	Bedrock: Mudstone.
BH09	4.50 to 5.50	2.28 to 2.29	8.73 to 8.72	Peat.
BH10	5.00 to 6.50	2.79 to 2.83	8.21 to 8.17	Bedrock: Mudstone/Siltstone.
BH17A	4.00 to 5.00	3.44 to 3.56	7.60 to 7.48	Gravel of mudstone and sandstone (probable weathered bedrock).
BH19	10.00 to 12.00	3.00 to 3.03	8.01 to 7.98	Bedrock: Mudstone and sandstone
BH23	4.00 to 5.00	4.73 to 4.75	7.18 to 6.26	Gravel (River Terrace Deposits)
BH25	9.00 to 13.00	3.07 to 4.56	7.93 to 6.44	Bedrock: Mudstone.

BH28	3.00 to 4.60	3.45 to 3.50	7.38 to 7.33	Clay (Alluvium)
BH30	3.00 to 5.00	3.22 to 3.25	7.77 to 7.74	Clay (River Terrace Deposits)/ Bedrock (Mudstone).
CP-BH101	4.00 to 5.50	1.95 to 2.10	7.70 to 7.55	Clay and mudstone
CP-BH102	4.00 to 8.44	3.92 to 4.69	6.36 to 5.59	Clay and mudstone
CP-BH103	1.00 to 3.45	1.30 to 1.36	9.30 to 9.24	Clay and mudstone
RC-BH101	1.00 to 3.00	2.26 to 2.32	7.92 to 7.86	Made Ground and clay
RC-BH102	3.00 to 12.00	2.64 to 2.66	7.71 to 7.69	Clay and mudstone
RC-BH103	2.00 to 8.30	2.35 to 4.10	7.64 to 5.89	Clay and mudstone
RC-BH104	3.00 to 15.10	2.62 to 2.64	8.24 to 8.22	Clay and mudstone
RC-BH105	1.00 to 4.00	3.08 to 3.12	7.69 to 7.65	Made Ground (sand and gravel)
WS-BH102	1.00 to 2.28	Dry	-	Made Ground (gravel)
WS-BH103	1.00 to 2.50	Dry	-	Made Ground (gravel) and clay
WS-BH104	0.50 to 2.25	Dry	-	Made Ground (gravel) and clay
WS-BH105	0.50 to 1.00	0.73	9.32	Made Ground (sand)
WS-BH106	0.50 to 1.50	1.48 to 1.58	8.92 to 8.82	Made Ground (sand and gravel)
WS-BH109	0.50 to 2.50	1.13 to 1.14	9.62 to 9.61	Made Ground and clay
WS-BH110	2.00 to 4.45	2.86 to 2.88	8.09 to 8.07	Made Ground, gravel and clay
WS-BH111	2.00 to 3.45	2.74	8.18	Made Ground (gravel) and mudstone

Groundwater depths during monitoring ranged between 1.13m and 4.69m below ground level and elevations ranging between 6.36m and 9.61m OD.

It is considered that the relatively shallow groundwater encountered within several of the boreholes may represent perched groundwater within the Made Ground. The groundwater below what is likely to be perched water has been measured as shallow as 1.77m below ground level.

It should be noted that groundwater levels can vary both seasonally and after prolonged periods of wet or dry weather.

The results of the monitoring are presented in Appendix 7.

9.0 GEOTECHNICAL EVALUATION

9.1 Proposals

It is understood that proposals for the site include demolition and clearance of the existing buildings/hardstanding followed by the construction of a new data centre comprising two buildings with associated areas of access roadways, hardstanding and car parking. It is also understood that the proposed development will include areas of soft landscaping and a number of ponds.

The three main structures of the proposed development are shown on the Proposed Masterplan (Appendix 13) are the two main data centre buildings (CWL 01 and CWL 02) and the electricity sub-station (structure number 04). The data centre buildings (CWL 01 and CWL 02) are expected to be of steel framed construction with lightweight cladding. The maximum anticipated structural loading at foundation level is understood to be 450kN and the maximum anticipated ground floor loading is 25kN/m². The building and ground floor slab are not expected to be particularly sensitive to settlement. It is understood that some minor retaining structures (1.20m high) will be required for the unloading docks.

At the time of writing the proposed finished floor levels (FFL) for both buildings are understood to be 11.50m above OD. A central, southern area believed to be at the proposed location of an electrical sub-station has a FFL indicated to be 11.15m. As a result of these proposed levels, a degree of cut and fill will be required, the primary cut area being towards the north-eastern corner of the site and primary fill area being towards the central part of the southern boundary.

A plan showing the proposed general arrangement options at the time of preparation of this report is presented in Appendix 14.

9.2 Foundation Design Principles

In formulating proposals for foundation and floor slab design, the two primary controlling factors are soil strength and foundation settlement. In general it is the latter which is the primary determinant of what is perceived to be satisfactory performance. For clay soils, allowable bearing capacity is based on undrained shear strength, although a Factor of Safety of 3 is commonly adopted in order to ensure that the loading is on the sensibly linear component of the stress/strain curve for the soil.

With time, the clays will strengthen under the higher loadings as any excess pore water pressures dissipate. Hence, the worst case is at the time of initial loading and, for gradually applied or static loading, bearing capacity should progressively increase. For eccentric loading, where peak load is at an extremity of the foundation, this can be higher than the allowable load, provided that the mean equivalent stress is within the allowable value.

For granular or essentially free draining soils the frictional characteristics and density will dominate bearing capacity and this is generally much higher than for clay soils. For normal spread foundations conventional design is typically based on the stress which would give rise to 25mm settlement. Actual settlements will depend upon the type, period, load intensity and width of the loaded area and the thickness and compressibility of the soils below.

A further issue for foundations is the degree of variability in the foundation soils. The adoption of a lower bearing pressure than strength criteria would indicate implicitly that a larger foundation is likely to behave more in line with average conditions and hence, for a given load, will result in less differential settlement.

9.3 Geotechnical Classification

The geotechnical classification appropriate for the site development, as defined in BS EN 1997-1:2004+A1:2013, is Category 2 as the anticipated development and construction comprises conventional geotechnical structures and foundations.

9.4 Earthworks

The proposed finished ground and floor levels will require a degree of cut and fill to be carried out. Several samples of soil from exploratory holes in the 'cut' areas were tested in the laboratory and samples of granular material were tested for particle size distribution and moisture content/dry density relationship and cohesive material was tested for water content, Plasticity Limits and moisture content/dry density relationship.

The particle size distributions of the granular materials were all seen to be generally well-graded and the percentage fines (smaller than 63µm) was generally low, ranging from 3% to 12% and classify as Class 1A according to the Specification for Highway Works Series 600. Cohesive samples from this are were of low plasticity and on the boundary between low and intermediate plasticity with a significant amount (32 to 42%) of granular material being retained on the 425µm sieve and classify as Class 2A according to the Specification for Highway Works Series 600. For all samples tested, the natural water contents were generally within 1% to 3% of the optimum moisture contents determined from the compaction test curves.

The soil samples tested suggest that the 'cut' soils, although variable in nature could be suitable for re-use in 'fill' areas. However, controls will need to be in place to ensure adequate screening of the soils to ensure separation of different classes of materials. Care will also be needed to ensure that water contents remain close to optimum in order to ensure that materials are placed at or close to maximum dry density.

Areas of soft, medium/high compressibility clay were encountered at depth in some of the exploratory holes. Raising ground levels above such materials will increase the overburden pressure on them and this is likely to result in some long-term consolidation settlement. Based on proposals available at the time of preparation of this report, a maximum 'fill' thickness of around 1.0m is anticipated. This would produce an increase in overburden pressure of

the order of approximately 20kN/m². It is estimated that such an increase in stress on a 2m thick layer of the soft clay (e.g. CP-BH102) could result in consolidation settlements in the soft clay alone of the order of 20mm. It would therefore be advisable to leave final surfacing for as long as possible after the cut/fill operation to minimise any distress to the finished surface or to consider the treatment or removal of such soft areas. Advice should be sought from a lime stabilisation specialist to discuss the potential for using such techniques to improve the condition of the near surface ground. Total sulphate (SO₄) values encountered during laboratory testing ranged between 0.01 and 0.29% and should be considered when discussing this potential option.

9.5 Foundation Solutions

The approach to design and selection of suitable foundation options for this site is based on a hierarchy of complexity and expense. If the simplest and cheapest solution case can be shown to be appropriate, then further discussion is considered superfluous. Where such simple and proven techniques are not expected to be suitable, then other options are examined in more detail. The following options have been considered:

- Traditional pad foundations at shallow depth.
- Traditional pad foundations, but using trench fill to transfer loads to soils at greater depths.
- Raft foundation to reduce the intensity of loading.
- Ground improvement prior to foundation construction.
- Piled solution, including selection of suitable pile types and preliminary calculation of carrying capacity.

9.5.1 Pad Foundations

The Made Ground, due to its variable nature and thickness and to avoid unpredictable total and differential settlements, does not form a suitable founding stratum. With Made Ground present to depths of up to 4.10m encountered in the initial ground investigation (3.00m in the most recent investigation), the use of traditional pad foundations is precluded.

9.5.2 Trench Fill Foundations

Consideration has been given to the use of concrete trench fill foundations taken through the Made Ground into the underlying natural soils. The three main structures of the proposed development CWL 01, CWL 02 and electricity sub-station (structure number 04 on the Proposed Masterplan) are discussed separately. Existing shallow foundations would need to be grubbed out to facilitate such foundations and any existing piles would need to be avoided.

Building CWL 01

Ground conditions comprise Made Ground up to 3.00m deep, underlain by cohesive deposits in some areas and granular deposits in other areas. In view of the variable nature of the materials beneath the proposed structure, including instances where the depth to the firm clay strata is up to 4.80m (Borehole BH10), organic material within Alluvium and peat to 5.50m (BH09), that could lead to excessive differential settlements of greater than 25mm and in places significant total settlements the use of trench fill foundations is unlikely to be economically viable. Therefore, trench fill foundations are likely to be precluded for this structure and consideration should be given to the use of ground improvement or piled foundations as discussed below. At the western end the structure may encroach over an area of soft alluvial soils including peat to a maximum depth of 5.50m below ground level (Borehole BH09). Elsewhere, the underlying River Terrace Clay Layers are typically firm and in some places stiff, although some layers of soft/very soft clay were encountered and these would result in long-term consolidation settlements where they are within the zone of influence of the foundation loads. As discussed in Section 9.4 above, settlements from placed 'fill' materials could be of the order of 20mm or more where they bear onto alluvial soils. Higher structural loadings would therefore increase settlements to levels that would be considered unacceptable. A safe bearing capacity in the order of 80 kN/m² can be anticipated for the lower strength cohesive deposits. River Terrace Granular deposits are also likely to be present under part of the structure and would provide a suitable founding stratum with considerably higher bearing capacity with low settlements compared to those foundations bearing on to the soft clay soils. The probable deep open excavations required are also likely to suffer from instability.

Building CWL 02

Ground conditions comprise Made Ground up to 1.20m deep, underlain by cohesive deposits in some areas and granular deposits in others. Hence as with Building CWL 01, in view of the variable ground conditions the use of trench fill foundations are likely to be precluded for this structure and consideration should be given to the use of ground improvement or piled foundations as discussed below. In the central part of the building footprint, Borehole BH17A encountered Alluvium comprising soft clay to a depth of 3.40m below ground level. Relatively high SPT N values within this stratum in Borehole BH17A are considered to relate to encountering boulders (low cobble content). A safe bearing capacity in the order of 80 kN/m² can be anticipated for the soft cohesive deposits. The variation between low strength cohesive and granular deposits is likely to lead to excessive total and differential settlement of greater than 25mm. In order to reach a suitable bearing stratum excavation up to 3.40m below ground level is anticipated with associated instability of excavation sides.

Electricity sub-station

There are no exploratory holes within the footprint of the proposed structure. However, ground conditions within this region of the site comprise Made Ground up to approximately 2.70m deep, underlain by cohesive deposits in some areas and granular deposits in others. Immediately to the west of the proposed sub-station location Borehole BH26 encountered Alluvium comprising soft and organic clay to a depth of 7.60m below ground level. Borehole WS-BH103 from the previous ground investigation, to the south of the proposed structure, encountered soft clay to its termination depth of 3.38m below ground level. However, Boreholes BH19, BH20 and BH27 to the north and east of the proposed structure indicate the presence of granular soils overlying mudstone bedrock. On the basis of the findings of Borehole BH26 a safe bearing capacity of around 40 kN/m² can be assumed for such material. Given the possibility of soft cohesive deposits to at least 2.70m below ground level and the possible presence of Alluvium to greater depths as described above with the associated total and differential settlement of greater than 25mm then trench fill foundations are likely to be precluded for this structure. However, if additional boreholes were to be undertaken within the footprint of the proposed structure and proved the absence of clay soils then trench fill could potentially be adopted.

9.5.3 Raft Foundations

Consideration has been given to the use of a reinforced concrete raft foundations to reduce the intensity of loading on the Made Ground and underlying low strength cohesive material. However, with the variable thickness of Made Ground and the presence of some soft and very soft clay and organic material, there is a risk that unacceptable differential settlements could occur resulting in cracking and tilting of the rafts. Furthermore, due to the length of the proposed buildings, it is considered unlikely that raft foundations with adequate stiffness to mitigate the effects of potential settlements could be economically designed/constructed without treatment of the Made Ground or soft compressible clay deposits. The use of raft foundations therefore is considered to be precluded.

9.5.4 Ground Improvement

Consideration has been given to the use of the vibratory 'vibro' ground improvement process by which stone columns would be formed through the Made Ground and underlying clay to increase the load bearing capacity.

However, the success of the 'vibro' technique is generally considered to be marginal where very soft clays are present due to the limited lateral restraint provided to the stone columns by the clay. This can result in stone migrating into the adjacent clay when loaded, thus leading to settlement of the foundations. Very soft clay was encountered in borehole CP-BH102 and soft clays/silts were encountered elsewhere below the site such as Borehole BH26. Prior to progressing vibro ground treatment designs the advice of specialist contractors should be sought to confirm the suitability of their methods for the particular ground conditions and to allow development of designs and costings. Any vibro-replacement works should ensure full depth treatment of the fills and should penetrate into the competent underlying strata and could also be suitably designed to accommodate the proposed foundation and floor slab loading subject to suitable settlement behaviour being found (see Section 9.6) and should be undertaken by suitably experienced ground treatment contractors. The presence of old foundations or buried structures if left in place must also be considered in the design. Assurances should also be sought on the likely bearing capacity that would be available for pad foundations and the likely settlements that would occur.

9.5.5 Piled Foundations

With the variable nature and thickness of Made Ground together with variable presence of some soft and occasionally very soft medium and high compressibility clays and granular soils below the building locations and relatively shallow groundwater level, consideration could be given to the adoption of piled foundations. Piles of either the driven or CFA bored type are likely to be suited to the ground conditions. It is recommended that specialist piling contractors are asked for advice on the suitability of their individual piling systems to these ground conditions. They should also be asked for their estimates of the pile size, length and load capacity relationship. For guidance purposes only, it is estimated that a 300mm diameter bored pile socketed 1.00m into the very weak to weak (or stronger) mudstone bedrock should be capable of supporting a safe working load of the order of 250kN. Higher working loads could be achieved by increasing the pile diameter or socket length.

As discussed above, the earthworks operation is expected to cause long-term consolidation settlement of the Made Ground and clay strata in some 'filled' parts of the site. Allowance should therefore be made in the pile design for negative skin friction on the upper part of the pile shaft in those areas of the site where 'fill' is to be placed.

This investigation has not included any investigation of the foundations to the existing buildings. Given the findings of the exploratory holes, it is anticipated that some of the existing buildings may also be supported on piled foundations. If that is the case, it may be possible to re-use these piles to provide support for the proposed buildings. Further investigation would be required, following demolition and clearance of the existing buildings.

9.5.6 Seasonal Ground Movements

NHBC Standards Chapter 4.2, 'Building near Trees' (2022) gives guidance on foundation depths and precautions against heave where foundations are to be constructed within influencing distance of trees and the volume change potential of the foundation soils. There are not believed to be any existing trees in influencing distance of the site. However, any planting which may be planned as part of the development will need to be considered.

The volume change potential of the soils found during the investigation are based on the Modified Plasticity Index I_p, which is calculated as follows:

$$I_p = \frac{PI \times \% \text{ less than } 425\mu\text{m}}{100}$$

The Modified Plasticity Index for the strata are summarised in Tables 1 to 4 of Appendix 11. The volume change potential for each of the stratum are summarised as follows:-

Strata Type	Volume Change Potential
Made Ground	Medium (based on initial phase of GI)
Alluvium	Low
River Terrace Deposits	Low
St. Maughan's Formation (Upper Clay Layer)	Low

Tests on samples of clay from the boreholes have shown the clay (Alluvium, River Terrace Deposits and St Maughan's Formation) to typically be of 'low' volume change potential. The initial phase of ground investigation indicated that the Made Ground had a 'Medium' volume change potential. Clays can shrink and swell due to seasonal variations in moisture content or due to variations in moisture content caused by tree root systems. It is therefore recommended that foundations are designed to limit the effects of any seasonal ground movements, especially where any trees are planned, present or have been removed within influencing distance of foundations. For piled foundations this could include sleeving the upper part of the pile shafts and providing compressible materials below any pile caps, ground beams or suspended floor slabs. Guidance on suitable precautions is provided in NHBC Chapter 4.2 'Building near trees'.

9.6 Slab Design

The long term settlement of the floor slab will depend on a number of factors including the structural design of the slab, the duration, intensity and distribution of the applied loading as well as the strength, compressibility and history of the soils beneath slab. The preferred solution for the floor slab will also depend on the type of foundation adopted with a suspended floor slab typically being used where the structural loads are carried on piled foundations.

Due to presence of Made Ground and its thickness and variability, as well the presence of some soft and very soft and organic clays, the adoption of a ground floor slab construction unlikely to be viable due to the risk of unacceptable settlements developing. It is therefore recommended that a fully suspended ground floor slab construction is adopted with all loads carried on the main structural foundations.

A ground bearing could be used following treatment of the Made Ground and the soft clays by extending the use of techniques such as vibro-compaction/replacement, if used for the foundations, beneath the area of the floor slab.

9.7 Retaining Walls

It is understood that some minor retaining structures (1.20m high) may be required for the vehicle unloading platforms. On the building line, it is anticipated that these walls will be supported on the main structural foundations. It is therefore recommended that similar foundations are used to support the retaining walls as they lead away from the buildings, in order to provide uniform support and minimise the risk of differential movements occurring. Testing on samples of the granular Made Ground which is likely to be retained indicates it to be well-graded with a generally low fines (<63µm) content. *British Standard BS8002:2015 Code of Practice for Earth Retaining Structures* provides suggested values for characteristic weight density (γ_k) and methods of estimating the critical state angle of shearing resistance ($\phi'_{cv,k}$). Based on the findings of the exploratory holes and laboratory test results, the following values are suggested for retaining wall design purposes assuming that the predominantly granular Made Ground would be the retained material:

$$\begin{aligned}\gamma_k &= 18 \text{ kN/m}^3 \\ \phi'_{cv,k} &= 36^\circ\end{aligned}$$

Design should take into account the ground conditions local to the proposed structure.

9.8 Buried Concrete

The results of the chemical testing on samples from the site during this investigation are summarised and presented in Tables 1 to 4 in Appendix 11.

Based on the procedures outlined in BRE Special Digest 1 : 2005 and the test results for water soluble sulphate the Design Sulphate Class for the strata at the site are shown in the table below together with the Aggressive Chemical Environment for Concrete (ACEC) Class. The results include those of the initial investigation. In view of the potential presence of pyrite that can oxidise to form sulphates, a check for their presence has been undertaken. The Oxidisable Sulphate Content (OS) is determined from the Total Potential Sulphur content and Total Sulphate content for the soils at the site. The oxidisable sulphate contents determined from the results do not indicate that pyrite is present.

The site is unlikely to contain chemical residues produced by or associated with industrial production. However, a “brownfield location” is considered for the Made Ground. For conservatism, groundwater is considered to be “mobile” for the assessment of the ACEC class.

Strata Type	Design Sulphate Class	ACEC Class
Made Ground	DS-I	AC-I
River Terrace Deposits	DS-I	AC-I
St Maughan's Formation	DS-I	AC-I

Any subsurface concrete or concrete in contact with the fill sourced from these stratum should be designed to meet the requirements of the appropriate classification.

9.9 Excavations

The soils encountered in the boreholes would generally be considered 'easy digging' for normal backhoe excavation plant. However, it should be noted that some buried obstructions were encountered within the boreholes and substructure remains will likely be present following demolition and clearance of the existing buildings. Methods of removal of these obstructions will depend on their size, nature and depth below ground level. It may be possible to remove some using the large buckets of an hydraulic excavator, others may need breaking up using hydraulic breaker attachments to the excavating plant. Allowance should therefore be made for removing such concrete or other buried obstructions using hydraulic breakers where necessary.

Where foundation excavations extend to depths greater than 1m they will need to be fully shored if entry by personnel is required. Even for shallow excavations the need for support will still need to be evaluated under CDM regulations. Shallow excavations (less than 1.20m) will likely remain relatively stable in the short-term although some local spalling may occur. Where such excavations are left open for longer periods, it is recommended that the sides are battered back to slopes no steeper than 1 (vertical) to 2 (horizontal). Alternatively, and for deeper excavations, support should be provided using close boarding or trench sheets with appropriately spaced walings and props.

The exploratory holes have shown the presence of perched groundwater within the Made Ground and monitoring has shown this to produce standing water levels at relatively shallow depths. Monitoring of installations within the natural soils has shown groundwater to be present as shallow as 1.77m below ground level. As a result, groundwater inflows are likely to be encountered in excavations of about 1.50m and deeper (possibly shallower) with accumulations occurring where such excavations are left open. The rate of water inflow will be dependent on the percentage of fine material present within the soils and this appears to vary across the site. Where the rate of inflow is relatively low, inflows are likely to be able to be dealt with by simple filtered pumping from sumps. Where higher rates of inflow are encountered, more specialist dewatering methods, such as well-point dewatering may be necessary.

All plant and machinery will need to maintain an appropriate stand off from the crest of all open excavations.

When exposed, the formation level for the foundations should be kept dry and steps taken to avoid disturbance. Prior to construction the formation should be inspected and any soft / loose spots removed. All formations should be protected from mechanical disturbance and assumed to be frost-susceptible.

9.10 Pavement Design

The conditions prevailing at the time of construction will affect the CBR of the subgrade soil and its strength. Research has shown the importance of the equilibrium moisture content of the subgrade. The relationship between soil suction and the moisture content shows that a soil that becomes wet during construction will retain water and will therefore be weaker under the pavement in the equilibrium condition than a foundation that has remained dry, particularly for soils of low to medium plasticity.

Equilibrium CBR values for various materials for poor and good construction conditions are given in a report by the TRRL (Report 1132) and in CD225 Revision 1 "Design for new pavement foundations" produced by the Highways Agency. The Made Ground materials likely to be exposed at formation level typically comprise sand and gravel with some silt, clay, cobbles, clinker, slag, brick fragments and occasional blocks of aircrete and Thermolite, and wood fragment and metal.

For sands and gravels an equilibrium CBR in excess of 10% is generally indicated. Laboratory testing indicated CBR values ranging between 37% and 58%. However, values as low as 3.8% were obtained for the Made Ground during the plate load testing. Laboratory CBR values on recompacted samples of Alluvium resulted in values of average 11% (two tests) and for the River Terrace Deposits average 17% (ten tests).

Without the benefit of in situ CBR test results on the actual formation surface, it is recommended that a cautious approach to pavement design is taken using a design CBR value of 5%. All formations should be assumed to be frost susceptible.

The exposed surface should be proof-rolled and any soft spots that depress unduly should be removed and replaced with clean crushed stone or similar suitable granular fill. Further testing of the formation surface following the site strip and any re-grading would assist with confirmation of the design CBR value and may allow a higher CBR value to be adopted.

9.11 Geotechnical Risk Register

A geotechnical risk register for the site is presented to reflect the findings of this investigation and above recommendations, as follows:

	Condition	Hazard	Potential Impact	Before Control			Comments / Proposed Mitigation	After Control		
				Probability	Impact	Risk		Probability	Impact	Risk
R1	Compressible ground	Insufficient bearing capacity leading to potentially increased total and differential settlement problems.	Failure / excessive movement of the foundations / ground bearing floor slabs leading to cracking of buildings. Potential for differential settlement.	3 (P)	4 (H)	12 (Md)	Adopt appropriate foundations to transfer the applied structural loads into the natural soils. Piled foundations bearing into the rock of the St Maughan's Formation likely to be the most suitable option. All foundation excavations to be inspected prior to foundation construction.	1 (VU)	4 (H)	4 (N)
R2	Made Ground	Variable behaviour and thickness leading to variable bearing capacities and unpredictable total and differential settlements.	Failure / excessive movement of the foundations / ground bearing floor slabs leading to cracking of buildings. Potential for differential settlement.	5 (VL)	4 (H)	20 (Sv)	Foundations to be taken below any Made Ground and bear into the natural soils.	1 (VU)	4 (H)	4 (N)
R3	Swelling / Shrinking Soils	Shallow foundation movement due to seasonal shrinkage / swelling of clay soils associated with trees and shrubs.	Excessive movement of the foundations / ground bearing floor slabs leading to cracking of buildings.	2 (U)	4 (H)	8 (Mn)	Foundations within influencing distance of planned, trees should be constructed in stable ground using guidance in NHBC Chapter 4.2 'Building Near Trees'. Requirements for compressible materials/voids adjacent to foundations/below floor slabs should also be followed.	1 (VU)	4 (H)	4 (N)
R4	Obstruction / Hard Strata	Affecting excavations during construction works and potential hard spots below foundations / floor slabs.	Differential movement of the foundations / ground bearing floor slabs leading to cracking of buildings. Delays to excavations during construction.	3 (P)	4 (H)	12 (Md)	Use backhoe excavation plant but have hydraulic breakers available to assist with the removal of any remnant hardstanding, concrete floor slabs, foundations or other substructure remains following the demolition of the previous development. The design needs to take account of any sub-structures and former foundations left in place.	2 (U)	4 (H)	8 (Mn)

R5	High groundwater	Instability of foundation excavations and problems with foundation, floor slab and road / hardstanding formations.	Excessive movement of the foundations / ground bearing floor slabs leading to cracking of buildings and subsidence of roads / hardstanding areas.	2 (U)	4 (H)	8 (Mn)	Shallow groundwater encountered within some exploratory holes. Sump pumping may be suitable.	1 (VU)	4 (H)	4 (N)
R6	Chemically Aggressive Soil	Corrosive attack of buried concrete from soils on the site.	Degradation of concrete foundation and buried concrete structures leading to failure.	2 (U)	3 (M)	6 (Mn)	Provisionally use concrete to AC-I classification of BRE SD1 for subsurface concrete. Further testing is recommended to confirm the above classes as part of future investigation.	1 (VU)	3 (M)	3 (N)
R7	Buried services	Damage during construction works posing risk to Health and Safety of site personnel and public. Evidence of the presence of buried services noted during site walkover.	Increased cost and delay for unplanned diversions, protection or repair.	2 (U)	5 (VH)	10 (Md)	All Statutory Service Plans to be provided to the Specialist Contractors prior to works taking place. Vigilance throughout any excavation work for any indications of unrecorded buried services.	1 (VU)	5 (VH)	5 (Mn)
R8	Slopes	Failure of existing slopes and any slope created during development separating different areas. The site is near flat.	Not expected.	1 (VU)	4 (H)	4 (N)	-	-	-	-
R9	Retaining Walls	Failure or movement of any new retaining walls or structures during development separating the different site areas.	Low retaining walls associated with loading platforms; differential settlement; failure of wall.	2 (U)	4 (H)	8 (Mn)	Use similar foundations to the adjacent structure. Design wall in accordance with current guidance.	1 (VU)	4 (H)	4 (N)
R10	Solution Features	Potential collapse or settlement of ground affecting buildings, hardstanding and infrastructure.	Not expected.	1 (VU)	4 (H)	4 (N)		-	-	-
R11	Mining Activities	Potential collapse or settlement of ground affecting buildings, hardstanding and infrastructure.	Not expected.	1 (VU)	4 (H)	4 (N)		-	-	-
R12	Frost Susceptibility	Affecting the subgrade of roads and areas of hardstanding.	Subsidence and cracking of roads and areas for hardstanding and increased maintenance and management costs.	2 (U)	3 (M)	6 (Mn)	For conservatism assume all formation soils are frost susceptible and design accordingly.	1 (VU)	3 (P)	3 (N)
R13	UXO	Affecting investigation and construction works and posing risk to Health and Safety of site personnel and the public.	Increased costs and delay to the project and potential serious injury or death.	2 (U)	5 (VH)	10 (Md)	Preliminary UXO Threat Assessment carried out and risk assessed as low and no further action required. Vigilance throughout investigation and construction works required.	1 (VU)	5 (VH)	5 (Mn)

10.0 CONCLUSIONS

10.1 Geotechnical

This preliminary ground investigation has shown the site to be underlain by a variable thickness of Made Ground of between 0.50 and 4.10m overlying Alluvium and River Terrace Deposits. Weathered mudstone bedrock (clay) was encountered at depths ranging between 2.30 and 7.60m and more competent bedrock comprising mudstone, siltstone and sandstone of the St. Maughan's Formation was encountered at depths ranging between 3.70 and 9.40m. The Made Ground Alluvial superficial deposits are not considered to be a suitable founding stratum for the proposed structures.

The variable nature, thickness and lateral extent of the Made Ground, Alluvium and cohesive River Terrace Deposits with the presence of some soft, highly compressible, organic clays below the site suggests that this material is not suitable for the anticipated loads from the proposed structures. Trench fill foundations extending below the soft clays may be possible in some areas. However, the possibility of unacceptable total and differential settlement together with excavation instability are likely to make this solution uneconomic. Therefore, the most suitable foundation solution to be adopted is considered to be piled foundations with a suspended floor slab.

To limit the effects of seasonal ground movements especially where any trees may be proposed within influencing distance of the foundations piled foundations may require sleeves over the upper part of the pile shafts.

Minimum foundation depths for any shallow foundations for lightly loaded structures and the requirement for voids or compressible materials against the face of foundations or below floor slabs should be determined in accordance with NHBC Chapter 4.2, 'Building near trees'. As a precaution against heave in the underlying clay soils there are requirements for compressible materials/voids adjacent to foundations/below floor slabs in accordance with NHBC guidelines.

Testing carried out during this preliminary investigation indicates that subsurface concrete should provisionally be designed to comply with the ACEC Class of AC-I of BRE Special Digest 1.

It would be prudent to adopt a conservative approach to pavement design, with the adoption of a preliminary design CBR value of 5% for the site. Where weaker zones are present at formation level, the exposed surface should be proof-rolled and any soft spots that depress unduly should be removed and replaced with compacted clean crushed stone or similar suitable granular fill. Further CBR testing of the likely formation surface is advised prior to final design/construction.

The natural material below the site often comprised clayey sand and clayey gravel and clay or mudstone and will likely exhibit poor to negligible infiltration rates. If the possible use of soakaway drainage is to be investigated, it would be necessary to carry out soakaway tests in accordance with BRE Digest 365 'Soakaway Design', 2016.

Significant earthworks are not anticipated on this generally flat-lying site. Surplus spoil will arise from excavations for foundations. These arising's may be possible for re-use, if required, for any landscape mounds, subject to their geo-environmental suitability.

Due to the generally flat topography of the site and the understood construction proposals, it is anticipated that significant retaining walls are unlikely to be required as part of the proposed development. Low retaining walls associated with vehicle loading platforms should be founded on similar foundations to the adjacent structure to avoid differential settlement.

It is recommended that further investigation is carried out once development proposals are further developed to provide information:-

- Confirmation of the design CBR value of the formation once exposed.
- Additional information on the pH and sulphate levels for the design of buried concrete.

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APPENDIX I

Client Brief

Our ref: MM/QN220354
Date: 18th March 2022

For the attention of Mr. Ed Coupe

Dear Sir

Ground Investigation Quotation: Newport Quinn

We refer to your enquiry of December 2021 and respond with our quotation based upon a scope of works recommended by our principle geotechnical engineering team. All work will be re-measured on completion and Geotechnics Ltd will advise you verbally and subsequently in writing should site and/or ground conditions dictate that additional or amended works be considered necessary, the impact on costs and whether the contract period is likely to be exceeded.

Geotechnics Limited will be responsible for undertaking:

- 20 Nr. cable percussion boreholes to rockhead.
- 10 Nr. cable percussion boreholes with rotary follow-on to 20m depth.
- 18 Nr. plate load tests up to a maximum depth of 0.50m below ground level.
- Concrete coring of all positions in hard standing to facilitate inspection pits.
- Breaking out 1.50m by 1.50m area at each plate load location.
- GPR service clearance at all exploratory hole locations.
- Provision of welfare and storage facilities.
- Provision of full time supervision.
- Installation and monitoring of 15 Nr. 50mm HDPE standpipes.
- Sampling and geotechnical/geochemical testing.
- Interpretative geotechnical reporting.
- A return visit to site once the demolition and leveling of the site has taken place to undertake resistivity testing and plate load testing at formation level.

Pinnacle shall be responsible for providing:

- Up to date design drawings for the proposed development and cut and fill plan.
- Unrestricted access to the site.
- Secure site.

We have also assumed the following:

- a) Undisturbed samples, including Class 1 samples or Standard Penetration Tests (SPT's) at 1m intervals to 5m depth and 1.5m thereafter.
- b) Access by a Land Rover towed cable percussion boring rig and rubber tracked rotary rig (Comacchio 205 or similar) is available, together with unlimited headroom. No allowance has been made for access facilitation such as tracked dumpers or ground protection, as this would be dependent on conditions at the time of the ground investigation.

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- c) We recommend that the insitu resistivity testing (Wenner probe) be undertaken once the existing buildings have been removed and the site has been leveled as any metallic objects will cloud the resolution of the survey leading to inaccurate data.
- d) Item **23** and **26** has been provided for geochemical testing and reporting in the event that contamination is encountered on site as per BS10175. Assuming no contamination is encountered, this rate will not be applied.
- e) No allowance cleaning the areas around exploratory hole locations. All excavation will be backfilled with arising and any excess arising's will be stockpiled onsite to be removed during demolition.

We ask you to note that it is company policy to excavate service inspection pits to 1.2m depth at all borehole locations unless instructed in writing by the Client/Engineer not to do so. Any such written instruction shall relieve Geotechnics Ltd of any responsibility for damage to underground apparatus.

According to our present commitments we could commence the fieldwork within about three weeks from receipt of your written instruction. We estimate that the fieldwork would take about five weeks and our draft report would be submitted to you within five to six weeks of the end of site work, assuming geotechnical testing is commissioned. Preliminary information would be made available to you throughout.

Should you require any other information in the meantime or wish to discuss the scope of the work proposed, please do not hesitate to contact the undersigned.

Yours faithfully

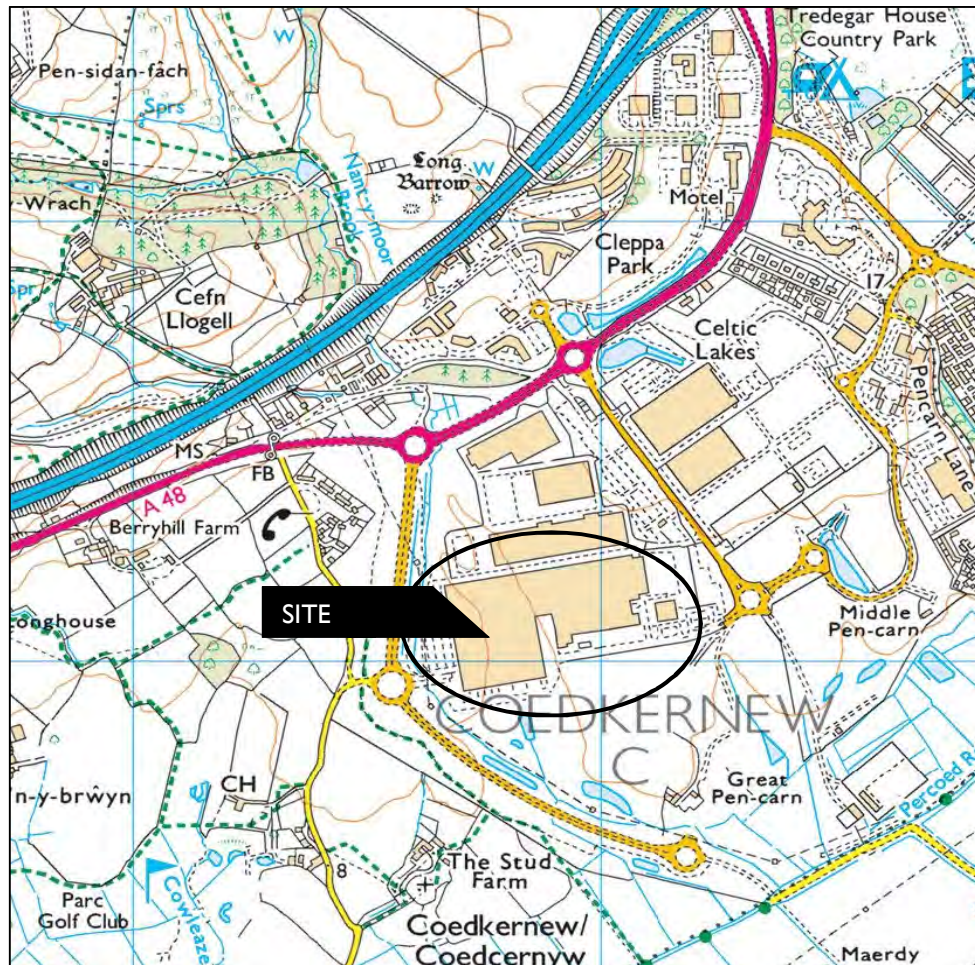
Matthew McLaughlin – Estimator
for GEOTECHNICS LIMITED – North West Office
e-mail: MMclaughlin@geotechnics.co.uk



APPENDIX 2

Site Location Plan

SITE LOCATION PLAN



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PN224395

Ground Investigation

Former Quinn Radiator Factory Site
for
Pinnacle Consulting Engineers Limited

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APPENDIX 3

Cable Percussion Borehole Records

DATA SHEET - Symbols and Abbreviations used on Records



Sample Types

B	Bulk disturbed sample
BLK	Block sample
C	Core sample
D	Small disturbed sample (tub/jar)
E	Environmental test sample
ES	Environmental soil sample
EW	Environmental water sample
G	Gas sample
L	Liner sample
LB	Large bulk disturbed sample
P	Piston sample (PF - failed P sample)
TW	Thin walled push in sample
U	Open Tube - 102mm diameter with blows to take sample. (UF - failed U sample)
UT	Thin wall open drive tube sampler - 102mm diameter with blows to take sample. (UTF - failed UT sample)
V	Vial sample
W	Water sample
#	Sample Not Recovered

Insitu Testing / Properties

CBRP	CBR using TRL probe
CHP	Constant Head Permeability Test
COND	Electrical conductivity
TC	Thermal Conductivity
TR	Thermal Resistivity
HV	Strength from Hand Vane
ICBR	CBR Test
IDEN	Density Test
IRES	Resistivity Test
MEX	CBR using Mexecon Probe Test
PKR	Packer Permeability Test
PLT	Plate Load Test
PP	Strength from Pocket Penetrometer
Temp	Temperature
VHP	Variable Head Permeability Test
VN	Strength from Insitu Vane
w%	Water content
(All other strengths from undrained triaxial testing)	
S	Standard Penetration Test (SPT)
C	SPT with cone
N	SPT Result
-/-	Blows/penetration (mm) after seating drive
-*/- (mm)	Total blows/penetration
()	Extrapolated value

Groundwater

Water Strike	
Depth Water Rose To	

Instrumentation

Seal

Filter

Seal

Strata

Made Ground Granular
Made Ground Cohesive
Topsoil
Cobbles and Boulders
Gravel
Sand
Silt
Clay
Peat

Note: Composite soil types shown by combined symbols

Chalk
Limestone
Sandstone
Coal

Strata, Continued

Mudstone

Siltstone

Metamorphic Rock

Fine Grained

Medium Grained

Coarse Grained

Igneous Rock

Fine Grained

Medium Grained

Coarse Grained

Backfill Materials

Arisings

Bentonite

Concrete

Sand

Grout

Gravel

Asphalt/Tarmacadam

Rotary Core

RQD Rock Quality Designation (% of intact core >100mm)

FRACTURE INDEX

NI	Non-intact core
NR	No core recovery
AZCL	Assumed zone of core loss

BOREHOLE RECORD - Cable Percussion

PRELIMINARY

Project	Newport Quinn Phase 2	Engineer	Pinnacle Consulting Engineers Limited	Project No.	PN224395
Client	Pinnacle Consulting Engineers Limited	National Grid Coordinates	327760.5 E 184201.7 N	Borehole	BH02
				Ground Level	10.88 m OD

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w(%)	SPT N	Description	Depth	Legend	Level (m OD)	
0.18 - 0.55	B					MADE GROUND: Black tarmacadam.	0.18		10.70	
0.25	D					[MADE GROUND - TARMACADAM]				
0.25	ES					MADE GROUND: Reddish brown gravelly fine to coarse sand. Gravel is anuglar to subangular fine to coarse of sandstone and limestone.	0.50		10.38	
0.55	D					[MADE GROUND]				
0.55	ES					Light brown slightly gravelly fine to medium SAND with a low subrounded cobble content of siltstone. Gravel is subangular to subrounded fine to coarse of siltstone and sandstone.				
0.55 - 1.20	B					[RIVER TERRACE DEPOSITS-GRANULAR]				
1.00	D					Below 1.20m, dense.				
1.00	ES									
1.20 - 1.65		1.20 (DRY)			S34					
1.20 - 1.65	D									
1.20 - 1.70	B									
1.80	D									
2.00 - 2.45		2.00 (DRY)			S23	Medium dense orangish brown slightly clayey sandy angular to subangular fine to coarse GRAVEL of various lithologies. Low subrounded cobble content of siltstone and sandstone.	2.00		8.88	
2.00	ES					[RIVER TERRACE DEPOSITS-GRANULAR]				
2.00 - 2.45	D									
2.00 - 2.50	B									
2.80	D									
3.00 - 3.45		3.00 (DRY)			S40	Dense orangish brown sandy slightly clayey GRAVEL with a low subrounded cobble content of sandstone. Gravel is angular to subrounded fine to coarse of siltstone and sandstone.	3.00		7.88	
3.00 - 3.45	D					[RIVER TERRACE DEPOSITS-GRANULAR]				
3.00 - 3.50	B									
3.80	D									
4.00 - 4.45		4.00 (DRY)			S18	Below 4.00m, medium dense.				
4.00 - 4.45	D									
4.00 - 4.50	B									
4.80	D									
5.00 - 5.45		5.00 (DRY)			S16					
5.00 - 5.45	D									
5.00 - 5.50	B									
6.00 - 6.45		6.00 (DRY)			S33	Very stiff purplish red slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse of siltstone and sandstone (probable weathered bedrock).	6.00		4.88	
6.00 - 6.45	D					[ST MAUGHANS FORMATION-UPPER CLAY]				
6.00 - 6.50	B					Between 6.00m and 9.45m, occasional pockets of orange mottled bluish grey fine to coarse sand.				
6.80	D			12						
7.00 - 7.45		7.00 (DRY)			S42					
7.00 - 7.45	D									
7.00 - 7.50	B									
7.80	D									
8.00 - 8.45		8.00 (DRY)			S34					
8.00 - 8.45	D									
8.00 - 8.50	B									
8.80	D									
9.00 - 9.45		9.00 (DRY)			S50					
9.00 - 9.45	D									
9.00 - 9.50	B									
9.80	D									
10.00 - 10.45		10.00 (DRY)			S33	Below 9.80m, sand is medium to coarse.				

Boring				Progress				Groundwater					
Depth	Hole Dia.	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed
1.20	0.30	Inspection Pit	AC/RW	0.00		DRY	18/08/22	08:00	7.40	7.00	3.70	20	
11.40	0.15	Cable Percussion	WN/JB	11.40	11.40	6.10	18/08/22	17:00	8.50	8.50	6.10	2	



Remarks Inspection pit hand excavated to 1.20m depth and no services were found.
ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1L plastic tub.
Chiselling: 11.00-11.40m for 60 minutes.
Borehole backfilled with bentonite pellets and topped with arisings on completion.
At 11.40m cable percussion borehole terminated on encountering bedrock.

Logged by AC
Checked by JN
Figure Sheet 1 of 2
06/01/2023

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Logged in accordance with BS5930:2015 + A1:2020

PRELIMINARY



Remarks  <p>Symbols and abbreviations are explained on the accompanying key sheets. All dimensions are in</p>	Logged by AC Checked by JN Figure Sheet 2 of 2 06/01/2023
	 <p>GEOTECHNICS geotechnical and geoenvironmental specialists</p>

BOREHOLE RECORD - Cable Percussion

PRELIMINARY

Project	Newport Quinn Phase 2	Engineer	Pinnacle Consulting Engineers Limited	Project No.	PN224395
Client	Pinnacle Consulting Engineers Limited	National Grid Coordinates	327816.5 E 184219.4 N	Borehole	BH03
				Ground Level	10.77 m OD

Sampling			Properties			Strata	Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w(%)	SPT N	Description	Depth	Legend	Level (m OD)
0.30	D					MADE GROUND: Black tarmacadam. [MADE GROUND - TARMACADAM]	0.25		10.52
0.30	ES					MADE GROUND: Orangish brown gravelly slightly silty fine to coarse sand. Gravel is subangular to subrounded fine to coarse of siltstone and sandstone..	0.65		10.12
0.30 - 0.40	B					[MADE GROUND]			
0.60	D					MADE GROUND: Brown sandy angular to subangular fine to coarse gravel of limestone, sandstone and granite.			
0.60	ES					[MADE GROUND]			
0.65 - 0.75	B					Below 0.90m, clayey.			
1.00	D								
1.00	ES								
1.00 - 1.10	B								
1.20 - 1.65		1.20 (DRY)			C21				
1.20 - 1.70	B								
2.00 - 2.45		2.00 (DRY)			C22	Firm reddish brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse of siltstone and sandstone. [RIVER TERRACE DEPOSITS-COHESIVE]	2.00		8.77
2.00 - 2.50	B			11					
2.00 - 2.50	D								
3.00 - 3.45		3.00 (DRY)			C30				
3.00 - 3.50	B					Medium dense to dense brown very sandy clayey subangular to subrounded fine to coarse GRAVEL of siltstone and sandstone. [RIVER TERRACE DEPOSITS-GRANULAR]	3.00		7.77
						Below 3.50m, high subrounded to rounded cobble content of siltstone and sandstone. Pockets of firm clay.			
4.00 - 4.45		4.00 (DRY)			C35				
4.00 - 4.50	B								
5.00 - 5.45		5.00 (DRY)			C29				
5.00 - 5.50	B								
5.80	D			32					
6.00 - 6.45		6.00 (DRY)			C29	Extremely weak reddish brown MUDSTONE. Recovered as slightly sandy gravelly silt. [ST MAUGHANS FORMATION]	5.80		4.97
6.00 - 6.50	B								
7.00 - 7.42		7.00 (DRY)			CS0/ 275mm		7.00		3.77
						End of Borehole			

Remarks Symbols and abbreviations are explained on the accompanying key sheets. All dimensions are in metres.		Inspection pit hand excavated to 1.20m depth and no services were found.	Logged by	TL
		ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1L plastic tub.	Checked by	JN
		A 50mm standpipe was installed to 5.50m with a geowrapped slotted section from 3.50 to 5.50m with a flush cover installed.	Figure	Sheet 1 of 1
		Backfill details from base of hole: bentonite seal up to 5.50m, gravel filter up to 3.50m, bentonite seal up to 0.20m, concrete up to ground level.		06/01/2023
		At 7.42m cable percussion borehole terminated on encountering bedrock.		
		Logged in accordance with BS5930:2015 + A1:2020	 geotechnical and geoenvironmental specialists	

Remarks Inspection pit hand excavated to 1.20m depth and no services were found.
 ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1L plastic tub.
 A 50mm standpipe was installed to 5.50m with a geowrapped slotted section from 3.50 to 5.50m with a flush cover installed.
 Backfill details from base of hole: bentonite seal up to 5.50m, gravel filter up to 3.50m, bentonite seal up to 0.20m, concrete up to ground level.
 At 7.42m cable percussion borehole terminated on encountering bedrock.

Logged by TL
 Checked by JN
 Figure Sheet 1 of 1
 06/01/2023

Project		Newport Quinn Phase 2		Engineer		Pinnacle Consulting Engineers Limited		Project No.		PN224395	
Client		Pinnacle Consulting Engineers Limited		National Grid Coordinates		327875.9 E 184217.4 N		Borehole		BH04	
								Ground Level		10.77 m OD	

Sampling			Properties			Strata			Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w(%)	SPT N	Description	Depth	Legend	Level (m OD)		
0.20	D					MADE GROUND: Black tarmacadam.	0.21		10.56		
0.20	ES					[MADE GROUND - TARMACADAM]					
0.20 - 0.40	B					MADE GROUND: Brown gravelly fine to medium sand. Gravel is subangular fine to coarse of sandstone.	0.46		10.31		
0.40 - 0.60	B					[MADE GROUND]					
0.50	D					MADE GROUND: Brown slightly gravelly fine to medium sand with a low subrounded cobble content of sandstone. Gravel is subanuglar to subrounded fine to coarse of sandstone.					
0.50	ES					[MADE GROUND]					
1.20 - 1.54		1.20 (DRY)			C50/245mm		1.54		9.23		
						End of Borehole					
3.00 - 3.50	D										

Boring				Progress				Groundwater						
Depth	Hole Dia.	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.30	Inspection Pit	AC/RW	0.00			10/08/22	08:00						No groundwater strikes noted - may have been masked by water added.
1.54	0.15	Cable Percussion	WO/JT	1.54		DRY	10/08/22	17:00						

Remarks

AGS

Inspection pit hand excavated to 1.20m depth and no services were found.
Cable Percussion borehole terminated at 1.54m depth on encountering a concrete obstruction and the Cable Percussion rig was moved to location BH4A.
ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1L plastic tub.
Borehole backfilled with bentonite pellets and topped with arisings on completion.

Logged by AC
Checked by JN
Figure Sheet 1 of 1
06/01/2023

Symbols and abbreviations are explained on the accompanying key sheets.
All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

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BOREHOLE RECORD - Cable Percussion

PRELIMINARY

Project	Newport Quinn Phase 2	Engineer	Pinnacle Consulting Engineers Limited	Project No.	PN224395
Client	Pinnacle Consulting Engineers Limited	National Grid Coordinates	328000.0 E 184242.0 N	Borehole	BH05
				Ground Level	10.76 m OD

Sampling			Properties			Strata			Scale 1:50					
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w(%)	SPT N	Description	Depth	Legend	Level (m OD)					
0.25	D	2.00 (DRY)		40	C50/125mm	MADE GROUND: Black tarmacadam.	0.02		10.74					
0.25	ES					[MADE GROUND - TARMACADAM]	0.18		10.58					
0.25 - 0.50	B					MADE GROUND: Grey concrete.	0.43		10.33					
0.50	D					[MADE GROUND - CONCRETE]								
0.50	ES					MADE GROUND: Reddish brown sandy subangular fine to coarse gravel of siltstone and sandstone.								
0.50 - 1.20	B					[MADE GROUND]								
1.00	D					PROBABLE MADE GROUND: Brown sandy subangular to subrounded fine to coarse gravel of sandstone and siltstone. Low subrounded cobble content.								
1.00	ES					[MADE GROUND]								
1.20 - 1.70	B						1.60			9.16				
2.00 - 2.28														
2.00 - 2.50	B	3.00 (DRY)			C36	Stiff to very stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of siltstone and sandstone. [RIVER TERRACE DEPOSITS-COHESIVE]								
2.60	D					Firm reddish brown slightly sandy slightly gravelly CLAY with occasional bands of silt. Gravel is subrounded fine to medium of siltstone and sandstone probable weathered bedrock). [ST MAUGHANS FORMATION-UPPER CLAY]	2.50		8.26					
3.00 - 3.45						Below 2.60m, stiff. Black organic staining (up to 30mm) and pockets of bluish grey (10-20mm).								
3.00 - 3.50	B					Below 3.00m, very stiff.								
4.00 - 4.38		4.00 (DRY)			C50/230mm									
						End of Borehole	4.38		6.38					
Boring			Progress						Groundwater					
Depth	Hole Dia.	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.18	0.30	Concrete Core	D-Drill AC/RW WO/JT	0.00		DRY	10/08/22	13:01						No groundwater strikes noted - may have been masked by water added.
1.20	0.30	Inspection Pit		1.20		DRY	10/08/22	17:00						
4.38	0.15	Cable Percussion		1.20	3.00	DRY	15/08/22	08:00						
				4.38		DRY	15/08/22	17:00						

BOREHOLE RECORD - Cable Percussion

PRELIMINARY

Project	Newport Quinn Phase 2	Engineer	Pinnacle Consulting Engineers Limited	Project No.	PN224395
Client	Pinnacle Consulting Engineers Limited	National Grid Coordinates	328131.6 E 184239.8 N	Borehole	BH06
				Ground Level	10.86 m OD

Sampling			Properties			Strata	Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w(%)	SPT N	Description	Depth	Legend	Level (m OD)
0.20 - 0.45	B					MADE GROUND: Light grey concrete. [MADE GROUND - CONCRETE]	0.20		10.66
0.25	D					MADE GROUND: Dark brown and grey gravelly fine to coarse sand. Gravel is subangular to subrounded fine to coarse of sandstone and concrete. Occasional fragments of metal.	0.45		10.41
0.45 - 0.80	B					[MADE GROUND]			
0.50	D					MADE GROUND: Yellowish brown gravelly fine to coarse sand with a low subangular cobble content of sandstone. Gravel is subangular to subrounded fine to coarse of siltstone, sandstone and concrete.	1.20		9.66
0.50	ES					[MADE GROUND]			
0.80 - 1.20	B					Stiff light brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse of siltstone and sandstone.			
1.00	D					[RIVER TERRACE DEPOSITS-COHESIVE]			
1.00	ES					Below 2.00m, very stiff.			
1.20 - 1.65		1.20 (DRY)			C22				
1.20 - 1.70	B			9					
2.00 - 2.45		2.00 (DRY)			C31				
2.00 - 2.50	B								
2.00 - 2.50	D								
2.70	D						2.70		8.16
3.00 - 3.45		3.00 (DRY)			S31	Very stiff reddish brown mottled grey slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse of mudstone and sandstone (probable weathered bedrock). [ST MAUGHANS FORMATION-UPPER CLAY]			
3.00 - 3.45	D								
3.00 - 3.50	B								
4.00 - 4.40		3.00 (DRY)			C50/ 250mm				
						End of Borehole	4.40		6.46

Boring				Progress					Groundwater					
Depth	Hole Dia.	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
0.15	0.30	Concrete Core	D-Drill	0.00	3.00	DRY	01/08/22	08:00						No groundwater strikes noted - may have been masked by water added.
1.20	0.30	Inspection Pit	JZW/AC	1.20			01/08/22	18:00						
4.40	0.15	Cable Percussion	WO/JT	1.20			19/08/22	08:00						
				4.40			19/08/22	17:00						

Remarks	<p>Inspection pit hand excavated to 1.20m depth and no services were found.</p> <p>ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1L plastic tub.</p> <p>Chiselling: 3.80-4.00m for 60 minutes.</p> <p>A 50mm standpipe was installed to 2.70m with a geowrapped slotted section from 1.00 to 2.70m with a flush cover installed.</p> <p>Backfill details from base of hole: bentonite seal up to 2.70m, gravel filter up to 1.00m, bentonite seal up to 0.20m, concrete up to ground level.</p> <p>At 4.40m cable percussion borehole terminated on encountering bedrock.</p> <p>Logged in accordance with BS5930:2015 + A1:2020</p>	<p>Logged by JZW</p> <p>Checked by JN</p> <p>Figure Sheet 1 of 1</p> <p>06/01/2023</p> <p>GEOTECHNICS geotechnical and geoenvironmental specialists</p>
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BOREHOLE RECORD - Cable Percussion

PRELIMINARY

Project	Newport Quinn Phase 2	Engineer	Pinnacle Consulting Engineers Limited	Project No.	PN224395
Client	Pinnacle Consulting Engineers Limited	National Grid Coordinates	327709.8 E 184130.1 N	Borehole	BH08
				Ground Level	10.95 m OD

Sampling			Properties			Strata	Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w(%)	SPT N	Description	Depth	Legend	Level (m OD)
0.30 - 0.50	B					MADE GROUND: Strong grey concrete. [MADE GROUND - CONCRETE]	0.23		10.72
0.40	D								
0.40	ES					MADE GROUND: Brown gravelly slightly silty fine to coarse sand with a low cobble content (<80mm) of granite. Gravel is subangular to subrounded fine to coarse of siltstone, sandstone and granite.			
0.60 - 0.75	B					[MADE GROUND]			
0.65	D								
0.75	ES					Below 0.95m, cobbles are >100mm.			
0.90	D						1.20		9.75
0.95 - 1.10	B					Medium dense brown gravelly fine to coarse clayey SAND. Gravel is subangular to subrounded fine to coarse of siltstone and sandstone.			
1.10	ES					[RIVER TERRACE DEPOSITS-GRANULAR]			
1.20 - 1.65		1.20 (DRY)			C17				
1.20 - 1.70	B								
2.00 - 2.45		2.00 (DRY)			C21				
2.00 - 2.50	B								
2.10	D								
3.00 - 3.45		3.00 (DRY)			C21				
3.00 - 3.50	B					Below 3.00m, with low cobble content.			
4.00 - 4.45		4.00 (DRY)			C32				
4.00 - 5.00	B					Firm to stiff reddish brown slightly sandy slightly gravelly CLAY with a low cobble content of subangular siltstone. Gravel is subangular to subrounded fine to coarse of siltstone and sandstone (probable weathered bedrock). [ST MAUGHANS FORMATION-UPPER CLAY]	4.10		6.85
5.00 - 5.45		5.00 (DRY)			S50				
5.00 - 5.45	D			28					
						End of Borehole	5.50		5.45

Boring				Progress				Groundwater					
Depth	Hole Dia.	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed
0.23	0.30	Concrete Core	D-Drill	0.00			16/08/22	08:00					
1.20	0.30	Inspection Pit	AC/JM	1.20		DRY	16/08/22	17:00					
5.45	0.15	Cable Percussion	WO/JT	1.20		DRY	22/08/22	08:00					
				5.45	4.50	DRY	22/08/22	17:00					

Remarks	<p>Inspection pit hand excavated to 1.20m depth and no services were found.</p> <p>ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1L plastic tub.</p> <p>Chiselling: 4.70-5.00m for 60 minutes.</p> <p>Borehole backfilled with bentonite pellets and topped with arisings on completion.</p> <p>At 5.45m cable percussion borehole terminated on encountering bedrock.</p>	<p>Logged by TL</p> <p>Checked by JN</p> <p>Figure Sheet 1 of 1</p> <p>06/01/2023</p>
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Symbols and abbreviations are explained on the accompanying key sheets.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

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BOREHOLE RECORD - Cable Percussion

PRELIMINARY

Project	Newport Quinn Phase 2	Engineer	Pinnacle Consulting Engineers Limited	Project No.	PN224395
Client	Pinnacle Consulting Engineers Limited	National Grid Coordinates	327771.6 E 184141.0 N	Borehole	BH09
				Ground Level	11.01 m OD

Sampling			Properties			Strata		Scale 1:50	
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w(%)	SPT N	Description	Depth	Legend	Level (m OD)
0.23 - 1.20	B	(DRY)			C34	MADE GROUND: Light grey concrete. [MADE GROUND - CONCRETE]	0.23		10.78
0.30	D					MADE GROUND: Reddish brown gravelly fine to coarse sand. Gravel is subangular to subrounded fine to coarse of siltstone, sandstone, limestone and tarmacadam. [MADE GROUND] Below 0.60m, low subrounded cobble content of sandstone. Between 0.80-0.90m, band of tarmacadam.			
0.30	ES								
0.50	D								
0.50	ES								
1.00	D								
1.00	ES								
1.20 - 1.65	B	2.00 (DRY)			C43				
2.00 - 2.45									
2.00 - 2.50	B								
3.00 - 3.45		3.00 (DRY)			C31	Firm to stiff light brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of siltstone and sandstone. [ALLUVIUM]	3.00		8.01
3.00 - 3.50	B								
3.20	D								
3.60 - 4.50	B	4.00 (DRY)	27			Firm reddish brown slightly sandy slightly gravelly CLAY occasionally tending towards silt. Gravel is subangular fine to coarse of sandstone. Slight organic odour. [ALLUVIUM]	3.60		7.41
3.80	D								
4.00 - 4.45	U11								
4.00 - 4.45	UT	5.00 (DRY)	33			Dark brown mottled grey clayey pseudo-fibrous PEAT with many fragments of wood. [PEAT]	4.50		6.51
4.45 - 4.50	D								
4.50 - 5.00	B								
4.50 - 5.00	D	5.00 (DRY)	141			Stiff reddish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mudstone (probable weathered bedrock). [ST MAUGHANS FORMATION-UPPER CLAY]	5.50		5.51
5.00 - 5.45	U15								
5.00 - 5.45	UT								
5.45 - 5.50	D	6.00 (DRY)			C26				
6.00 - 6.45									
6.00 - 6.50	B								
7.00 - 7.40		6.00 (DRY)			SS0/ 245mm				
7.00 - 7.40	D								
						End of Borehole	7.40		3.61

Boring				Progress				Groundwater					
Depth	Hole Dia.	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed
0.23	0.30	Concrete Core	D-Drill	0.00		DRY	26/08/22	08:00					
1.20	0.30	Inspection Pit	PO/JT	2.50	2.50	DRY	26/08/22	17:00					
7.40	0.15	Cable Percussion	PO/JT	2.50	2.50	DRY	30/08/22	08:00					
				7.40	6.00	DRY	30/08/22	18:00					

Remarks Inspection pit hand excavated to 1.20m depth and no services were found.
ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1L plastic tub.
A 50mm standpipe was installed to 5.50m with a geowrapped slotted section from 4.50m to 5.50m with a flush cover installed.
Backfill details from base of hole: bentonite seal up to 5.50m, gravel filter up to 4.50m, bentonite seal up to 0.20m, concrete up to ground level.
Borehole terminated at 7.40m depth upon encountering bedrock.
Logged in accordance with BS5930:2015 + A1:2020

Logged by AC
Checked by JN
Figure Sheet 1 of 1
06/01/2023



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BOREHOLE RECORD - Cable Percussion

PRELIMINARY

Project	Newport Quinn Phase 2	Engineer	Pinnacle Consulting Engineers Limited	Project No.	PN224395
Client	Pinnacle Consulting Engineers Limited	National Grid Coordinates	327884.0 E 184159.6 N	Borehole	BH11
				Ground Level	10.97 m OD

Sampling			Properties			Strata	Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w(%)	SPT N	Description	Depth	Legend	Level (m OD)
0.21 - 0.30	B					MADE GROUND: Grey concrete. [MADE GROUND - CONCRETE]	0.21		10.76
0.25	D					MADE GROUND: Brown slightly gravelly clayey fine to coarse sand. Gravel is subangular to subrounded fine to coarse of siltstone and granite.	0.30		10.67
0.30	ES					[MADE GROUND]			
0.40	D					MADE GROUND: Orangish green gravelly slightly silty fine to coarse sand. Gravel is subangular to subrounded fine to coarse of siltstone and granite.			
0.40 - 0.50	B					[MADE GROUND]			
0.60	D					MADE GROUND: Orangish green gravelly slightly silty fine to coarse sand. Gravel is subangular to subrounded fine to coarse of siltstone and granite.			
0.70	ES					[MADE GROUND]			
0.90 - 1.10	B					Below 0.75m, low cobble content (up to 100mm) of granite.	1.20		9.77
1.10	ES					Firm light brown sandy gravelly CLAY with a low subrounded cobble content of siltstone and sandstone. Gravel is subrounded fine to coarse of siltstone and sandstone.			
1.20 - 1.40		1.20 (DRY)			S50/45mm	[RIVER TERRACE DEPOSITS-COHESIVE]			
1.20 - 1.40	D			11					
1.20 - 1.70	B								
1.80	D								
2.00 - 2.35		2.00 (DRY)			S50/200mm				
2.00	ES								
2.00 - 2.50	B								
2.00 - 2.50	D								
2.80	D					Firm to stiff reddish brown slightly sandy slightly gravelly CLAY with occasional bands of silt. Gravel is subangular to subrounded fine to coarse of mudstone and sandstone (probable weathered bedrock).	2.80		8.17
3.00 - 3.45		3.00 (DRY)			S26	[ST MAUGHANS FORMATION-UPPER CLAY]			
3.00 - 3.45	D			36					
3.00 - 3.50	B								
3.80	D								
4.00 - 4.38		4.00 (DRY)			S50/225mm				
4.00 - 4.38	D								
4.00 - 4.50	B								
4.80	D								
5.00 - 5.43		5.00 (DRY)			S50/280mm				
5.00 - 5.45	D								
						End of Borehole	5.43		5.54

Remarks Symbols and abbreviations are explained on the accompanying key sheets. All dimensions are in metres.		Inspection pit hand excavated to 1.20m depth and no services were found.	Logged by	TL
		ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1L plastic tub.	Checked by	JN
		Slow progress: 2.00-3.00m for 60 minutes.	Figure	Sheet 1 of 1
		Chiselling: 5.00-5.430m for 60 minutes.		06/01/2023
		Borehole backfilled with bentonite pellets and topped with arisings on completion. At 5.43m cable percussion borehole terminated on encountering bedrock.		
		Logged in accordance with R55930:2015 + A1:2020		
			 geotechnical and geoenvironmental specialists	

Remarks  Inspection pit hand excavated to 1.20m depth and no services were found.
ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1L plastic tub.
Slow progress: 2.00-3.00m for 60 minutes.
Chiselling: 5.00-5.430m for 60 minutes.
Borehole backfilled with bentonite pellets and topped with arisings on completion.
At 5.43m cable percussion borehole terminated on encountering bedrock.
Logged in accordance with BS5930:2015 + A1:2020

Logged by TL
Checked by JN
Figure Sheet 1 of 1
06/01/2023



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BOREHOLE RECORD - Cable Percussion

PRELIMINARY

Project	Newport Quinn Phase 2	Engineer	Pinnacle Consulting Engineers Limited	Project No.	PN224395
Client	Pinnacle Consulting Engineers Limited	National Grid Coordinates	327945.1 E 184170.6 N	Borehole	BH12
				Ground Level	10.99 m OD

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w(%)	SPT N	Description	Depth	Legend	Level (m OD)	
0.20	D					MADE GROUND: Grey concrete.	0.17		10.82	
0.20	ES					[MADE GROUND - CONCRETE]				
0.20 - 0.40	B					MADE GROUND: Dark brown gravelly medium to coarse sand. Gravel is subangular fine to coarse of sandstone and brick fragments. Rare metal fragments.	0.47		10.52	
0.50	D					[MADE GROUND]				
0.50 - 1.20	B					Dense brown very sandy clayey GRAVEL with a low subrounded cobble content. Gravel is subrounded fine to coarse of siltstone and sandstone.				
1.00	D					[RIVER TERRACE DEPOSITS-GRANULAR]				
1.20 - 1.46	ES	1.20 (DRY)			S50/110mm	Below 1.20m, clayey.				
1.20 - 1.46	D									
1.20 - 1.70	B									
1.80	D									
2.00 - 2.45		2.00 (DRY)			S33					
2.00	ES									
2.00 - 2.45	D									
2.00 - 2.50	B									
2.80	D						2.80		8.19	
3.00 - 3.37		3.00 (DRY)			S50/220mm	Stiff to very stiff reddish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mudstone and sandstone (probable weathered bedrock).				
3.00	ES					[ST MAUGHANS FORMATION-UPPER CLAY]				
3.00 - 3.37	D									
3.00 - 3.50	B									
3.80	D									
4.00 - 4.34		4.00 (DRY)			S50/190mm					
4.00 - 4.34	D					End of Borehole	4.34		6.65	

Remarks Symbols and abbreviations are explained on the accompanying key sheets. All dimensions are in metres.		Inspection pit hand excavated to 1.20m depth and no services were found.	Logged by	AC
		ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1L plastic tub.	Checked by	JN
		Slow progress: 1.20-1.80m for 60 minutes.	Figure	Sheet 1 of 2
		Chiselling: 3.50-4.00m for 60 minutes.		06/01/2023
		Borehole backfilled with bentonite pellets and topped with arisings on completion. At 4.34m cable percussion borehole terminated on encountering bedrock.		
		Logged in accordance with BS5930:2015 + A1:2020		
			 geotechnical and geoenvironmental specialists	

Remarks

Inspection pit hand excavated to 1.20m depth and no services were found.

ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1L plastic tub.

Slow progress: 1.20-1.80m for 60 minutes.



Chiselling: 3.50-4.00m for 60 minutes.

Borehole backfilled with bentonite pellets and topped with arisings on completion.

At 4.34m cable percussion borehole terminated on encountering bedrock.

Logged by AC
Checked by JN
Figure Sheet 1 of 2
06/01/2023

PRELIMINARY

Remarks  Symbols and abbreviations are explained on the accompanying key sheets. All dimensions are in	Logged by AC Checked by JN Figure Sheet 2 of 2 06/01/2023
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BOREHOLE RECORD - Cable Percussion

PRELIMINARY

Project	Newport Quinn Phase 2	Engineer	Pinnacle Consulting Engineers Limited	Project No.	PN224395
Client	Pinnacle Consulting Engineers Limited	National Grid Coordinates	328001.1 E 184179.7 N	Borehole	BH13
				Ground Level	10.99 m OD

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w(%)	SPT N	Description	Depth	Legend	Level (m OD)	
0.15	D					MADE GROUND: Grey concrete.	0.15		10.84	
0.15	ES					[MADE GROUND - CONCRETE]				
0.15 - 0.60	B					MADE GROUND: Yellowish brown very gravelly fine to coarse sand. Gravel is subangular to subrounded fine to coarse of siltstone, sandstone, concrete and brick fragments.				
0.50	D					[MADE GROUND]				
0.50	ES									
0.60 - 1.00	B					Below 0.60m, slightly clayey gravelly fine to coarse SAND.	1.00		9.99	
1.00 - 1.20	B					MADE GROUND: Yellowish brown gravelly clayey fine to coarse sand. Gravel is subangular to subrounded fine to coarse of siltstone and sandstone.	1.20		9.79	
1.20 - 1.35	D	(DRY)			S50/75mm	[MADE GROUND]				
1.20 - 1.35	D									
1.20 - 1.70	B					Dense light brown gravelly clayey medium to coarse SAND with a low subrounded cobble content of sandstone. Gravel is subangular to subrounded fine to coarse of siltstone and sandstone.				
1.80	D					[RIVER TERRACE DEPOSITS-GRANULAR]				
2.00 - 2.15		2.00 (DRY)			S50/75mm					
2.00	ES									
2.00 - 2.15	D									
2.00 - 2.50	B					Between 2.50m and 3.00m, driller notes no flush returns whilst open-hole drilling.				
2.80	D									
3.00 - 3.45		3.00 (DRY)			S17	Firm to stiff dark reddish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mudstone and sandstone.	3.00		7.99	
3.00 - 3.45	D			21		[ST MAUGHANS FORMATION-UPPER CLAY]				
3.00 - 3.50	B									
3.80	D									
4.00 - 4.45		4.00 (1.39)			S26	Firm light brown sandy gravelly CLAY with a medium subrounded cobble content of sandstone. Gravel is subangular to subrounded fine to coarse of sandstone.	4.00		6.99	
4.00 - 4.45	D					[ST MAUGHANS FORMATION-UPPER CLAY]				
4.00 - 4.50	B						4.50		6.49	
4.80	D			10		Firm to stiff dark reddish brown sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mudstone and sandstone (probable weathered bedrock).				
5.00 - 5.45		5.00 (1.39)			S7	[ST MAUGHANS FORMATION-UPPER CLAY]				
5.00 - 5.45	D					At 5.00m, soft.				
5.00 - 5.50	B									
5.60 - 5.69		5.00 (5.40)			S50/15mm					
5.60	D					End of Borehole	5.80		5.19	

Boring				Progress				Groundwater				
Depth	Hole Dia.	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins
0.15	0.30	Concrete Core	D-Drill	0.00			03/08/22	08:00	3.45	3.45	1.39	20
1.20	0.30	Inspection Pit	JZW/DG	1.20		DRY	03/08/22	17:00				
5.80	0.15	Cable Percussion	WO/JT	1.20		DRY	09/08/22	08:00				
				2.30	2.00	DRY	09/08/22	18:00				

Remarks Inspection pit hand excavated to 1.20m depth and no services were found.
ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1L plastic tub.
Chiselling: 1.50-1.80m for 60 minutes, 1.80-2.00m for 60 minutes, 2.00-2.30m for 60 minutes, 5.50-5.80m for 60 minutes.
50mm standpipe was installed to 5.00m with a geowrapped slotted section from 4.00m to 5.00m with a flush cover installed.
Backfill details from base of hole: bentonite seal up to 5.00m, gravel filter up to 4.00m, bentonite seal up to 0.20m, concrete up to ground level.
At 5.80m cable percussion borehole terminated on encountering bedrock.
Logged in accordance with BS5930:2015 + A1:2020


Logged by AC
Checked by JN
Figure Sheet 1 of 2
06/01/2023

PRELIMINARY



Project No. PN224395

Borehole BH13

Ground Level 10.99 m OD

Remarks  <p>Symbols and abbreviations are explained on the accompanying key sheets.</p> <p>All dimensions are in metres.</p>	<p>Logged in accordance with BS5930:2015 + A1:2020</p>	<p>Logged by</p> <p>Checked by</p> <p>Figure</p>	<p>AC</p> <p>JN</p> <p>Sheet 2 of 2</p> <p>06/01/2023</p>
		<p>GEOTECHNICS geotechnical and geoenvironmental specialists</p>	

PRELIMINARY



Remarks  Inspection pit hand excavated to 1.20m depth and no services were found. ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1L plastic tub. At 1.20m depth on encountering a concrete obstruction the Cable Percussion rig was moved to location BH14A. Borehole backfilled with bentonite pellets and topped with arisings on completion.	Logged by JWZ Checked by JN Figure Sheet 1 of 1 06/01/2023
	 geotechnical and geoenvironmental specialists

BOREHOLE RECORD - Cable Percussion

PRELIMINARY

Project	Newport Quinn Phase 2	Engineer	Pinnacle Consulting Engineers Limited	Project No.	PN224395
Client	Pinnacle Consulting Engineers Limited	National Grid Coordinates	328128.5 E 184193.1 N	Borehole	BH15
				Ground Level	10.65 m OD

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w(%)	SPT N	Description	Depth	Legend	Level (m OD)	
0.20 - 0.35	B					MADE GROUND: Light grey concrete.	0.20		10.45	
0.25	D					[MADE GROUND - CONCRETE]	0.35		10.30	
0.25	ES					MADE GROUND: Black mottled brown gravelly fine to coarse sand. Gravel is subangular to subrounded fine to coarse of sandstone and concrete.				
0.35 - 0.70	B					[MADE GROUND]				
0.50	D					MADE GROUND: Reddish brown gravelly fine to coarse sand. Gravel is subangular fine to coarse of sandstone, limestone and concrete.				
0.50	ES					[MADE GROUND]				
0.70 - 1.20	B					Below 0.70m, slightly silty.	1.25		9.40	
1.00	D					Very dense light brown slightly gravelly clayey SAND with localised clay pockets. Gravel is subrounded fine to coarse of siltstone and sandstone.				
1.00	ES					[RIVER TERRACE DEPOSITS-GRANULAR]				
1.20 - 1.60		1.20 (DRY)			S50/255mm					
1.20 - 1.60	B									
1.20 - 1.65	D									
1.80	D									
2.00 - 2.45		2.00 (DRY)			S11	Firm reddish brown slightly sandy slightly gravelly CLAY. Gravel is angular to subangular fine to coarse of mudstone (probable weathered bedrock).	2.00		8.65	
						[RIVER TERRACE DEPOSITS-COHESIVE]				
2.00	ES									
2.00 - 2.45	D									
2.00 - 2.50	B									
2.80	D									
3.00	ES					At 3.00m, medium strength.				
3.00 - 3.45	UT150	3.00 (DRY)	64	22						
3.00 - 3.45										
3.50	D									
3.50 - 4.00	B									
4.00 - 4.38		4.00 (DRY)			S50/230mm	Below 4.00m, very stiff.				
4.00 - 4.38	D									
4.00 - 4.50	B									
						End of Borehole	4.60		6.05	

Remarks Symbols and abbreviations are explained on the accompanying key sheets. All dimensions are in metres.		Inspection pit hand excavated to 1.20m depth and no services were found.	Logged by	AC
		ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1L plastic tub.	Checked by	JN
		Chiselling: 4.50-4.60m for 60 minutes.	Figure	Sheet 1 of 1
		Borehole backfilled with bentonite pellets and topped with arisings on completion.		06/01/2023
		At 4.60m cable percussion borehole terminated on encountering bedrock.		
		Logged in accordance with BS5930:2015 + A1:2020	 geotechnical and geoenvironmental specialists	

Remarks Inspection pit hand excavated to 1.20m depth and no services were found.
ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1L plastic tub.
Chiselling: 4.50-4.60m for 60 minutes.
Borehole backfilled with bentonite pellets and topped with arisings on completion.
At 4.60m cable percussion borehole terminated on encountering bedrock.



Logged by AC
Checked by JN
Figure Sheet 1 of 1
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BOREHOLE RECORD - Cable Percussion

PRELIMINARY

Project	Newport Quinn Phase 2	Engineer	Pinnacle Consulting Engineers Limited	Project No.	PN224395
Client	Pinnacle Consulting Engineers Limited	National Grid Coordinates	328193.2 E 184185.1 N	Borehole	BH16
				Ground Level	13.12 m OD

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w(%)	SPT N	Description	Depth	Legend	Level (m OD)	
0.20 - 0.50	B					Grass over MADE GROUND: Light brown gravelly slightly silty fine to coarse sand with rootlets. Gravel is subangular to subrounded fine to coarse of granite.	0.15		12.97	
0.30	ES									
0.40	D					[MADE GROUND]				
0.60	D					MADE GROUND: Brown gravelly slightly silty fine to coarse sand with a low cobble content (<80mm) of granite. Gravel is subangular to subrounded fine to coarse of siltstone, sandstone and granite.	0.80		12.32	
0.65 - 0.75	B									
0.70	ES					[MADE GROUND]				
0.85	D					MADE GROUND: Dark brown slightly gravelly slightly clayey fine to coarse sand. Gravel is subangular to subrounded fine to coarse of siltstone and granite.	1.20		11.92	
1.00 - 1.20	B									
1.10	ES									
1.20 - 1.51		1.20 (DRY)			C50/160mm					
1.20 - 1.70	B					At 0.80m, band (5mm) of dark grey clay.				
2.00 - 2.45		2.00 (DRY)			C29	Below 1.00m, low cobble content (<120mm) of granite.				
2.00 - 2.50	B					Stiff yellowish brown slightly sandy slightly gravelly silty CLAY. Gravel is subangular fine to coarse of siltstone and sandstone.				
						[RIVER TERRACE DEPOSITS-COHESIVE]				
3.00 - 3.32		3.00 (DRY)			C50/175mm					
3.00 - 3.50	B					Below 3.00m, very stiff.				
4.00 - 4.10		4.00 (DRY)			C50/35mm					
4.00 - 4.50	B					Very stiff light brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse of mudstone and sandstone.	4.10		9.02	
						[ST MAUGHANS FORMATION-UPPER CLAY]				
5.00 - 5.27		5.00 (DRY)			C50/120mm					
5.00 - 5.50	B									
5.80	D									
6.00 - 6.45		6.00 (DRY)			C28	Extremely weak reddish brown SANDSTONE. Recovered as sandy gravel.	5.80		7.32	
6.00 - 6.50	B					[ST MAUGHANS FORMATION]				
7.00 - 7.32		6.00 (DRY)			S50/165mm					
7.00 - 7.32	D					End of Borehole	7.32		5.80	



Remarks Symbols and abbreviations are explained on the accompanying key sheets. All dimensions are in metres.		Inspection pit hand excavated to 1.20m depth and no services were found.	Checked by Figure	JN Sheet 1 of 1 06/01/2023
		ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1L plastic tub.		
		Slow Progress: 1.20-1.60m for 90 minutes, 2.50-4.00m for 210 minutes, 4.00-4.60m for 120 minutes.		
		Chiselling: 3.00-3.30m for 60 minutes, 5.30-5.50m for 75 minutes.		
		Borehole backfilled with bentonite pellets and topped with arisings on completion.		
		At 7.32m cable percussion borehole terminated on encountering bedrock.		
		Logged in accordance with BS5930:2015 + A1:2020		
 geotechnical and geoenvironmental specialists				

Remarks Inspection pit hand excavated to 1.20m depth and no services were found.
 ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1L plastic tub.
 Slow Progress: 1.20-1.60m for 90 minutes, 2.50-4.00m for 210 minutes, 4.00-4.60m for 120 minutes.
 Chiselling: 3.00-3.30m for 60 minutes, 5.30-5.50m for 75 minutes.
 Borehole backfilled with bentonite pellets and topped with arisings on completion.
 At 7.32m cable percussion borehole terminated on encountering bedrock.

Checked by JN
 Figure Sheet 1 of 1
 06/01/2023

GEOTECHNICS
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PRELIMINARY

Remarks Symbols and abbreviations are explained on the accompanying key sheets. All dimensions are in metres.		Inspection pit hand excavated to 1.20m depth and no services were found. ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1L plastic tub.	Logged by Checked by Figure	AC JN Sheet 1 of 1 06/01/2023
		At 1.70m depth on encountering a concrete obstruction the Cable Percussion rig was moved to location BH17A. Borehole backfilled with bentonite pellets and topped with arisings on completion.		
		Logged in accordance with BS5930:2015 + A1:2020	 geotechnical and geoenvironmental specialists	

BOREHOLE RECORD - Cable Percussion

PRELIMINARY

Project	Newport Quinn Phase 2	Engineer	Pinnacle Consulting Engineers Limited	Project No.	PN224395
Client	Pinnacle Consulting Engineers Limited	National Grid Coordinates	327781.8 E 184081.0 N	Borehole	BH18
				Ground Level	11.03 m OD

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w(%)	SPT N	Description	Depth	Legend	Level (m OD)	
0.25	D					MADE GROUND: Light grey concrete.	0.22		10.81	
0.25	ES					[MADE GROUND - CONCRETE]				
0.25 - 0.60	B					MADE GROUND: Dark grey to black slightly gravelly medium to coarse sand.				
0.50	D					Gravel is subangular to subrounded fine to coarse of sandstone and clinker.				
0.50	ES					Sand contains ash. Some fragments of metal.				
0.60 - 1.20	B					[MADE GROUND]				
1.00	D					Below 0.80m, low angular to subangular cobble content of sandstone.	1.20		9.83	
1.00	ES					Occasional fragments of plastic, rubber and wire.				
1.20 - 1.65	D	(DRY)			S34	Below 1.00m, pockets of reddish brown sandy clay.				
1.20 - 1.65	D					Very stiff light brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of sandstone and siltstone.				
1.20 - 1.70	B					[RIVER TERRACE DEPOSITS-COHESIVE]				
1.80	D									
2.00 - 2.45		2.00 (DRY)			S12	Below 2.00m, firm.				
2.00	ES									
2.00 - 2.45	D									
2.00 - 2.50	B									
2.80	D									
3.00 - 3.38		3.00 (DRY)			S50/225mm	Very dense light brown very sandy clayey GRAVEL with occasional clay pockets. Gravel is angular to subangular fine to medium of sandstone.	3.00		8.03	
3.00	ES					[RIVER TERRACE DEPOSITS-GRANULAR]				
3.00 - 3.38	D					Firm light brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of sandstone and siltstone.	3.40		7.63	
3.00 - 3.50	B					[RIVER TERRACE DEPOSITS-COHESIVE]				
3.80	D			12						
4.00 - 4.45		4.00 (DRY)			S16					
4.00	ES									
4.00 - 4.45	D									
4.00 - 4.50	B									
4.80	D									
5.00 - 5.45		5.00 (DRY)			S16					
5.00 - 5.45	D									
5.00 - 5.50	B									
5.60 - 5.80	B									
5.80	D					Stiff becoming stiff dark reddish brown slightly sandy slightly gravelly CLAY. Gravel is subangular fine to medium of mudstone (probable weathered bedrock).	5.60		5.43	
6.00 - 6.45		6.00 (DRY)			S29	[ST MAUGHANS FORMATION-UPPER CLAY]				
6.00 - 6.45	D									
6.00 - 6.50	B									
6.80	D									
7.00 - 7.45		7.00 (DRY)			S11	Below 7.00m, firm.				
7.00 - 7.45	D									
7.00 - 7.50	B									
7.50	D									
8.00 - 8.45		8.00 (DRY)			S34	Below 8.00m, very stiff.				
8.00 - 8.45	D									
8.00 - 8.50	B									
8.80	D									
9.00 - 9.45		9.00 (7.90)			S28	Below 9.00m, stiff.				
9.00 - 9.45	D									
9.00 - 9.50	B									
9.80	D									
10.00 - 10.33		10.00 (6.00)			S50/180mm					

Boring				Progress				Groundwater					
Depth	Hole Dia.	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed
0.22	0.30	Concrete Core	D-Drill	0.00			03/08/22	08:00	8.45		7.90	20	
1.20	0.30	Inspection Pit	RW/AC	6.00	6.00	DRY	03/08/22	18:00	10.00		6.00	20	
10.33	0.15	Cable Percussion	WN/JB	6.00	6.00	DRY	04/08/22	08:00					
				10.33	10.00	6.0	04/08/22	17:00					



Remarks Inspection pit hand excavated to 1.20m depth and no services were found.
 ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1L plastic tub.
 Chiselling: 9.80-10.00m for 60 minutes.
 Borehole backfilled with bentonite pellets and topped with arisings on completion.
 At 10.33m cable percussion borehole terminated on encountering bedrock.

Logged by RW
 Checked by JN
 Figure Sheet 1 of 2
 06/01/2023

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Logged in accordance with BS5930:2015 + A1:2020

PRELIMINARY

Remarks Symbols and abbreviations are explained on the accompanying key sheets. All dimensions are in		Logged by Checked by Figure	RW JN Sheet 2 of 2 06/01/2023
		<div>  </div>	


BOREHOLE RECORD - Cable Percussion

PRELIMINARY



Project	Newport Quinn Phase 2	Engineer	Pinnacle Consulting Engineers Limited	Project No.	PN224395
Client	Pinnacle Consulting Engineers Limited	National Grid Coordinates	327837.4 E 184090.8 N	Borehole	BH19
				Ground Level	11.01 m OD

Sampling			Properties			Strata	Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w(%)	SPT N	Description	Depth	Legend	Level (m OD)
0.25	D					MADE GROUND: Light grey concrete.	0.23		10.78
0.25	ES					[MADE GROUND - CONCRETE]			
0.25 - 0.60	B					MADE GROUND: Dark brown gravelly fine to coarse sand. Gravel is subangular to subrounded fine to coarse of siltstone, sandstone and limestone. Some fragments of metal.			
0.50	D					[MADE GROUND]			
0.50	ES					Below 0.60m, locally silty.			
0.60 - 1.20	B					At 0.80m, section of black tube (150mm diameter).			
1.00	D						1.20		9.81
1.00	ES					Brown very sandy subangular to subrounded fine to coarse clayey GRAVEL of siltstone and sandstone. Medium subangular to subrounded cobble content of siltstone and sandstone.			
1.10 - 1.20	D				C32	[RIVER TERRACE DEPOSITS-GRANULAR]			
1.20 - 1.65		1.20 (DRY)							
1.20 - 1.70	B				C38				
2.00 - 2.45		2.00 (DRY)							
2.00 - 2.50	B								
3.00 - 3.45		3.00 (DRY)			C32				
3.00 - 3.50	B								
4.00 - 4.45		4.00 (DRY)			C30				
4.00 - 4.50	B								
4.50 - 4.80	D					Below 4.50m, very clayey.			
5.00 - 5.45		5.00 (DRY)			C30	Extremely weak reddish brown MUDSTONE. Recovered as slightly sandy gravelly clay.	4.80		6.21
5.00 - 5.50	B					[ST MAUGHANS FORMATION]			
5.50 - 5.94		5.50 (DRY)			C50/ 290mm		5.50		5.51
						End of Borehole			



Boring				Progress				Groundwater					
Depth	Hole Dia.	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed
0.23	0.30	Concrete Core	D-Drill	0.00			03/08/22	08:00	4.50	4.00			5.00
1.20	0.30	Inspection Pit	RW/AC	1.20		DRY	03/08/22	18:00					
5.94	0.15	Cable Percussion	WO/JT	1.20		DRY	01/09/22	08:00					
				5.94	5.50	DRY	01/09/22	17:00					

Remarks  Inspection pit hand excavated to 1.20m depth and no services were found. ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1L plastic tub. A 50mm standpipe was installed to 5.00m with a geowrapped slotted section from 4.00m to 5.00m with a flush cover installed. Backfill details from base of hole: gravel filter up to 4.00m, bentonite seal up to 0.20m, concrete up to ground level. At 5.94m cable percussion borehole terminated on encountering bedrock.										Logged by RW Checked by JN Figure Sheet 1 of 1 06/01/2023			
Symbols and abbreviations are explained on the accompanying key sheets. All dimensions are in metres.										GEOTECHNICS geotechnical and geoenvironmental specialists			

PRELIMINARY

Remarks Symbols and abbreviations are explained on the accompanying key sheets. All dimensions are in metres.	 Inspection pit hand excavated to 1.20m depth and no services were found. ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1L plastic tub. Chiselling: 1.40-2.00m for 90 minutes. Borehole backfilled with bentonite pellets and topped with arisings on completion. At 5.40m cable percussion borehole terminated on encountering bedrock.	Logged by AC
		Checked by JN Figure Sheet 1 of 1 06/01/2023
Logged in accordance with R55930:2015 + A1:2020		 geotechnical and geoenvironmental specialists

PRELIMINARY

Remarks Symbols and abbreviations are explained on the accompanying key sheets. All dimensions are in metres.		Inspection pit hand excavated to 1.20m depth and no services were found. ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1L plastic tub. Chiselling: 1.50-2.00m for 60 minutes. Borehole backfilled with bentonite pellets and topped with arisings on completion. At 5.42m cable percussion borehole terminated on encountering bedrock.	Logged by Checked by Figure	RW JN Sheet 1 of 2 06/01/2023
		Logged in accordance with BS5930:2015 + A1:2020		



PRELIMINARY

<p>Remarks</p> <p>Symbols and abbreviations are explained on the accompanying key sheets.</p> <p>All dimensions are in</p>	<p>Logged by RW</p> <p>Checked by JN</p> <p>Figure Sheet 2 of 2</p> <p>06/01/2023</p> <p>GEOTECHNICS geotechnical and geoenvironmental specialists</p>
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PRELIMINARY

Project No. PN224395

Ground Level 10.70 m OD



Remarks Symbols and abbreviations are explained on the accompanying key sheets. All dimensions are in metres.	 Inspection pit hand excavated to 1.20m depth and no services were found. ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1 litre plastic tub. Borehole backfilled with bentonite pellets and topped with arisings on completion. At 5.90m cable percussion borehole terminated on encountering bedrock.	Logged by AC
		Checked by JN Figure Sheet 1 of 2 06/01/2023
Logged in accordance with BS5930:2015 + A1:2020		 geotechnical and geoenvironmental specialists

PRELIMINARY

Project No. PN224395

Borehole BH22

Ground Level 10.70 m OD



Remarks  <p>Symbols and abbreviations are explained on the accompanying key sheets.</p> <p>All dimensions are in metres.</p> <p>Logged in accordance with BS5930:2015 + A1:2020</p>	Logged by Checked by Figure	AC JN Sheet 2 of 2 06/01/2023
	 <p>geotechnical and geoenvironmental specialists</p>	


BOREHOLE RECORD - Cable Percussion

PRELIMINARY

Project	Newport Quinn Phase 2	Engineer	Pinnacle Consulting Engineers Limited	Project No.	PN224395
Client	Pinnacle Consulting Engineers Limited	National Grid Coordinates	327731.1 E 184000.5 N	Borehole	BH24
				Ground Level	11.06 m OD



Sampling			Properties			Strata	Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w(%)	SPT N	Description	Depth	Legend	Level (m OD)
0.20 - 0.50	B					MADE GROUND: Grey concrete. [MADE GROUND - CONCRETE]	0.21		10.85
0.25	D					MADE GROUND: Dark greyish brown slightly gravelly medium sand. Gravel is subangular to subrounded fine to coarse of sandstone, metal and aircrete fragments.	0.66		10.40
0.50 - 0.80	B					[MADE GROUND]	0.81		10.25
0.60	D					MADE GROUND: Reddish brown slightly gravelly medium sand with a low subangular to subrounded cobble content of sandstone. Gravel is subangular to subrounded medium to coarse of sandstone.	1.20		9.86
0.60	ES					[MADE GROUND]			
1.00	D					MADE GROUND: Dark greyish brown slightly gravelly medium sand with a low subangular to subrounded cobble content of sandstone and aircrete fragments. Gravel is subangular to subrounded medium to coarse of sandstone and aircrete fragments.	2.50		8.56
1.00	ES					[MADE GROUND]			
1.20 - 1.29		(DRY)			C50/50mm	Soft to firm dark brown slightly gravelly sandy CLAY with a low subrounded cobble content of siltstone and sandstone. Gravel is subangular to subrounded fine to coarse of sandstone.	3.00		8.06
1.20 - 1.70	B					[RIVER TERRACE DEPOSITS-COHESIVE]			
2.00 - 2.14		2.00 (DRY)		9	C50/65mm	Brown fine to coarse SAND and subangular to subrounded fine to coarse GRAVEL of various lithologies.			
2.00	D					[RIVER TERRACE DEPOSITS-GRANULAR]			
2.00 - 2.50	B					Firm reddish brown slightly sandy slightly gravelly CLAY with a low subrounded cobble content of mudstone. Gravel is subangular to subrounded fine to coarse of mudstone and sandstone (probable weathered bedrock).	5.41		5.65
3.00 - 3.45		3.00 (DRY)			C42	[ST MAUGHANS FORMATION-UPPER CLAY]			
3.00 - 3.50	B					At 5.00m, stiff.			
4.00 - 4.45		3.50 (DRY)			C30	End of Borehole			
4.00	D								
4.00 - 4.50	B								
5.00 - 5.40		3.50 (DRY)			C50/255mm				

Remarks Symbols and abbreviations are explained on the accompanying key sheets. All dimensions are in metres.		Inspection pit hand excavated to 1.20m depth and no services were found.	Logged by	RW
		ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1L plastic tub.	Checked by	JN
		Slow progress: 1.40-2.50m for 270 minutes	Figure	Sheet 1 of 2
		Chiselling: 1.20-1.40m for 90 minutes.		06/01/2023
		Borehole backfilled with bentonite pellets and topped with arisings on completion. At 5.41m cable percussion borehole terminated on encountering bedrock.		
		Logged in accordance with BS5930:2015 + A1:2020		
			 geotechnical and geoenvironmental specialists	

Remarks  Inspection pit hand excavated to 1.20m depth and no services were found.
ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1L plastic tub.
Slow progress: 1.40-2.50m for 270 minutes
Chiselling: 1.20-1.40m for 90 minutes.
Borehole backfilled with bentonite pellets and topped with arisings on completion.
At 5.41m cable percussion borehole terminated on encountering bedrock.

Logged by RW
Checked by JN
Figure Sheet 1 of 2
06/01/2023

PRELIMINARY



Remarks  <p>Symbols and abbreviations are explained on the accompanying key sheets.</p> <p>All dimensions are in</p>	Logged by Checked by Figure	RW JN Sheet 2 of 2 06/01/2023
	 <p>geotechnical and geoenvironmental specialists</p>	

BOREHOLE RECORD - Cable Percussion

PRELIMINARY

Project	Newport Quinn Phase 2	Engineer	Pinnacle Consulting Engineers Limited	Project No.	PN224395
Client	Pinnacle Consulting Engineers Limited	National Grid Coordinates	327792.4 E 184010.5 N	Borehole	BH25
				Ground Level	11.00 m OD

Sampling			Properties			Strata	Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w(%)	SPT N	Description	Depth	Legend	Level (m OD)
0.21 - 0.80	B					MADE GROUND: Light grey concrete. [MADE GROUND - CONCRETE]	0.21		10.79
0.25	D					MADE GROUND: Dark brown gravelly fine to coarse sand. Gravel is angular to subangular fine to coarse of sandstone and concrete. Sand is of ash. [MADE GROUND]			
0.55	ES					At 0.21m, plastic geotextile.			
0.90 - 1.20	B			11		Soft to firm dark brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of siltstone and sandstone.	0.90		10.10
1.00	D					[RIVER TERRACE DEPOSITS-COHESIVE]	1.10		9.90
1.20 - 1.65	ES	1.20 (DRY)			C17	Below 1.00m, gravel is fine to medium			
1.20 - 1.70	B					Medium dense brown clayey SAND and GRAVEL with low cobble content. Gravel is fine to coarse subangular to subrounded. Gravel and cobbles of various lithologies.			
2.00 - 2.45		2.00 (DRY)			C31	[RIVER TERRACE DEPOSITS-GRANULAR]			
2.00 - 2.50	B								
3.00 - 3.45		3.00 (DRY)			C48				
3.00 - 3.50	B								
4.00 - 4.40		4.00 (DRY)			C50/ 247mm	Below 4.00m, light brown, sandy.			
4.00 - 4.50	B								
4.60	D						4.60		6.40
5.00 - 5.45		5.00 (DRY)			C39	Stiff dark red slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse of mudstone and sandstone (probable weathered bedrock). [ST MAUGHANS FORMATION-UPPER CLAY]			
5.00 - 5.50	B								
6.00 - 6.39		6.00 (DRY)			S50/ 241mm	Extremely weak reddish brown MUDSTONE. Recovered as gravelly clay. [ST MAUGHANS FORMATION]	6.00		5.00
6.00 - 6.45	D						6.39		4.61
						End of Borehole			

Remarks Symbols and abbreviations are explained on the accompanying key sheets. All dimensions are in metres.		Inspection pit hand excavated to 1.20m depth and no services were found.	Logged by	AC
		ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1L plastic tub.	Checked by	JN
		Slow progress: 3.00-4.00m for 150 minutes, 5.00-6.00m for 60 minutes.	Figure	Sheet 1 of 2
		A 50mm standpipe was installed to 4.60m with a geowrapped slotted section from 3.00m to 4.60m with a flush cover installed.		06/01/2023
		Backfill details from base of hole: bentonite seal up to 4.60m, gravel filter up to 3.00m, bentonite seal up to 0.20m, concrete up to ground level.		
		At 6.39m cable percussion borehole terminated on encountering bedrock.	 geotechnical and geoenvironmental specialists	
	Logged in accordance with BS5930:2015 + A1:2020			

Remarks

Inspection pit hand excavated to 1.20m depth and no services were found.

ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1L plastic tub.

Slow progress: 3.00-4.00m for 150 minutes, 5.00-6.00m for 60 minutes.

A 50mm standpipe was installed to 4.60m with a geowrapped slotted section from 3.00m to 4.60m with a flush cover installed.

Backfill details from base of hole: bentonite seal up to 4.60m, gravel filter up to 3.00m, bentonite seal up to 0.20m, concrete up to ground level.

At 6.39m cable percussion borehole terminated on encountering bedrock.

Logged in accordance with BS5930:2015 + A1:2020


Logged by AC
Checked by JN
Figure Sheet 1 of 2
06/01/2023

PRELIMINARY

Project No. PN224395

Borehole BH25

Ground Level 11.00 m OD

Remarks  <p>Symbols and abbreviations are explained on the accompanying key sheets.</p> <p>All dimensions are in metres.</p>	<p>Logged in accordance with BS5930:2015 + A1:2020</p>	<p>Logged by</p> <p>Checked by</p> <p>Figure</p>	<p>AC</p> <p>JN</p> <p>Sheet 2 of 2</p> <p>06/01/2023</p>
		<p>GEOTECHNICS geotechnical and geoenvironmental specialists</p>	


BOREHOLE RECORD - Cable Percussion

PRELIMINARY

Project	Newport Quinn Phase 2	Engineer	Pinnacle Consulting Engineers Limited	Project No.	PN224395
Client	Pinnacle Consulting Engineers Limited	National Grid Coordinates	327846.6 E 184019.3 N	Borehole	BH26
				Ground Level	10.95 m OD

Sampling			Properties			Strata	Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w(%)	SPT N	Description	Depth	Legend	Level (m OD)
0.25	D					MADE GROUND: Light grey concrete.	0.21		10.74
0.25	ES					[MADE GROUND - CONCRETE]			
0.25 - 0.60	B					MADE GROUND: Light greyish brown gravelly medium to coarse sand.	0.60		10.35
0.50	D					Gravel is angular to subangular fine to coarse of siltstone, sandstone and concrete. Some fragments of steel reinforcing bar and 'ThermoLite' insulation..			
0.50	ES					[MADE GROUND]			
0.60 - 1.20	B					MADE GROUND: Dark brown slightly gravelly fine to coarse sand with a low subrounded cobble content. Gravel is subangular to subrounded fine to coarse of siltstone, sandstone and limestone.	1.20		9.75
1.00	D					[MADE GROUND]			
1.00	ES					Soft to firm light brown slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse of siltstone and sandstone. With probable low coble content.			
1.20 - 1.51	D	(DRY)			S50/160mm	[ALLUVIUM]			
1.20	D								
1.20 - 1.70	B								
1.80	D								
2.00 - 2.33		2.00 (DRY)		11	S50/175mm				
2.00	D								
2.00	ES								
2.00 - 2.50	B								
2.80	D								
3.00 - 3.45		3.00 (DRY)			S11				
3.00	ES								
3.00 - 3.45	D								
3.00 - 3.50	B								
3.80	D								
4.00 - 4.45		4.00 (DRY)			S8	Soft to firm light brown mottled dark brown slightly sandy slightly gravelly organic CLAY with frequent bands of pseudo-fibrous peat and wood fragments. Occasionally tending to wards silt. Gravel is subrounded to rounded fine to coarse of siltstone and sandstone.	4.00		6.95
4.00	ES					[ALLUVIUM]			
4.00 - 4.45	D			33					
4.00 - 4.50	B								
4.80	D								
5.00 - 5.45		5.00 (DRY)			S4				
5.00	ES								
5.00 - 5.45	D								
5.00 - 5.50	B								
5.80	D								
6.00 - 6.45		6.00 (DRY)			S0*/450mm				
6.00	ES								
6.00 - 6.45	D								
6.00 - 6.50	B								
6.80	D								
7.00 - 7.45		7.00 (DRY)			S7				
7.00 - 7.45	D								
7.00 - 7.50	B								
7.80	D					Soft becoming firm reddish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of mudstone, siltstone and sandstone (probable weathered bedrock).	7.60		3.35
8.00 - 8.45		8.00 (DRY)			S7	[ST MAUGHANS FORMATION-UPPER CLAY]			
8.00 - 8.45	D								
8.00 - 8.50	B								
8.80	D								
9.00 - 9.38		9.00 (DRY)			S50/225mm	At 9.00m becoming stiff to very stiff.			
9.00 - 9.38	D								
						End of Borehole	9.38		1.57

Boring				Progress				Groundwater					
Depth	Hole Dia.	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed
0.21	0.30	Concrete Core	D-Drill	0.00			29/07/22	08:00					
1.20	0.30	Inspection Pit	RW/AC	1.20		DRY	29/07/22	18:00					
9.38	0.15	Cable Percussion	WN	1.20		DRY	10/08/22	08:00					
				3.45	3.00	DRY	10/08/22	18:00					


Remarks  Inspection pit hand excavated to 1.20m depth and no services were found.
ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1L plastic tub.
Chiselling: 8.80-9.00m for 60 minutes.
Borehole backfilled with bentonite pellets and topped with arisings on completion.
At 9.38m cable percussion borehole terminated on encountering bedrock.

Logged by RW
Checked by JN
Figure Sheet 1 of 2
06/01/2023

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Logged in accordance with BS5930:2015 + A1:2020

PRELIMINARY

Remarks  <p>Symbols and abbreviations are explained on the accompanying key sheets.</p> <p>All dimensions are in metres.</p>	<p>Logged in accordance with BS5930:2015 + A1:2020</p>	<p>Logged by</p> <p>Checked by</p> <p>Figure</p>	<p>RW</p> <p>JN</p> <p>Sheet 2 of 2</p> <p>06/01/2023</p>
		<p>GEOTECHNICS geotechnical and geoenvironmental specialists</p>	

BOREHOLE RECORD - Cable Percussion

PRELIMINARY

Project	Newport Quinn Phase 2	Engineer	Pinnacle Consulting Engineers Limited	Project No.	PN224395
Client	Pinnacle Consulting Engineers Limited	National Grid Coordinates	328189.7 E 184099.2 N	Borehole	BH29
				Ground Level	11.22 m OD

Sampling			Properties			Strata	Scale 1:50		
Depth	Sample Type	Depth Cased & (to Water)	Strength kPa	w(%)	SPT N	Description	Depth	Legend	Level (m OD)
0.10 - 0.25	B					MADE GROUND: Black tarmacadam.	0.10		11.12
0.20	D					[MADE GROUND - TARMACADAM]	0.25		10.97
0.20	ES					MADE GROUND: Reddish brown gravelly medium to coarse sand with a low cobble content. Gravel is subangular to subrounded medium to coarse of igneous lithologies.			
0.30 - 0.60	B					[MADE GROUND]	0.90		10.32
0.50	D					MADE GROUND: Greyish brown gravelly medium to coarse sand with a low cobble content. Gravel is subangular to subrounded medium to coarse of concrete.	1.20		10.02
0.50	ES					[MADE GROUND]			
0.90 - 1.20	B					Light brown gravelly medium to coarse SAND. Gravel is subrounded fine to coarse of sandstone.			
1.00	D					[RIVER TERRACE DEPOSITS-GRANULAR]			
1.00	ES					Soft to firm orangish brown slightly gravelly sandy CLAY with a low subrounded cobble content. Gravel is subrounded fine to coarse of siltstone.			
1.20 - 1.65		1.20 (DRY)			C26	[RIVER TERRACE DEPOSITS-COHESIVE]			
1.20 - 1.70	B			8					
1.80	D								
2.00 - 2.45		2.00 (DRY)			C46				
2.00	ES								
2.00 - 2.50	B								
2.70	D								
3.00 - 3.45		3.00 (DRY)			C32				
3.00 - 3.50	B								
3.70	D								
4.00 - 4.45		4.00 (DRY)			S26	Extremely weak reddish brown MUDSTONE. Recovered as stiff to very stiff reddish brown slightly gravelly clay.	3.70		7.52
4.00 - 4.45	D					[ST MAUGHANS FORMATION]			
4.00 - 4.50	B								
5.00 - 5.45		5.00 (DRY)			S39				
5.00 - 5.45	D								
5.00 - 5.50	B								
5.50 - 5.90		5.00 (DRY)			S50/255mm				
						End of Borehole	5.90		5.32

Boring				Progress				Groundwater					
Depth	Hole Dia.	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed
1.20	0.30	Inspection Pit	RW/AC	0.00			28/07/22	08:00					
5.90	0.15	Cable Percussion	PO/JT	5.90	5.00	DRY	28/07/22	18:00					

Remarks

Inspection pit hand excavated to 1.20m depth and no services were found.

ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1L plastic tub.

Slow progress: 2.40-2.80m for 75 minutes and 3.10-3.50m for 60 minutes.

Chiselling: 5.30-5.50m for 60 minutes.

Borehole backfilled with bentonite pellets and topped with arisings on completion.

At 5.90m cable percussion borehole terminated on encountering bedrock.

Logged by RW
Checked by JN
Figure Sheet 1 of 1
06/01/2023

FIELDWORK RESULTS - SPT Results Summary

Project Newport Quinn Phase 2

Engineer

Pinnacle Consulting
Engineers Limited

Project No.

PN224395

Client

Pinnacle Consulting Engineers Limited

Hole	Depth (m bgl)	Depth (m OD)	SPT Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' value				
					0 - 75 (mm)	75 - 150 (mm)	0 - 75 (mm)	75 - 150 (mm)	150 - 225 (mm)	225 - 300 (mm)		10	20	30	40	50
BH02	1.20	9.68	S		4	3	10	10	7	7	34	<div></div>				
BH02	2.00	8.88	S		3	4	4	5	5	9	23	<div></div>				
BH02	3.00	7.88	S		8	10	10	10	10	10	40	<div></div>				
BH02	4.00	6.88	S		1	1	4	4	6	4	18	<div></div>				
BH02	5.00	5.88	S		2	3	3	4	4	5	16	<div></div>				
BH02	6.00	4.88	S		8	7	7	6	10	10	33	<div></div>				
BH02	7.00	3.88	S		4	10	12	12	8	10	42	<div></div>				
BH02	8.00	2.88	S		8	8	10	8	8	8	34	<div></div>				
BH02	9.00	1.88	S		12	13	16	12	10	12	50	<div></div>				
BH02	10.00	0.88	S		4	7	8	8	8	9	33	<div></div>				
BH02	11.00	-0.12	S		10	12	15	13	12	10	50/245	<div></div>				
Hammer No.:			JB14				Remarks									
Energy Ratio, Er (%):			63													

-/- Blows/penetration (mm) after seating

S - SPT with split spoon sampler

*/- Total blows/penetration (mm)

C - SPT with cone

SWP Penetration under own weight (mm)

L - Split Spoon liner used

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FIELDWORK RESULTS - SPT Results Summary

Project Newport Quinn Phase 2 **Engineer** Pinnacle Consulting Engineers Limited **Project No.** PN224395
Client Pinnacle Consulting Engineers Limited

Hole	Depth (m bgl)	Depth (m OD)	SPT Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' value				
					0 - 75 (mm)	75 - 150 (mm)	0 - 75 (mm)	75 - 150 (mm)	150 - 225 (mm)	225 - 300 (mm)		10	20	30	40	50
BH03	1.20	9.57	C		4	4	5	6	5	5	21					
BH03	2.00	8.77	C		5	5	5	6	5	6	22					
BH03	3.00	7.77	C		6	7	7	8	7	8	30					
BH03	4.00	6.77	C		5	7	9	9	8	9	35					
BH03	5.00	5.77	C		6	7	8	8	7	6	29					
BH03	6.00	4.77	C		5	6	6	7	8	8	29					
BH03	7.00	3.77	C		8	10	11	12	14	13	50/275					

Hammer No.:	SAM1	Remarks
Energy Ratio, Er (%):	75	

-/- Blows/penetration (mm) after seating S - SPT with split spoon sampler
 -*/- Total blows/penetration (mm) C - SPT with cone
 SWP Penetration under own weight (mm) L - Split Spoon liner used

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FIELDWORK RESULTS - SPT Results Summary

Project Newport Quinn Phase 2 **Engineer** Pinnacle Consulting Engineers Limited **Project No.** PN224395
Client Pinnacle Consulting Engineers Limited

Hole	Depth (m bgl)	Depth (m OD)	SPT Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' value				
					0 - 75 (mm)	75 - 150 (mm)	0 - 75 (mm)	75 - 150 (mm)	150 - 225 (mm)	225 - 300 (mm)		10	20	30	40	50
BH04	1.20	9.57	C		9	16	50				50/245					
Hammer No.:			SAM1				Remarks									
Energy Ratio, Er (%):			75													

-/- Blows/penetration (mm) after seating S - SPT with split spoon sampler
 -*/- Total blows/penetration (mm) C - SPT with cone
 SWP Penetration under own weight (mm) L - Split Spoon liner used

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FIELDWORK RESULTS - SPT Results Summary

Project Newport Quinn Phase 2

Engineer Pinnacle Consulting Engineers Limited

Project No. PN224395

Client Pinnacle Consulting Engineers Limited

Hole	Depth (m bgl)	Depth (m OD)	SPT Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' value				
					0 - 75 (mm)	75 - 150 (mm)	0 - 75 (mm)	75 - 150 (mm)	150 - 225 (mm)	225 - 300 (mm)		10	20	30	40	50
BH05	2.00	8.76	C		9	12	16	34			50/125					
BH05	3.00	7.76	C		7	8	8	9	9	10	36					
BH05	4.00	6.76	C		8	11	14	15	17	4	50/230					

Hammer No.:	SAM1	Remarks
Energy Ratio, Er (%):	75	

-/- Blows/penetration (mm) after seating

S - SPT with split spoon sampler

*/- Total blows/penetration (mm)

C - SPT with cone

SWP Penetration under own weight (mm)

L - Split Spoon liner used

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FIELDWORK RESULTS - SPT Results Summary

Project Newport Quinn Phase 2 **Engineer** Pinnacle Consulting Engineers Limited **Project No.** PN224395
Client Pinnacle Consulting Engineers Limited

Hole	Depth (m bgl)	Depth (m OD)	SPT Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' value				
					0 - 75 (mm)	75 - 150 (mm)	0 - 75 (mm)	75 - 150 (mm)	150 - 225 (mm)	225 - 300 (mm)		10	20	30	40	50
BH06	1.20	9.66	C		5	4	6	6	5	5	22					
BH06	2.00	8.86	C		7	9	9	8	7	7	31					
BH06	3.00	7.86	S		7	7	8	8	7	8	31					
BH06	4.00	6.86	C		8	11	12	14	14	10	50/250					

Hammer No.:	SAM1	Remarks
Energy Ratio, Er (%):	75	

-/- Blows/penetration (mm) after seating S - SPT with split spoon sampler
 -*/- Total blows/penetration (mm) C - SPT with cone
 SWP Penetration under own weight (mm) L - Split Spoon liner used

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Project	Newport Quinn Phase 2	Engineer	Pinnacle Consulting Engineers Limited	Project No.	PN224395
Client	Pinnacle Consulting Engineers Limited				

Hole	Depth (m bgl)	Depth (m OD)	SPT Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' value				
					0 - 75 (mm)	75 - 150 (mm)	0 - 75 (mm)	75 - 150 (mm)	150 - 225 (mm)	225 - 300 (mm)		10	20	30	40	50
BH08	1.20	9.75	C		2	4	4	5	4	4	17	<div></div>				
BH08	2.00	8.95	C		5	5	6	5	5	5	21	<div></div>				
BH08	3.00	7.95	C		5	6	5	6	5	5	21	<div></div>				
BH08	4.00	6.95	C		7	8	8	7	8	9	32	<div></div>				
BH08	5.00	5.95	S		8	10	14	11	12	13	50	<div></div>				

Hammer No.:	SAM1	Remarks
Energy Ratio, Er (%):	75	

SWP Penetration under own weight (mm)

L - Split Spoon liner used

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Project	Newport Quinn Phase 2	Engineer	Pinnacle Consulting Engineers Limited	Project No.	PN224395
Client	Pinnacle Consulting Engineers Limited				

Hole	Depth (m bgl)	Depth (m OD)	SPT Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' value				
					0 - 75 (mm)	75 - 150 (mm)	0 - 75 (mm)	75 - 150 (mm)	150 - 225 (mm)	225 - 300 (mm)		10	20	30	40	50
BH09	1.20	9.81	C		5	6	9	9	8	8	34	<div></div>				
BH09	2.00	9.01	C		8	9	10	10	11	12	43	<div></div>				
BH09	3.00	8.01	C		5	6	7	7	8	9	31	<div></div>				
BH09	6.00	5.01	C		5	6	6	7	6	7	26	<div></div>				
BH09	7.00	4.01	S		8	10	11	14	14	11	50/245	<div></div>				

Hammer No.:	SAM1	Remarks
Energy Ratio, Er (%):	75	

-/-	Blows/penetration (mm) after seating	S - SPT with split spoon sampler
*/-	Total blows/penetration (mm)	C - SPT with cone
SWP	Penetration under own weight (mm)	L - Split Spoon liner used

Project	Newport Quinn Phase 2	Engineer	Pinnacle Consulting Engineers Limited	Project No.	PN224395
Client	Pinnacle Consulting Engineers Limited				

Hole	Depth (m bgl)	Depth (m OD)	SPT Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' value				
					0 - 75 (mm)	75 - 150 (mm)	0 - 75 (mm)	75 - 150 (mm)	150 - 225 (mm)	225 - 300 (mm)		10	20	30	40	50
BH11	1.20	9.77	S		4	8	50				50/45					
BH11	2.00	8.97	S		5	6	20	12	18		50/200					
BH11	3.00	7.97	S		3	2	4	6	8	8	26					
BH11	4.00	6.97	S		4	10	12	17	21		50/225					
BH11	5.00	5.97	S		10	10	15	18	17		50/280					

Hammer No.:	JB14	Remarks
Energy Ratio, Er (%):	63	

S - SPT with split spoon sampler

C - SPT with cone

L - Split Spoon liner used

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FIELDWORK RESULTS - SPT Results Summary

Project Newport Quinn Phase 2

Engineer Pinnacle Consulting Engineers Limited

Project No. PN224395

Client Pinnacle Consulting Engineers Limited

Hole	Depth (m bgl)	Depth (m OD)	SPT Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' value				
					0 - 75 (mm)	75 - 150 (mm)	0 - 75 (mm)	75 - 150 (mm)	150 - 225 (mm)	225 - 300 (mm)		10	20	30	40	50
BH12	1.20	9.79	S		5	10	15	35			50/110					
BH12	2.00	8.99	S		8	9	7	8	9	9	33					
BH12	3.00	7.99	S		4	8	13	20	17		50/220					
BH12	4.00	6.99	S		7	12	20	18	12		50/190					

Hammer No.:	JB14	Remarks
Energy Ratio, Er (%):	63	

-/- Blows/penetration (mm) after seating

S - SPT with split spoon sampler

*/- Total blows/penetration (mm)

C - SPT with cone

SWP Penetration under own weight (mm)

L - Split Spoon liner used

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FIELDWORK RESULTS - SPT Results Summary

Project Newport Quinn Phase 2

Engineer

Pinnacle Consulting
Engineers Limited

Project No.

PN224395

Client

Pinnacle Consulting Engineers Limited

Hole	Depth (m bgl)	Depth (m OD)	SPT Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' value				
					0 - 75 (mm)	75 - 150 (mm)	0 - 75 (mm)	75 - 150 (mm)	150 - 225 (mm)	225 - 300 (mm)		10	20	30	40	50
BH13	1.20	9.79	S		25		50				50/75					
BH13	2.00	8.99	S		25		50				50/75					
BH13	3.00	7.99	S		2	3	7	4	2	4	17					
BH13	4.00	6.99	S		1	5	5	5	6	10	26					
BH13	5.00	5.99	S		1	2	3	2	-	2	7					
BH13	5.60	5.39	S		25		50				50/15					
<div> <div>Hammer No.:</div> <div>JB14</div> </div> <div> <div>Energy Ratio, Er (%):</div> <div>63</div> </div> <div>Remarks</div>																

-/- Blows/penetration (mm) after seating

S - SPT with split spoon sampler

-*/- Total blows/penetration (mm)

C - SPT with cone

SWP Penetration under own weight (mm)

L - Split Spoon liner used

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FIELDWORK RESULTS - SPT Results Summary

Project Newport Quinn Phase 2

Engineer Pinnacle Consulting
Engineers Limited

Project No. PN224395

Client Pinnacle Consulting Engineers Limited

Hole	Depth (m bgl)	Depth (m OD)	SPT Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' value				
					0 - 75 (mm)	75 - 150 (mm)	0 - 75 (mm)	75 - 150 (mm)	150 - 225 (mm)	225 - 300 (mm)		10	20	30	40	50
BH15	1.20	9.45	S		4	17	20	17	13		50/255					
BH15	2.00	8.65	S		2	3	2	2	3	4	11					
BH15	4.00	6.65	S		12	13	20	30			50/230					

Hammer No.:	JB14	Remarks
Energy Ratio, Er (%):	63	

-/- Blows/penetration (mm) after seating

S - SPT with split spoon sampler

-*/- Total blows/penetration (mm)

C - SPT with cone

SWP Penetration under own weight (mm)

L - Split Spoon liner used

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