LanzaTech UK Limited

Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility: Production Development Zone

Geotechnical Assessment Report

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Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility: Production Development Zone

Geotechnical Assessment Report

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			Reinier van der Kuip	Sophie Thomas	Claire Hooley
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EXECUTIVE SUMMARY

BACKGROUND INFORMATION	**Client**	**LanzaTech UK Limited**
	Site Details	The site comprises a parcel of land adjacent to Crown Wharf (Port Talbot) (referred to as the 'Production Development Zone [PDZ]), located off the Port Talbot Docks. The nearest postcode is SA13 1RA. The site covers an area of approximately 9.12 hectares, with the centre situated at approximate National Grid Reference 276420, 188660.
	Site Objectives	The purpose of the additional ground investigation is to provide information on the ground engineering conditions and constraints associated with the site with regard to the proposed development.
	Proposed Development	The proposed development is understood to comprise the demolition of existing structures and erection of a Sustainable Aviation Fuel (SAF) production facility with associated structures, access routes, car parking etc. as specified within the statutory planning application. The proposed development layout is presented in the Inspire Architects drawing, referenced Drawing No. 2143.01-IA-ZZ-ST-DR-A-0225. Revision P12, dated 13.10.2023, it
	Current Land Use and Description	The site currently comprises a roughly rectangular disused parcel of land that features a large central concrete slab surrounded by dense overgrown vegetation, situated in part of the dock area owned by Associated British Ports (ABP).
	Geology	The site is recorded to be underlain by superficial Tidal Flat Deposits typically described by the British Geological Survey (BGS) as a consolidated soft silty clay with layers of sand, gravel and peat. Within the south-western most site boundary the underlying superficial deposit is reported to comprise Wind Blown Sand, generally described by the BGS as sand generally transported by wind. In addition, based on available OS mapping dated 1919, the entire southern site area and south-eastern site area recorded sand deposits to be present. Alluvial Fan Deposits are reported by the BGS to be located further north-east of the site. However, during a previous phase of investigation undertaken by TEC, Alluvial Fan Deposits, generally described by the BGS as relatively flat to gently sloping masses of loose rock, were encountered below the Wind Blown Sand and Tidal Flat Deposits. The underlying bedrock geology is recorded as the South Wales Middle Coal Measures and is described as grey coal bearing mudstones/siltstones with seatearths and minor sandstones. In addition, the BGS reports the site and surrounding area to comprise 'Landscaped Ground', described as mainly redeveloped areas and others where extensive earth moving has occurred. Previous ground investigations at an adjacent site record made ground up to 5.5mbgl.
	Unexploded Ordnance	The majority of the site has been assessed as a Moderate Risk from German UXBs and as a result, prior to the start of construction, that an UXO Safety Awareness Briefing is carried out prior to all intrusive works commencing; A watching brief of all open excavations; and it is recommended that a non-intrusive magnetometer survey is undertaken across the site and, in particular, within the areas of undeveloped open ground identified on the WWII mapping. In addition, once a piling layout has been finalised, an intrusive magnetometer survey would be required.
GEOTECHNICAL INVESTIGATION	**Geotechnical Ground Investigation Rationale**	The scope of the additional ground investigation works includes the requirements detailed with Technip Energies' specification, titled, '*Scope of Work for Geotechnical Investigation and Topographical Survey*', referenced 202947C_000_SOW_1410_00001 (rev1), dated 24-02-2023 and provides additional information regarding the site conditions and constraints for the site. In addition, the works provide recommendations in relation to ground engineering for the proposed development, provided on the basis of the findings of the previous and current intrusive ground investigations.
	Scope of Works	20No. Cable percussive boreholes to approximately 22mbgl to determine the depth of Alluvial Fan Deposits and underlying bedrock geology comprising South Wales Middle Coal Measures Formation and installation of shallow and deep ground gas and groundwater monitoring boreholes across the site to provide spatial coverage. 5No. Follow-on rotary boreholes over previously drilled cable percussive boreholes to characterise the bedrock geology (South Wales Middle Coal Measures Formation) with and installation of shallow and deep ground gas and groundwater monitoring boreholes across the site.

		30No. Trial pits to provide a general coverage of the site and characterisation of shallow ground conditions. 13No. Dynamic sample boreholes to provide spatial coverage across the site area to characterise shallow ground conditions and allow sampling of encountered materials. 6No. CHST rotary core drilling with installation for the cross-hole seismic testing purposes for determining Velocity profiles, density, Poisson's Ratio, Shear modulus (G), Young's modulus (E) and Bulk modulus (K) 5No. Soil Resistivity Testing locations were conducted to determine the underlying soil resistivity for classification purposes. 4No. SCPTu tests were carried out to provide correlated geotechnical design parameters: undrained shear strength, coefficient of volume change, overconsolidation ratio, SPT N60, peak friction angle, relative density and Young's modulus. 12No. DCP-TRL (Dynamic Cone Penetration Tests) were carried out for preliminary pavement and road design purposes.12No. DCPs 12No. Plate CBR test locations across the site were tested for preliminary pavement and road design purposes. 6No. Double Ring Infiltrometer were carried out across the site to assess the viability of potential methods of drainage. 2No. Hand pits were advanced at locations targeted based on visual observations for geoenvironmental purposes.
	Ground Conditions	Made ground material was encountered within all exploratory locations to depths of between 0.35m (8.1mAOD) and 6.9m (1.3mAOD) and was noted to be highly variable, but was generally noted to be cohesive in nature. This materials included slag, vesicular slag, clinker, coke, wood fragments, metal fragments, metal wire, metal lintel, rebar, plastic fragments, plastic pipes, brick, concrete, glass, tiles, terracotta and porcelain fragments tyres, rubber, sandstone, mudstone, siltstone, lime and plaster. While no exploratory locations were undertaken within the concrete hardstanding located within the central site area, however based on the previous investigation undertaken by TEC, the concrete slab thickness was recorded to between 0.12m and 0.13m thick base on 2No. exploratory holes undertaken within this area. The Wind Blown Sand was encountered to at depths between ground level (8.48mAOD) and 6m (2.2mAOD) and maximum depths of 2.4m (6.1mAOD) and 9.5m (-0.9mAOD). The encountered material was generally described as slightly silty fine to medium grained sand. The Tidal Flat Deposits were encountered across the site at depths of between 1m (6.2mAOD) and 6.9m (1.3mAOD) to maximum encountered depths of between 10m (-3.2mAOD) and 16.5m (-7.9mAOD). The material generally comprised cohesive material of low to very low strength silty clay with occasional pockets of amorphous to fibrous peat and pockets of fine to medium grained sand. The more granular material encountered within the Tidal Flat Deposits generally comprised grey, brownish grey and greyish brown slightly clayey slightly silty sand to silty clayey sand with occasion pockets of silty clay. Across the site, within the cable percussive boreholes, peat beds have been recorded as slightly clayey plastic to spongy fibrous to amorphous peat with a weak to strong organic odour. Alluvial fan deposits were encountered between depths of 10m (-3.2mAOD) and 16.5m (-7.9mAOD) and observed to be underlying the Tidal Flat Deposits across the site, to maximum encountered depths of between >18m (-10.8mAOD) and 25m (-16.5mAOD). The encountered ground conditions were generally described as slightly clayey slightly gravelly sand and sandy gravel with low to medium cobble content. The gravel generally comprised fine to coarse subangular to rounded sandstone. Within the rotary cored boreholes, the bedrock was encountered at depths of between 21.4m (-16.5mAOD) and 29m (-20.1mAOD) with an encountered depth of 54m (-45.8mAOD) and 62m (-53.5mAOD). The encountered bedrock generally comprised interbedded medium strong to very strong sandstone, extremely weak to medium strong siltstone and mudstone with rare to occasional veins of quartz. Within two boreholes, BH113 and BH119, very weak to weak black coal and weak dark grey dark grey to black mudstone with occasional very thinly bedded bands of coal with rare to occasional

		very thin veins of pyrite between fractures were recorded between 30.5m to 30.6m, 31.2m to 31.85m and 31.9m to 32.15m respectively. <u>*Groundwater*</u> Standing groundwater levels were recorded between 0.35m to 1.91mbgl and 0.99m and 4.85mbgl across the site area. It should also be noted that localised areas were prone to flooding due to limited permeability of the underlying ground materials and/or hardstanding surfaces. Continuous groundwater monitoring has been undertaken between 13 July to 24 July, to have indicated that groundwater at the site is tidally influenced. <u>*Ground Gas*</u> It should be noted that ongoing gas monitoring is being undertaken at the time of writing and further results and a detailed gas risk assessment will follow on completion of the monitoring and it is considered that there is currently insufficient data to adequately characterise the site. However, the initial results indicate the site may be generally classified as Characteristic Situation 2.
	Foundations	It is considered that conventional foundations for all loaded structures are unlikely to be suitable for the proposed development without deep soil improvement and it is considered likely that a piled foundation will be required for the more heavily loaded structures. As a result of the recorded generally poor ground conditions recorded across the site together with the need to provide a level development area, it may be more economical to treat the site won materials to allow them to be easily incorporated into the earthworks and while the advice of a specialist ground improvement contractor should be sought it is considered that the materials could be improved using cement stabilisation to provide a suitable formation level that potentially may be suitable as a piling platform. Soil mixed columns may be a viable option to improve the general bearing resistance of the ground and may be single or overlapping column where a cementitious binder is introduced into the peat, silts and soft clays to produce a 'soilcrete'. However, it should be noted that localised contamination, including the presence of Japanese Knotweed, has been identified across the site and therefore the requirements of NWR will need to be taken into account when determining the suitability of soil mixing as a viable ground improvement technique at the site. While details of design loads have not been provided to TEC, it is understood that design pile resistance of 600kN and 1000kN are required in compression. In addition, it is understood that for some of the structures high shear loads are calculated in excess of that provided by the weight of the foundation and therefore the piles will be required to work in tension. It is understood that at this stage a Fundex pile system is proposed by Technip and it is considered that the proposed 410mm and 510mm diameter piles will provide the required compression resistances, respectively, when end bearing in the Alluvial Fan deposits. However, while details of the likely tension resistances have not been required, it is understood that the piles will need to be formed approximately 1m into these deposits.
	Preliminary Pavement Design	A preliminary design CBR value of less than 2.5% is recommended. It should be noted that all road formations should be proof rolled and soft spots removed and replaced with selected granular fill.
	Drainage	Vertical infiltration rates of between 1.4×10^{-6} m/s and 4.8×10^{-5} m/s have been determined for the near surface materials. However, observations made during the ground investigation indicate high groundwater levels during the winter period with the site noted to have numerous areas of standing water and saturated marsh areas and therefore drainage to the ground may not be suitable.
	Buried Concrete	Concrete piles may be designed to DS-3, based on the recorded soluble Sulphate concentrations as the soils would not be 'disturbed' (resulting in oxidation of the pyrite) during piling activities. However, where soils are disturbed, ie for near surface concrete structures, a design sulphate class of DS-5 would be required within the made ground and Tidal Flat Deposits due to the high Total Potential Sulphate concentrations recorded. Where concrete is within the Wind Blown Sands, a design class of DS-1 may be used.
	Earthworks	<u>*Made Ground*</u> A review of the site material for the made ground indicates the of the materials to a combination of 4No. classes including primarily Class 1A (well graded granular material) requiring Method 1 compaction; Class 1B (uniformly graded granular material) requiring method 3 compaction; Class 2A (wet cohesive material), requiring method 1 and to a lesser extent, Class 2B (dry cohesive material), requiring method 2 compaction.

		It should be noted that the single granular sample classed as Class 2A recorded a higher percentage fine (>0.63mm) of 27%, of which 22.3% silt was recorded. *Wind Blown Sand* The majority of the samples tested within the Wind Blown Sand indicated to be Class 1B (uniformly graded granular material) requiring Method 3 compaction and locally Class 2A (wet cohesive material), due to a higher percentage fine (>0.63mm) recorded within a single sample, therefore requiring method 1 compaction. *Tidal Flat Deposits* Following a review of the Tidal Flat Deposits tested, the material indicates to be of Class 2A, requiring method 1 compaction. However, due to a liquid limit of greater than 50% recorded in the majority of the Tidal Flat Deposits deemed as Class 2A, when compacting, only deadweight tamping, or vibratory tamping rollers or grid rollers should be used as specified by BS 1377: Part 2. However, it should be noted that the presence of Japanese Knotweed has been identified across the site and would need to be considered within any designs as part of the development.
	Construction Issues / Recommended further works	Perched water levels within the made ground / Tidal Flat Deposits may be close to the current ground level and be tidally influenced. Additional continuous groundwater level monitoring is recommended to determine the maximum groundwater levels across the site, capturing both spring high tides and the winter groundwater peak. As a result, construction activities will need to be carefully planned to allow the proposed development. The recorded generally poor ground conditions may result in the need to treat the site won materials to provide a suitable construction platform. While the advice of a specialist ground improvement contractor should be sought, it is considered that the materials could be improved using cement stabilisation. The proposed drainage scheme for the site and any underground structures will need to take account of the potential high water levels. The development of the construction platform may result in some areas being raised by up to 1m, resulting in potentially significant long-term settlement. It is therefore recommended that in these areas any non-piled settlement critical elements, such as drainage, are constructed as late in the construction programme as possible to reduce potential long-term maintenance issues. Observations made during the site investigation suggest that the addition of concentrated flows of water may result in inundation settlement of the Wind Blown Sands which are present across the southern part of the site. While it is recommended that inundation testing is undertaken, it is recommended that the drainage design avoids any concentrations of flow to ground within these materials. Localised ground contamination, including the presence of Japanese Knotweed and localised asbestos, will necessitate the requirements of NWR to be taken into account when determining the suitability of potential ground improvement techniques at the site. The presence of hydrocarbon impacted ground, while likely requiring suitable remediation, may affect the strength of concrete, which will need to be considered within the design. The method of piling must avoid the creation of a new potential contamination migration pathway and, given the site's environmental setting and the presence of significant thicknesses of made ground as well as localised hydrocarbon impacted ground and the presence of potentially contaminated groundwater, a Foundation Works Risk Assessment is likely to be required by NRW. With respect to the recorded UXO risk, the following is required: • A watching brief of all open excavations; and • A non-intrusive magnetometer survey across the site, in particular, within the areas of undeveloped open ground identified on the WWII mapping; • An intrusive magnetometer survey within the proposed pile layout.

1 INTRODUCTION

1.1 Terms of Reference

1.1.1 TEC has been appointed by LanzaTech UK Limited to undertake a Ground Investigation of Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility, located at Land at Crown Wharf, Port Talbot Docks. All works were undertaken in accordance with our proposal letter dated 14 March 2023 and referenced RE.2111006.005.

1.2 Background

1.2.1 The proposed production facility currently comprises land and is situated adjacent to Land at Crown Wharf (Port Talbot) (referred to as the 'Production Development Zone [PDZ]). The site address is Land at Crown Wharf, Port Talbot Docks, Port Talbot, with the nearest postcode SA13 1RA (Figure 1). The site covers an area of approximately 9.12 hectares, with the centre situated at approximate National Grid Reference 276420, 188660.

1.2.2 The proposed development is understood to comprise the erection of a Sustainable Aviation Fuel (SAF) production facility, including enclosed ground flare, storage tanks, installation of pipework and electrical, processing and utility equipment, administration, warehouse and laboratory buildings, new access, car parking and transport infrastructure including a truck loading area and associated works, hard and soft landscaping, areas for temporary construction laydown, and associated development. The proposed development layout is presented in the drawing provided by The Client and referenced: Inspire Architects – Project Dragon – Sustainable Aviation Fuel (SAF), Drawing No. 2143.01-IA-ZZ-ST-DR-A-0225. Revision P12, dated 13.10.2023.

1.2.3 The aim of these works is to provide information on the ground engineering conditions and engineering constraints associated with the site with regard to the proposed development.

1.2.4 The scope of work has included the elements detailed in Technip Energies' specification, titled, '*Scope of Work for Geotechnical Investigation and Topographical Survey*', referenced 202947C_000_SOW_1410_00001 (rev1), dated 24-02-2023 and have been undertaken in accordance with current guidance such as BS10175+A2:2017, BS5930:2015+A1:2020 and, where appropriate, Eurocode 7.

2 SITE OVERVIEW

2.1 Potential for Unexploded Ordnance

2.1.1 A Stage 2 - Detailed UXO Desk Study and Risk Assessment has been undertaken for the site by Brimstone Site Investigation Limited (report reference no. DRA-23-1532 rev2, dated September 2023 - Appendix B). The report concluded the ground conditions across the majority of the site was unconducive to the detection of UXO. Bombs, including those with delayed-action fuzes, are recorded across the southern part of the docks, ie within the site. Potential repair works, indicative of bomb damage, have been observed to the metal refinery. This, together with the recorded bombing to the copper works and the nearby steelworks, has resulted in the majority of the site being assessed at a Moderate Risk from German UXBs.

2.1.2 Prior to the start of construction, it has been recommended that a non-intrusive magnetometer survey is undertaken across the site and, in particular, within the areas of undeveloped open ground identified on the WWII mapping. Where anomalies are recorded there would be the need for further investigation to confirm/remove the risk. It should be noted that the recorded presence of slag within the made ground materials, may reduce the effectiveness of a magnetometer survey.

2.1.3 Once a piling layout has been finalised, an intrusive magnetometer survey would be required. Should any anomalies are recorded there would be the need for further investigation to confirm/remove the risk.

2.2 Previous Site Report Summary

2.2.1 Information for the site had also been obtained through review of previous assessments undertaken by TEC, as detailed within the following reports:

- 'Project Dragon – Sustainable Aviation Fuel (SAF) Production Facility: Production Development Zone (PDZ) – Desk Study', report ref.: 2111006.002.01 Rev. G. Prepared for LanzaTech UK Limited, dated May 2022 and revised October 2023; and
- 'Project Dragon – Sustainable Aviation Fuel (SAF) Production Facility: Production Development Zone (PDZ) – Ground Investigation Report', report ref.: 2111006.003.01. Rev. D. Prepared for LanzaTech UK Limited, dated June 2022 and revised August 2023.

2.2.2 A summary of relevant information from these previous TEC reports, in relation to this geotechnical assessment, is summarised in Table 2.1. Reference should be made to these previous reports for full information.

Table 2.1: Previous TEC Report Summary

PROJECT DRAGON: PDZ Desk Study (May 2022, Rev. G October 2023)	
Site History	Earliest available historical mapping shows the site remained undeveloped until 1917 when a centrally located large factory building is identified on maps as 'Crown Preserved Coal Works'. This was demolished and replaced by factory buildings identified as 'Metal Refinery Works' by 1939 and later as 'Steel Ceilings Factory' and 'Wagon Repair Shop' with associated railway tracks. By 1939, additional railway lines were constructed on an embankment in the south of the site on the area previously recorded as 'sand'. By 1949, a large pond is present in the west of the site, along with a number of heaped areas of unknown constituents. Additional industrial buildings have been constructed along the northern perimeter, with three rectangular warehouse buildings constructed to the east on mapping dating to 1964. All buildings on site appear to have been demolished as of 2009.
Coal Mining	It is reported that the site is located within an area which may be affected by coal mining activity, although is not located within a Development High Risk Area and therefore there is no requirement for a Coal Mining Risk Assessment to determine the mining legacy at the site. The Mining and Ground Stability Datasheet included within the Envirocheck Report obtained for the site indicates that the data is inconclusive with regard the presence of mining instability. The report also indicates that historical records indicate the presence of underground coal mining at Morfa Colliery, located approximately 310m to the southeast of the site. The Consultants Coal Mining Report (ref: 51003005839001), also presented in the Desk Study report prepared by TEC, states there to be no records of 'probable unrecorded shallow workings' (<30m below ground level) at the site, no mine entries, recorded mine gas emissions

	or mining subsidence notice/claims in the vicinity of the site. Further, there are no records of future underground mining. Notwithstanding the above, a previous site investigation on land to the west of the site recorded coal beds at varying depths between 31m and 47.3mbgl. One of the boreholes indicates the presence of a coal seam between 34m and 36mbgl; however, below this, potential backfilled workings are recorded to a depth of 37.5mbgl. As a consequence, although the risk of voiding below the site may be considered as being low, at this stage, it cannot be ruled out.
Ground Engineering	Multiple records of potential excavations or extractive industry usage are reported on site, including unspecified deposited materials, unspecified pits, railway embankments and railway cuttings. In addition, current and historical ponds are reported on site. Potentially soft, compressible clay/silt/sand tidal flat deposits which could include peat as indicated from BGS borehole records, and/or potentially significant thicknesses of made ground, may yield low CBR and design subgrade surface modulus values requiring improvement of the subgrade to support the construction of a pavement foundation. The potential for a high-water table may need consideration within the pavement design based on proximity to the docks and seasonal ponds observed on site.
PROJECT DRAGON: PDZ Exploratory Ground Investigation Report (June 2022, Rev. D August 2023)	
Ground Investigation Details	4No. Cable percussive boreholes were advanced to approximately 20mbgl to determine the depth of made ground, the nature of the underlying natural ground materials and allow sampling of encountered materials. 19No. Trial pits and 11No. dynamic sample boreholes were advanced to provide spatial coverage across the accessible site area to characterise shallow ground conditions and allow sampling of encountered materials. Installation of shallow and deep ground gas and groundwater monitoring boreholes across the accessible site area was also undertaken. Due to extensive Japanese Knotweed contamination observed across much of the site during the previous ground investigation access to much of the site was restricted due to this as well as other ecological constraints.
Ground Conditions	*Made Ground* Made ground was encountered across the majority of the site to depths in excess of 5.0mbgl. The made ground generally comprised dark brown silty gravelly sand with gravel of vesicular slag, concrete and rare clinker, brick and mudstone. *Superficial Deposits (Blown Sand)* Wind-blown sand was encountered in four exploratory locations, and was generally observed as very loose becoming medium dense yellowish brown fine to medium sand, recorded to depths of between 1.2 and >6.5mbgl. *Superficial Deposits (Tidal Flat Deposits)* Tidal Flat Deposits were encountered across the site and were found to vary in composition, but typically comprised either loose dark grey and black mottled silty sand, very soft dark grey slightly sandy slightly gravelly silt, or soft to firm dark grey slightly sandy gravelly clay. Peat beds were observed within the cable percussive boreholes, which varied from plastic dark grey amorphous peat to firm dark grey mottled brown pseudo-fibrous peat. *Superficial Deposits (Alluvial Fan Deposits)* Below the fine grained Tidal Flat Deposits either dense becoming very dense dark grey, greyish brown and brownish grey mottled gravelly sand and slightly sandy gravel with medium cobble content or medium dense to very dense greyish brown slightly sandy gravel with low cobble content was recorded at depths below 9.5m to 14.2mbgl. Gravel and cobbles were consistently observed to be mudstone and sandstone. *Solid Geology (South Wales Middle Coal Formation)* The solid geology was recorded at BH04 only, at a depth of 17.7mbgl, comprising dark grey sandstone to a maximum recorded depth of 20.35mbgl.

Groundwater	Groundwater strikes were recorded within the made ground and superficial Tidal Flat Deposits between 0.5m and 2.6m. Based upon the initial investigation, it was unclear as to whether the groundwater present on the site is tidally influenced.
TEC Recommendations for Further Works	Given the site information obtained during the initial ground investigation, further works were recommended to fully determine the site conditions and constraints with regards to the proposed development. These were outlined to include the following: • additional exploratory ground investigation works across areas of the site inaccessible at the time of the investigation, as well as additional groundwater and ground gas monitoring of the installed boreholes to confirm preliminary assessments and to determine the nature and extent of any remedial measures required; • due to the presence of potential contamination and ground gas across the site, it was considered likely that there would be the need to undertake a Foundation Works Risk Assessment in order to determine and minimise the risks associated with each founding method; • due to the potential mining legacy risk, there may be the need to determine the presence (or absence) of voiding in the bedrock as part of the geotechnical assessment; and • due to the uncertainty as to whether the groundwater levels recorded at the site are influenced by the tide, it was recommended that further monitoring be undertaken in order to determine this.

3 GROUND INVESTIGATION METHODOLOGY

3.1 Background

3.1.1 The ground investigation undertaken was designed to provide information on the ground conditions to aid with the design of the development and was broadly in accordance with the requirements detailed in the Technip Energies specification, titled, '*Scope of Work for Geotechnical Investigation and Topographical Survey*', referenced 202947C_000_SOW_1410_00001 (rev1), dated 24-02-2023.

3.1.2 Geotechnical assessment works were undertaken in accordance with BS5930:2015+A1:2020, BS10175+A2:2017 and, where appropriate, Eurocode 7. Works were supervised by a suitably experienced Engineering Geologist from TEC.

3.2 Methodology

3.2.1 A summary of the ground investigation works undertaken and the rationale for each location is provided in in Table 3.1, as follows:

Table 3.1: Summary of Ground Investigation Works

Investigation Method	Location	Date(s)	Location Rationale	Purpose
Trial Pitting (JCB 3CX)	TP101 – TP130	26.04.2023 – 24.05.2023	Positioned to provide spatial coverage across the site area	Characterisation of shallow ground conditions Collection of geochemical and geotechnical samples for analysis
Hand Dug Pits	HP101 – HP102	30.03.2023	Based on visual observations made during the ground investigation	Characterisation of shallow ground conditions Collection of geochemical samples for analysis
Dynamic Sample Boreholes (Archway Competitor)	DS101 – DS113	24.05.2023 – 26.05.2023	Positioned to provide spatial coverage across the site area	Characterisation of shallow ground conditions for shallow foundation information Collection of geochemical and geotechnical samples for analysis Installation of groundwater monitoring wells
Cable Percussive Boreholes (Dando 2000)	BH101 – BH120	20.03.2023 – 22.05.2023	Positioned to provide spatial coverage across the site area	Characterisation of deeper ground conditions for piled foundation information Collection of geochemical and geotechnical samples for analysis Installation of groundwater monitoring well
Cable Percussive Boreholes with Rotary Core follow-on (Klem KR802)	BH104-, BH113-, BH116-, BH117- and BH119- Follow on	27.04.2023 – 16.05.2023	Positioned to provide spatial coverage across the site area	Characterisation of deeper ground conditions for piled foundation information Collection of geotechnical samples taken from bedrock for analysis Installation of groundwater monitoring well
Rotary Drilling (Comacchio 305)	CHST101A – CHST102C	28.03.2023 – 17.05.2023	Position within southern site area to provide coverage for seismic boreholes	Installation of downhole seismic boreholes

Investigation Method	Location	Date(s)	Location Rationale	Purpose
Cone Penetration Testing with Seismic Testing (17.9-tonne track-truck mounted CPT unit (UK20))	SCPTu101 - SCPTu104	26.04.2023 – 27.04.2023	Positioned to provide spatial coverage across the site area at locations determined by Technip	Provision of correlated geotechnical design parameters: undrained shear strength, coefficient of volume change, overconsolidation ratio, SPT N_{60}, peak friction angle, relative density and Young's modulus
Cross-hole seismic surveys	CHST101 and CHST102	30.05.2023 - 31.05.2023	At locations specified by Technip	Velocity profiles, density, Poisson's Ratio, Shear modulus (G), Young's modulus (E), Bulk modulus (K)
Soil Resistivity Testing	VES 1A – VES 5B	31.05.2023	At locations specified by Technip	Soil Resistivity (Voltage (mV), Current (mA), Rho (ohm.m))
Infiltration Testing – Double Ring Infiltrometer	SA101 - SA102	31.05.2023 – 01.06.2023	Positioned to provide spatial coverage in approximate areas of proposed permeable hardstanding	Provision of permeability/infiltration rates to aid in design of permeable hardstanding area
Plate Bearing Tests	TP101 – TP112	19.05.2023 – 24.05.2023	Located in approximate areas of proposed access roads/ parking at locations determined by Technip	Provision of indicative Californian Bearing Ratio (CBR) values
Dynamic Cone Penetrometer	DCP101 – DCP112	28.03.2023	Located in approximate areas of proposed access roads/ parking	Provision of indicative Californian Bearing Ratio (CBR) values

3.2.2 Exploratory hole locations are provided in Table 3.2 below and are presented on Figure 3. Detailed descriptions of encountered ground conditions are shown on exploratory hole logs presented in Appendix C.

Table 3.2: Exploratory Hole Details

Reference	Easting	Northing	Elevation (mAOD)	Comment
BH01	276596.4	188722.4	7.224	Monitoring well
BH02	276245.6	188739.8	8.207	Monitoring well
BH03A	276485.2	188567.2	7.87	Monitoring well
BH04	276227.1	188626.7	9.698	Monitoring well
BH101	276273.1	188600.3	8.585	Borehole
BH102	276300.4	188609.8	9.194	Borehole
BH103	276317.5	188671	8.432	Monitoring well
BH104	276327.4	188593.7	8.731	Monitoring well/Level Logger Installation
BH105	276375.2	188639.3	8.435	Monitoring well
BH106	276465.1	188765	7.133	Monitoring well/Level Logger Installation
BH107	276383	188602.5	8.609	Monitoring well
BH108	276434.2	188702.3	7.303	Monitoring well/Level Logger Installation
BH109	276451.9	188540.6	7.772	Borehole
BH110	276476	188600	7.909	Monitoring well/Level Logger Installation
BH111	276510.3	188679.6	7.449	Monitoring well
BH112	276499.2	188720	7.154	Monitoring well/Level Logger Installation
BH113	276520.1	188607.4	8.079	Monitoring well/Level Logger Installation
BH114	276543.3	188706.8	7.835	Borehole
BH115	276616.4	188674.8	7.482	Monitoring well/Level Logger Installation

Reference	Easting	Northing	Elevation (mAOD)	Comment
BH116	276279.6	188672.7	8.718	Monitoring well/Level Logger Installation
BH117	276369.7	188710.5	8.349	Monitoring well/Level Logger Installation
BH118	276397.7	188602.5	8.377	Borehole
BH119	276559.8	188686.2	8.248	Monitoring well/Level Logger Installation
BH120	276554.2	188602.9	8.378	Monitoring well/Level Logger Installation
CHST101	276414.6	188561.6	8.246	Downhole Seismic Test Array
CHST102	276517.8	188535.9	7.972	Downhole Seismic Test Array
DS101	276210.6	188733.3	8.268	Monitoring well/Level Logger Installation
DS102	276361.4	188757.4	8.254	Monitoring well
DS103	276398.4	188781.3	7.707	Monitoring well/Level Logger Installation
DS104	276621.8	188674.2	7.507	Monitoring well
DS105	276596.3	188637.9	8.283	Monitoring well
DS106	276538	188669.2	8.065	Monitoring well
DS107	276490.1	188588.9	8.082	Monitoring well/Level Logger Installation
DS108	276246.8	188608.3	8.81	Monitoring well
DS109	276536.9	188528.2	7.959	Monitoring well
DS110	276274.6	188708.8	8.006	Monitoring well/Level Logger Installation
DS111	276388	188660.1	8.287	Monitoring well
DS112	276326.3	188665.3	8.639	Monitoring well
DS113	276481.9	188627.2	7.287	Monitoring well/Level Logger Installation
SCPTu101	276280	188673	8.718	Cone Penetration Test Location
SCPTu102	276405.8	188681.9	8.048	Cone Penetration Test Location
SCPTu103	276392.1	188601.9	8.286	Cone Penetration Test Location
SCPTu104	276555.6	188677.7	7.991	Cone Penetration Test Location
TP101	276191.6	188690.2	8.476	Plate Load Test
TP102	276234.5	188608.8	8.918	Plate Load Test
TP103	276279.3	188748.4	7.977	Plate Load Test
TP104	276313.5	188585.6	8.261	Plate Load Test
TP105	276378.5	188660.3	8.213	Plate Load Test
TP106	276364.9	188726.7	8.732	Plate Load Test
TP107	276473	188638.8	6.722	Plate Load Test
TP108	276498.2	188700.1	7.28	Plate Load Test
TP109	276500.7	188748.6	6.862	Plate Load Test
TP110	276534	188517.9	7.737	Plate Load Test
TP111	276547.9	188564.5	8.521	Plate Load Test
TP112	276590.8	188696.2	7.637	Plate Load Test
TP113	276379.8	188623.5	8.511	Trial Pit
TP114	276434	188547.8	8.011	Trial Pit
TP115	276396.6	188661	8.228	Trial Pit
TP116	276221.7	188622.3	9.692	Trial Pit
TP117	276527.7	188625.6	8.304	Trial Pit
TP118	276342.1	188729.3	8.236	Trial Pit
TP119	276591	188730	7.077	Trial Pit
TP120	276534.1	188738.8	7.177	Trial Pit
TP121	276470.4	188747	6.969	Trial Pit
TP122	276254.1	188690.9	8.488	Trial Pit
TP123	276266.4	188707.2	7.962	Trial Pit
TP124	276393.1	188777	7.624	Trial Pit
TP125	276582.1	188675.8	8.356	Trial Pit

Reference	Easting	Northing	Elevation (mAOD)	Comment
TP126	276568.5	188643.4	8.196	Trial Pit
TP127	276493.2	188635	7.521	Trial Pit
TP128	276483.1	188592.4	8.056	Trial Pit
TP129	276555.5	188547.3	8.562	Trial Pit
TP130	276543	188535.9	8.089	Trial Pit
DCP101	276527	188719	7.34	Dynamic Cone Penetration Test
DCP102	276601	188673	7.92	Dynamic Cone Penetration Test
DCP103	276570	188624	8.45	Dynamic Cone Penetration Test
DCP104	276527	188669	8.09	Dynamic Cone Penetration Test
DCP105	276519	188602	8.10	Dynamic Cone Penetration Test
DCP106	276450	188599	7.91	Dynamic Cone Penetration Test
DCP107	276371	188603	8.80	Dynamic Cone Penetration Test
DCP108	276355	188672	7.94	Dynamic Cone Penetration Test
DCP109	276253	188637	9.62	Dynamic Cone Penetration Test
DCP110	276230	188681	8.74	Dynamic Cone Penetration Test
DCP111	276411	188706	7.92	Dynamic Cone Penetration Test
DCP112	276337	188730	8.23	Dynamic Cone Penetration Test
WS01	276192.4	188665.1	9.161	2022 monitoring well
WS03	276332.2	188607	8.976	2022 monitoring well
WS06	276466.6	188647.7	7.049	2022 monitoring well
WS07	276479.7	188726.4	7.256	2022 monitoring well
WS10	276264.9	188658.8	9.235	2022 monitoring well/level logger installation
WS11	276377.5	188586.2	8.442	2022 monitoring well/level logger installation

3.2.3 It should be noted that co-ordinates for the 2022 exploratory hole, where not installed, are not available although approximate locations are presented in Figure 3 for reference. In addition, a plan of the cable percussion and rotary boreholes used to generate the ground models is presented in Figure 5.

3.3 Limitations

3.3.1 It should be noted that due to extensive Japanese Knotweed contamination observed across much of the site during this ground investigation, localised areas of the site were restricted due to this as well as other ecological constraints. Locations affected by these constraints were repositioned within the most suitable areas as close to the original positions as possible.

3.4 Field Testing

3.4.1 A summary of in situ field testing undertaken as part of these ground investigation works is provided in Table 3.3.

Table 3.3: Summary of Field Testing

Field Test	Purpose
Hand Shear Vane (HSV)	Estimation of undrained shear strengths of cohesive strata
Pocket Penetrometer (PP)	Indication of unconfined compressive strength of cohesive strata
Standard Penetration Test (SPT)	Provision of strength profile of underlying ground conditions Provision of in situ densities of granular deposits
Photo-Ionisation Detector (PID)	Indication of the presence/concentrations of volatile organic compounds (VOCs)
Dual Phase Interface Probe	Indication of the presence of free product
Plate Load and Dynamic Cone Penetration Testing	Indication of CBR for pavement design

3.5 Monitoring Works

3.5.1 A summary of the monitoring works completed at the site to date is provided below in Table 3.4.

Table 3.4: Summary of Monitoring Works

Monitoring	Instrument/ Kit	No. of Rounds (to-date)	Date(s)
Ground Gas	GFM430 and GFM436 Landfill Gas Monitor	3	13/06/2023 10/07/2023 24/07/2023
Groundwater	Solinst peristaltic pump	3	26/06/2023 – 28/06/2023 11/07/2023 24/07/2023 – 25/07/2023
	Waterra inertial pump	2	13/06/2023 – 14/06/2023 24/07/2023 – 25/07/2023
	Level Loggers (Rugged BaroTROLL Data Logger)	1	13/07/2023 to 24/07/2023

3.6 Geotechnical Testing

3.6.1 Selected soil samples were submitted for geotechnical analysis at K4 Soils Ltd, Geolabs and The Environmental Laboratory Ltd (ELab). In addition, representative groundwater samples as part of concrete design purposes were collected and chemically tested at i2 Analytical Ltd, a UKAS/MCERTS accredited laboratory. Laboratory testing was scheduled upon the basis of field observations for a selection of the following:

Soil

- Atterberg limit tests – natural moisture content, liquid limit and plastic limit;
- Particle size distribution (PSD) tests;
- Multistage undrained triaxial tests;
- Oedometer tests;
- Laboratory remoulded CBR tests;
- Compaction Test (2.5kg);
- Small Shearbox tests;
- Large Shearbox tests;
- Particle Density
- Dry Density;
- Bulk Density;
- Thermal Conductivity;
- BRE SD1 Suite B – Water soluble and acid soluble sulphates, total sulphur and pH;
- BRE SD1 Suite C – Water soluble sulphates, chloride, nitrate and magnesium, and pH; and
- BRE SD1 Suite D – Water soluble and acid soluble sulphates, water soluble chloride, nitrate and magnesium, total sulphur and pH.

Water

- Sulphate, sulphide, elemental sulphur and pH;

3.6.2 Soil geotechnical certificates of analysis are presented in Appendix E.

3.7 General Sampling

3.7.1 Samples were collected in accordance with the following guidance;

- BS5930:2015+A1:2020 – Code of practice for ground investigations;
- BS-EN 1997-2:2007 - Eurocode 7 — Geotechnical design —Part 2: Ground investigation and testing
- BS ISO 10175:2011+A2:2017 - Investigation of potentially contaminated sites – Code of practice;
- BS ISO 18400-105:2017 Soil quality – Sampling - Packaging, transport, storage and preservation of samples; and
- BS ISO 18400-106:2017 Soil quality – Sampling - Quality control and quality assurance.

3.8 Geophysical Surveys

Cross-hole Seismic Survey

3.8.1 Cross-hole seismic surveys were undertaken by Terradat in accordance with ASTM D4428/D4428M-14, the results of which are presented in Appendix H as a series of compiled profiles/sections and tables. The plots for the cross-hole element include velocity tomograms, velocity profiles, density, Poisson's Ratio, Shear modulus (G), Young's modulus (E), Bulk modulus (K) and a summary of the results.

3.8.2 It was reported by Teradat that the quality of the P-wave and Sv-wave data sets was generally very good to excellent for both clusters (CHST101 and CHST102).

Soil Resistivity Survey

3.8.3 The results of the soil resistivity tests undertaken by Terradat in accordance with IEEE81-2012 are presented in Appendix H and include depth profiles and summary tables.

Cone penetration / Seismic testing

3.8.4 The results of the cone penetration testing undertaken by Lankelma in accordance with BS ISO 22476-1:2012 are presented in Appendix I and include the corrected cone resistance (qt), local side friction (fs), dynamic pore water pressure (u2), friction ratio (Rf) and inclination presented against depth and elevation in accordance with BS ISO 22476-1:2012. Correlated undrained shear strength, coefficient of volume change, over-consolidation ratio, equivalent SPT N_{60}, peak friction angle, relative density, Young's modulus as well as SBT descriptions and SBT index Ic (Robertson, 1990) are also presented.

4 GROUND INVESTIGATION FINDINGS

4.1 Ground Conditions

4.1.1 A summary of encountered ground conditions for the site is provided below, while detailed descriptions are shown on exploratory hole logs presented in Appendix C. Photographs of the materials encountered, together with a selection of photographs depicting the exploratory locations are presented within Appendix A.

Made Ground

4.1.2 Made ground was encountered within all exploratory locations to depths of between 0.35m (8.1mAOD) and 6.9m (1.3mAOD). The material was observed to be heterogenous in nature across the site and varied in composition greatly.

4.1.3 The gravel component was observed as slag, vesicular slag, clinker, coke, wood fragments, metal fragments, metal wire, metal lintel, rebar, plastic fragments, plastic pipes, brick, concrete, glass, tiles, terracotta and porcelain fragments tyres, rubber, sandstone, mudstone, siltstone, lime and plaster.

4.1.4 A number of the trial pits were terminated within the made ground due to obstructions, as summarised in Table 4.1 below:

Table 4.1: Made ground Obstructions

Exploratory Location	Depth Terminated (m)	Depth Terminated (mAOD)	Encountered Obstruction
TP103	0.5	7.48	Metal lintels
TP106	1.5	7.23	Concrete slab
TP108	1.8	5.48	Boulders of brick walls and footings.
TP125	1.3	7.06	Concrete slab
TP126	1.1	7.1	Concrete footing in northern end of the trial pit (1.2m width and 0.6m in height)

4.1.5 No exploratory locations were undertaken within the concrete hardstanding located within the central site area; however, previous investigations undertaken by TEC within this area indicates the concrete slab thickness is between 0.12m and 0.13m in thickness based on 2No. exploratory holes previously advanced within this area.

Superficial Deposits (Wind Blown Sand)

4.1.6 The Wind-Blown Sand was encountered from depths between ground level (8.48mAOD) and 6mbgl (2.2mAOD) to depths of between 2.4mbgl (6.1mAOD) and 9.5mbgl (-0.9mAOD). The encountered material was generally described as slightly silty fine to medium grained sand.

Superficial Deposits (Tidal Flat Deposits)

4.1.7 The Tidal Flat Deposits were encountered across the site from depths of between 1mbgl (6.2mAOD) and 6.9mbgl (1.3mAOD) to maximum encountered depths of between 10mbgl (-3.2mAOD) and 16.5mbgl (-7.9mAOD). The material generally comprised soft to firm, low to very low strength grey; grey mottled black; brownish grey and blueish grey to brownish grey silty clay with occasional pockets of amorphous to fibrous peat and pockets of fine to medium grained sand.

4.1.8 Where granular in composition, the Tidal Flat Deposits were recorded to comprise grey, brownish grey and greyish brown slightly clayey slightly silty sand to silty clayey sand with occasion pockets of silty clay.

4.1.9 Peat beds, comprising fibrous to amorphous peat were recorded across the site between depths of 5.0mbgl 2.3mAOD) and 16.5mbgl (-7.77mAOD).

Superficial Deposits (Alluvial Fan Deposits)

4.1.10 Alluvial fan deposits were observed to underlie the Tidal Flat Deposits across the site from depths of between 10mbgl (-3.2mAOD) and 16.5mbgl (-7.9mAOD) to maximum encountered depths of between 18mbgl (-10.8mAOD) and 25mbgl (-16.5mAOD). The encountered ground conditions were generally described as slightly clayey slightly gravelly sand and sandy gravel with low to medium cobble content. The gravel generally comprised fine to coarse subangular to rounded sandstone.

Solid Geology (South Wales Middle Coal Formation)

4.1.11 Within the rotary cored boreholes, the bedrock was encountered from depths of between 21.4mbgl (-16.5mAOD) and 29mbgl (-20.1mAOD) to depths of between >54mbgl (-45.8mAOD) and >62mbgl (-53.5mAOD). The encountered bedrock generally comprised interbedded medium strong to very strong sandstone, extremely weak to medium strong siltstone and mudstone with rare to occasional veins of quartz. The recorded dip within the sandstone was recorded be approximately 23° to 30°, whereas the interbedded siltstone and mudstone recorded a dip of 2° to 5°; 14° to 19° and 40° to 48°.

4.1.12 Within two boreholes (BH113 and BH119) very weak to weak black coal and weak dark grey to black mudstone with occasional very thinly bedded bands of coal and rare to occasional very thin veins of pyrite between fractures were recorded between 30.5mbgl to 30.6mbgl, 31.2mbgl to 31.85mbgl and 31.9mbgl to 32.15mbgl respectively.

4.2 Generalised Ground Profile

4.2.1 Cross-sections showing the ground profile across the site are provided in Appendix D and the general ground profile encountered at the site with depth is summarised in Table 4.2 and against elevation in Table 4.3 below. In addition, a plan of the cable percussion and rotary boreholes used to generate the ground models is presented in Figure 5.

Table 4.2: Generalised Ground Profile – Depth Below Ground Level

Exploratory Hole Reference	Ground level (mAOD)	Made Ground			Wind Blown Sand			Tidal Flat Deposits - silts/clays			Tidal Flat Deposits- peat			Wind Blown Sand			Tidal Flat Deposits- silts/clays			Tidal Flat Deposits - organic rich clays			Tidal Flat Deposits- peat			Tidal Flat Deposits - silts/clays			Alluvial Fan Deposits		
		Top	Base	Thickness	Top	Base	Thickness	Top	Base	Thickness	Top	Base	Thickness	Top	Base	Thickness	Top	Base	Thickness	Top	Base	Thickness	Top	Base	Thickness	Top	Base	Thickness	Top	Base	Thickness
BH01	7.224	0.0	2.2	2.2													2.2	9.3	7.1				9.3	9.5	0.2				9.5	19.6	10.1
BH02	8.207	0.0	3.0	3.0				3.0	3.8	0.8	3.8	4.8	1.0				4.8	10.2	5.4				10.2	13.5	3.3				13.5	24.5	11.0
BH03	8.6	0.0	2.0	2.0	2.0	6.5	4.5																								
BH03A	7.870				0.0	2.5	2.5										2.5	10.5	8.0				10.5	13.5	3.0	10.5	14.2	3.7	14.2	20.6	6.4
BH04	9.698				0.0	1.2	1.2										1.2	9.0	7.8				9.0	13.0	4.0				13.0	20.4	7.4
BH101	8.585	0.0	2.5	2.5				2.5	6.0	3.5				6.0	7.0	1.0	7.0	14.0	7.0				14.0	15.0	1.0				15.0	25.0	10.0
BH102	9.194	0.0	2.5	2.5				2.5	4.5	2.0				4.5	9.5	5.0	9.5	14.8	5.3				14.8	15.5	0.7				15.5	20.5	5.0
BH103	8.432	0.0	3.0	3.0				3.0	7.4	4.4										7.4	10.6	3.2							10.6	22.0	11.4
BH104	8.731	0.0	0.4	0.4	0.4	1.5	1.2	1.5	2.4	0.9				2.4	6.8	4.4				6.8	12.0	5.2	12.0	16.5	4.5				16.5	25.0	8.5
BH105	8.435	0.0	3.0	3.0													3.0	9.1	6.1	9.1	9.8	0.7	9.8	13.2	3.4				13.2	23.0	9.8
BH106	7.133	0.0	1.0	1.0													1.0	7.0	6.0				7.0	10.0	3.0				10.0	20.5	10.5
BH107	8.609	0.0	1.3	1.3	1.3	2.5	1.2										2.5	7.5	5.0	7.5	11.0	3.5	11.0	14.3	3.3				14.3	22.0	7.7
BH108	7.303	0.0	5.0	5.0																5.0	6.0	1.0	6.0	8.0	2.0	6.0	12.0	6.0	12.0	21.3	9.3
BH109	7.772	0.0	0.8	0.8	0.8	6.5	5.7																								
BH110	7.909	0.0	2.0	2.0				2.0	6.0	4.0													6.0	7.5	1.5	6.0	12.9	6.9	12.9	19.0	6.1
BH111	7.449	0.0	2.0	2.0													2.0	7.5	5.5	7.5	10.8	3.3							10.8	18.0	7.2
BH112	7.154	0.0	2.8	2.8																2.8	11.2	8.4							11.2	22.0	10.8
BH113	8.079	0.0	3.4	3.4				3.4	5.5	2.1													5.5	11.4	5.9				11.4	17.5	6.1
BH114	7.835	0.0	4.0	4.0																4.0	8.5	4.5	8.5	9.5	1.0	8.5	10.5	2.0	10.5	22.2	11.7
BH115	7.482	0.0	4.9	4.9				4.9	6.0	1.1										6.0	10.9	4.9	10.9	11.6	0.7				11.6	20.4	8.8
BH116	8.718	0.0	3.9	3.9													3.9	9.1	5.2	9.1	12.6	3.5							12.6	19.5	6.9
BH117	8.349	0.0	4.0	4.0																4.0	10.0	6.0	10.0	12.0	2.0				12.0	22.2	10.2
BH118	8.377	0.0	3.0	3.0																3.0	10.5	7.5	10.5	11.5	1.0	10.5	14.2	3.7	11.5	20.5	9.0
BH119	8.248	0.0	6.9	6.9																6.9	12.1	3.1							12.1	20.0	7.9
BH120	8.378	0.0	5.0	5.0																5.0	10.0	5.0	10.0	11.0	1.0				11.0	21.5	10.5
Average	8.132		3.07	3.07	1.11	3.45	2.71	2.85	5.20	2.35	3.80	4.80	1.00	4.30	7.77	3.47	3.60	9.82	6.22	6.42	10.43	4.47	9.72	12.03	2.31	8.30	12.76	4.46	12.39	21.18	8.79
Max	9.698		9.0	9.0	2.0	6.5	5.7	4.9	7.4	4.4	3.8	4.8	1.0	6.0	9.5	5.0	9.5	14.8	8.0	9.1	12.6	11.2	14.8	16.5	5.9	10.5	14.2	6.9	16.5	25.0	11.7
Min	7.133		0.35	0.35	0.35	1.2	1.15	1.5	2.4	0.8	3.8	4.8	1.0	2.4	6.8	1.0	1.0	7.0	5.0	3.0	6.0	0.7	5.5	7.5	0.2	6.0	10.5	2.0	9.5	17.5	5.0

Table 4.3: Generalised Ground Profile – Elevation (mAOD)

Exploratory Hole Reference	Ground level (mAOD)	Made Ground			Wind Blown Sand			Tidal Flat Deposits - silts/clays			Tidal Flat Deposits- peat			Wind Blown Sand			Tidal Flat Deposits- silts/clays			Tidal Flat Deposits - organic rich clays			Tidal Flat Deposits- peat			Tidal Flat Deposits - silts/clays			Alluvial Fan Deposits		
		Top	Base	Thickness	Top	Base	Thickness	Top	Base	Thickness	Top	Base	Thickness	Top	Base	Thickness	Top	Base	Thickness	Top	Base	Thickness	Top	Base	Thickness	Top	Base	Thickness	Top	Base	Thickness
BH01	7.2	7.2	5.0	2.2													5.0	-2.1	7.1				-2.1	-2.3	0.2				-2.3	-12.4	10.1
BH02	8.2	8.2	5.2	3.0				5.2	4.4	0.8	4.4	3.4	1.0				3.4	-2.0	5.4				-2.0	-5.3	3.3				-5.3	-16.3	11.0
BH03	8.6	8.6	6.6	2.0	6.6	2.1	4.5																								
BH03 A	7.9				7.9	5.4	2.5										5.4	-2.6	8.0				-2.6	-5.6	3.0	-2.6	-6.3	3.7	-6.3	-12.7	6.4
BH04	9.7				9.7	8.5	1.2										8.5	0.7	7.8				0.7	-3.3	4.0				-3.3	-10.7	7.4
BH101	8.6	8.6	6.1	2.5				6.1	2.6	3.5				2.6	1.6	1.0	1.6	-5.4	7.0				-5.4	-6.4	1.0				-6.4	-16.4	10.0
BH102	9.2	9.2	6.7	2.5				6.7	4.7	2.0				4.7	-0.3	5.0	-0.3	-5.6	5.3				-5.6	-6.3	0.7				-6.3	-11.3	5.0
BH103	8.4	8.4	5.4	3.0				5.4	1.0	4.4										1.0	-2.2	3.2							-2.2	-13.6	11.4
BH104	8.7	8.7	8.4	0.4	8.4	7.2	1.2	7.2	6.3	0.9				6.3	1.9	4.4				1.9	-3.3	5.2	-3.3	-7.8	4.5				-7.8	-16.3	8.5
BH105	8.4	8.4	5.4	3.0													5.4	-0.7	6.1	-0.7	-1.4	0.7	-1.4	-4.8	3.4				-4.8	-14.6	9.8
BH106	7.1	7.1	6.1	1.0													6.1	0.1	6.0				0.1	-2.9	3.0				-2.9	-13.4	10.5
BH107	8.6	8.6	7.3	1.3	7.3	6.1	1.2										6.1	1.1	5.0	1.1	-2.4	3.5	-2.4	-5.7	3.3				-5.7	-13.4	7.7
BH108	7.3	7.3	2.3	5.0																2.3	1.3	1.0	1.3	-0.7	2.0	1.3	-4.7	6.0	-4.7	-14.0	9.3
BH109	7.8	7.8	7.0	0.8	7.0	1.3	5.7																								
BH110	7.9	7.9	5.9	2.0				5.9	1.9	4.0													1.9	0.4	1.5	1.9	-5.0	6.9	-5.0	-11.1	6.1
BH111	7.4	7.4	5.4	2.0													5.4	-0.1	5.5	-0.1	-3.4	3.3							-3.4	-10.6	7.2
BH112	7.2	7.2	4.4	2.8																									0.0	-10.8	10.8
BH113	8.1	8.1	4.7	3.4				4.7	2.6	2.1													2.6	-3.3	5.9				-3.3	-9.4	6.1
BH114	7.8	7.8	3.8	4.0																3.8	-0.7	4.5	-0.7	-1.7	1.0	-0.7	-2.7	2.0	-2.7	-14.4	11.7
BH115	7.5	7.5	2.6	4.9				2.6	1.5	1.1										1.5	-3.4	4.9	-3.4	-4.1	0.7				-4.1	-12.9	8.8
BH116	8.7	8.7	4.8	3.9													4.8	-0.4	5.2	-0.4	-3.9	3.5							-3.9	-10.8	6.9
BH117	8.3	8.3	4.3	4.0																4.3	-1.7	6.0	-1.7	-3.7	2.0				-3.7	-13.9	10.2
BH118	8.4	8.4	5.4	3.0																5.4	-2.1	7.5	-2.1	-3.1	1.0	-2.1	-5.8	3.7	-3.1	-12.1	9.0
BH119	8.2	8.2	1.3	6.9																1.3	-3.9	5.2							-3.9	-11.8	7.9
BH120	8.4	8.4	3.4	5.0																3.4	-1.6	5.0	-1.6	-2.6	1.0				-2.6	-13.1	10.5
Ave	8.13		5.115	2.980	7.805	5.1	3.0	7.8	5.1	2.7	5.5	3.1	2.4	4.4	3.4	1.0	4.5	1.1	3.5	4.7	-1.5	6.2	1.9	-2.2	4.1	-1.5	-3.8	2.3	-0.4	-4.9	4.5
Max	9.69		8.381	6.900	9.698	8.4	6.9	9.7	8.5	5.7	7.2	6.3	4.4	4.4	3.4	1.0	6.3	1.9	5.0	8.5	1.1	8.0	5.4	1.3	7.5	2.6	0.4	5.9	1.9	-2.7	6.9
Min	7.13		1.348	0.350	6.600	1.3	0.4	6.6	1.3	1.2	2.6	1.0	0.8	4.4	3.4	1.0	2.6	-0.3	1.0	-0.3	-5.6	5.0	-0.7	-3.9	0.7	-5.6	-7.8	0.2	-2.6	-6.3	2.0

4.3 Groundwater

4.3.1 Groundwater observations recorded during the ground investigation works, and standing depths within the boreholes recorded as part of subsequent monitoring visits are summarised in Table 4.4 for the shallow boreholes and Table 4.5 for the deeper boreholes. Groundwater monitoring well locations are provided in Figure 4.

4.3.2 In addition, groundwater strikes / observations are also shown on the exploratory hole logs in Appendix C.

Table 4.4: Summary of Groundwater Conditions recorded within Shallow Dynamic Sampling Boreholes

Location	Groundwater Strike (mbgl)	Standing Depths (mbgl)			Response zone (mbgl)	Strata
	24.05.2023 to 26.05.2023	31.05.2023	26.06.2023	24.06.2023		
DS101	1.2	1.26	1.64	1.9	1.0 - 2.5	Made Ground/ Wind Blown Sand
DS102D (DS102)	Dry to 1.0	Dry	Dry	Dry	0.5 - 1.0	Made Ground
DS103	1.2	0.75	1.41	1.21	1.0 - 5.0	Tidal Flat Deposits
DS104	1.7	1.28	1.83	1.88	1.0 - 5.0	Made Ground
DS105B (DS105)	2.0	2.07	2.56	Dry	1.0 - 4.0	Made Ground
DS106	1.8	1.81	2.31	2.54	1.0 - 4.0	Made Ground
DS107	1.2	0.87	1.04	1.01	1.0 - 5.0	Tidal Flat Deposits
DS108	1.0	1.36	2.28	2.31	1.0 - 4.0	Tidal Flat Deposits
DS109	1.2	0.7	1.00	0.93	0.5 -2 .0	Made Ground/ Wind Blown Sand
DS110	1.6	1.9	1.74	1.86	1.0 - 5.0	Made Ground/ Tidal Flat Deposits
DS111A (DS111)	Dry to 1.5	1.49	Dry	Dry	0.5 - 1.5	Made Ground
DS112	2.0	2.23	3.2	2.69	1.0 - 4.0	Made Ground/ Tidal Flat Deposits
DS113	1.1	0.74	1.16	1.13	1.0 - 5.0	Tidal Flat Deposits
2022 Boreholes						
Location	**Groundwater Strike (mbgl)**	**Standing Depths (mbgl)**			**Response zone (mbgl)**	**Strata**
	(14.04.2022 to 21.04.2022)	**31.05.2023**	**26.06.2023**	**24.06.2023**		
WS01	1.69	2.41	Dry	Dry	1.0 – 5.0	Made Ground
WS03	0.55	2.26	Dry	Dry	1.0 – 5.0	Tidal Flat Deposits
WS06	0.35	0.43	0.81	0.85	1.0 – 5.0	Tidal Flat Deposits
WS07	0.45	0.71	1.03	0.93	1.0 – 5.0	Made Ground/ Tidal Flat Deposits
WS10	1.89	3.11	3.23	3.29	1.0 – 5.0	Made Ground/ Tidal Flat Deposits
WS11	1.04	1.26	1.72	1.95	1.0 – 5.0	Wind Blown Sand

Table 4.5: Summary of Groundwater Conditions within Cable Percussive and Rotary follow-on Boreholes

Location	Groundwater Strike (mbgl)	Standing Depths (mbgl)			Response zone (mbgl)	Strata
		31.05.2023	26.06.2023	24.06.2023		
BH103	2.0	3.17	3.96	3.38	14.0 – 21.5	Alluvial Fan Deposits
BH104	2.0	3.63	4.36	3.83	32.0 - 62.0	South Wales Middle Coal Measures Formation
BH105	1.35 / 13.5	3.13	3.86	3.28	13.5 - 23.0	Alluvial Fan Deposits
BH106	Ground level / 10.0	1.68	2.50	2.30	10.5 - 21.0	Alluvial Fan Deposits
BH107	0.8	3.31	4.04	3.64	14.0 -2 2.0	Alluvial Fan Deposits
BH108	0.8	2.07	2.84	2.93	13.5 - 21.3	Alluvial Fan Deposits
BH110	4.0	2.62	3.30	2.95	13.0 - 19.0	Alluvial Fan Deposits
BH111	0.8	1.88	2.67	2.30	12.0 - 18.0	Alluvial Fan Deposits
BH112	1.3 / 11.5	0.73	1.11	0.99	0.4 - 7.4	Made Ground/ Tidal Flat Deposits
BH113	0.5	2.21	3.33	2.56	30.0 - 60.0	South Wales Middle Coal Measures Formation
BH115	1.5 / 11.2	1.86	2.69	2.25	12.2 - 20.2	Alluvial Fan Deposits
BH116	1.0	3.81	4.4	4.85	32.0 - 60.0	South Wales Middle Coal Measures Formation
BH117	1.2 / 12.1	3.46	4.13	3.74	26.0 - 55.0	South Wales Middle Coal Measures Formation
BH119	1.3 / 12.5	2.83	2.57	3.18	23.0 - 54.0	South Wales Middle Coal Measures Formation
BH120	3.0	2.52	3.62	3.22	12.5 - 20.5	Alluvial Fan Deposits
2022 Boreholes						
Location	**Ground water Strike (mbgl)**	**Standing Depths (mbgl)**			**Response zone (mbgl)**	**Strata**
		22.03.2023	**31.05.2023**	**26.06.2023**	**24.06.2023**	
BH01	1.91	1.44	1.71	2.38	2.55	9.5 – 19.5	Alluvial Fan Deposits
BH02	3.95	3.08	3.17	3.77	3.40	13.5 – 24.5	Alluvial Fan Deposits
BH03A	3.42	2.48	2.71	3.26	2.94	14.5 – 20.0	Alluvial Fan Deposits
BH04	5.36	4.59	4.67	5.21	4.87	15.0 – 20.35	Alluvial Fan Deposits

4.3.3 Groundwater strikes were recorded at depths of between 0.35mbgl and 12.5mbgl with standing groundwater levels of between 0.43mbgl and 5.21mbgl recorded during subsequent monitoring.

4.3.4 It should also be noted that localised areas were prone to flooding due to limited permeability of the underlying ground materials and/or hardstanding surfaces.

4.3.5 Level loggers were installed within selected boreholes between 13 July to 24 July 2023 to determine whether groundwater at the site is prone to tidal influences. The corresponding groundwater levels are shown in Appendix F. Following a review of this information, the deeper boreholes have shown relatively minor fluctuations in groundwater levels, potentially related to tidal variation. In addition, within each of the boreholes, recorded groundwater levels show relatively persistent peaks and troughs, together with a slight lag, following the high and low tide. This lag is likely to be a result of the site being located some distance from the coastal zone and therefore likely to be influenced by natural soil permeability and porosity, and anthropogenic permeability constriction zones i.e., harbour wall, and more cohesive land infill materials.

4.3.6 It should be further noted that groundwater conditions recorded during the investigation may not be representative of long-term conditions and that groundwater levels may vary in response to meteorological/ seasonal changes.

4.4 Contamination Observations

4.4.1 Visual and olfactory evidence of potentially gross contamination was recorded during the intrusive works. While a summary of the evidence recorded is detailed below, reference should be made to TEC report referenced 2111006.005.01 for full details.

4.4.2 Potential asbestos containing material (ACM), observed as fragments of corrugated sheeting, were observed within the south-eastern site area. In addition, asbestos fibres were recorded locally in the soils tested.

4.4.3 An unnamed borehole (referred to as U1), which is assumed to be part of the PrenergyPower investigation (2009), within the western site area, was monitored by TEC on 24 March 2023 as part of the on-going monitoring works. Groundwater level gauging indicated the borehole was approximately 4m in depth, with the standing water level recorded at approximately 2.6mbgl. Notwithstanding this, the monitoring was undertaken using a dual phase interface probe, which detected the presence of free product between approximately 2.6mbgl and 3.6mbgl. Sampling of the free product indicated it comprised a thick, sticky, strong odorous coal tar like substance and subsequent laboratory analysis of this material and the underlying groundwater indicated the presence of elevated PAH's, aromatic TPH fractions and BTEX. DS112 was constructed in close proximity to U1 to allow further investigation and assessment to be made.

4.4.4 Furthermore, a faint sheen and very faint organic odour was noted within the groundwater encountered during the advancement of BH112. As a result, the borehole was installed with a groundwater monitoring well to allow for on-going groundwater monitoring and analysis. Laboratory analysis of a sample collected from this location recorded marginally elevated PAH concentrations and heavier ended fractions of aromatic TPH.

4.5 Ground Gas

4.5.1 An initial ground gas risk assessment has been undertaken as part of this geotechnical report to provide an outline classification for the proposed development. However, it should be noted that ground gas monitoring was ongoing at the time of this report being prepared and therefore recommendations within this section are preliminary only at this stage. A full ground gas risk assessment will be prepared on completion of the ground gas monitoring in due course.

Ground Gas Monitoring Results

4.5.2 All gas monitoring was undertaken using a calibrated GFM 430/436 infra-red gas analyser fitted with an internal flow pod. The full monitoring results to date are presented in Appendix G and summarised in Table 4.6 overleaf.

Table 4.6: Summary of Ground Gas Monitoring Data

Borehole	Response Zone/Strata	Potential source of ground gas	No. of monitoring occasions	Maximum (Steady State) Methane (%)	Maximum Carbon dioxide (Steady State) (%)	Minimum (Steady State) Oxygen (%)	Maximum (Steady State) Flow Rate (l/hr)	Water levels (mbgl)	Range of atmospheric pressure (mb)
WS01	Made Ground	Organic matter within the made ground	3	0.0 (0.0)	0.1 (0.1)	19.7	0.0	Dry	1009 – 1023
WS03	Tidal Flat Deposits	Tidal Flat Deposits – Organic layers	3	0.0 (0.0)	2.4 (2.4)	16.8	0.0	1.41 - Dry	1007 - 1023
WS06	Tidal Flat Deposits	Tidal Flat Deposits – Organic layers	3	0.0 (0.0)	0.0 (0.0)	20.0	0.0	0.50 - 0.91	1008 - 1021
WS07	Made Ground/ Tidal Flat Deposits	Organic material within the made ground and organic rich layers within the Tidal Flat Deposits	3	1.9 (1.9)	8.5 (8.5)	0.0	41.4 (0.1)	0.79 - 1.19	1007 - 1027
WS10	Made Ground/ Tidal Flat Deposits	Organic material within the made ground and organic rich layers within the Tidal Flat Deposits	3	0.0 (0.0)	2.2 (2.2)	9.0	0.1 (0.0)	3.23 -3.34	1008 - 1023
WS11	Wind Blown Sand	Could act as a permeable pathway to gas migration	3	0.0 (0.0)	3.4 (3.4)	17.6	0.0	1.36 - 1.84	1008 - 1022
DS101	Made Ground/ Wind Blown Sand	Organic matter within the made ground and acting as a permeable pathway within the Blown Sand	3	0.0 (0.0)	1.0 (1.0)	19.9	0.0	1.34 – 1.9	1008 – 1024
DS102	Made Ground	Organic matter within the made ground	3	0.0 (0.0)	1.3 (0.7)	0.9 (1.6)	0.9 (0.0)	Dry	1009 – 1028
DS103	Tidal Flat Deposits	Organic rich Tidal Flat Deposits	3	0.0 (0.0)	0.2 (0.1)	2.8 (8.2)	2.8 (0.0)	0.95 – 1.21	1007 – 1025
DS104	Made Ground	Organic matter within the made ground	3	0.0 (0.0)	2.5 (2.5)	12.7	0.1 (0.0)	1.42 – 2.0	1008 – 1024
DS105	Made Ground	Organic matter within the made ground	3	0.0 (0.0)	0.8 (0.8)	8.0	3.8 (0.0)	2.19 – Dry	1007 - 1023

Borehole	Response Zone/Strata	Potential source of ground gas	No. of monitoring occasions	Maximum (Steady State) Methane (%)	Maximum Carbon dioxide (Steady State) (%)	Minimum (Steady State) Oxygen (%)	Maximum (Steady State) Flow Rate (l/hr)	Water levels (mbgl)	Range of atmospheric pressure (mb)
DS106	Made Ground	Organic matter within the made ground	3	0.0 (0.0)	2.7(2.7)	3.0	2.1 (0.0)	1.91 – 2.54	1009 -1023
DS107	Tidal Flat Deposits	Organic rich Tidal Flat Deposits	3	0.0 (0.0)	4.6 (4.6)	13.8	0.4 (0.0)	0.94 – 1.21	1007 – 1023
DS108	Tidal Flat Deposits	Organic rich Tidal Flat Deposits	3	0.0 (0.0)	4.7 (4.7)	15.1	0.0	1.57 – 2.31	1008 – 1023
DS109	Made Ground/ Wind Blown Sand	Organic matter within the made ground and acting as a permeable pathway within the Blown Sand	3	0.0 (0.0)	5.8 (5.8)	3.7 (3.8)	0.0	0.78 – 1.05	1008 - 1022
DS110	Made Ground/ Tidal Flat Deposits	Organic rich Tidal Flat Deposits	3	0.0 (0.0)	2.1 (2.1)	0.2	0.5 (0.0)	1.5 – 2.83	1008 - 1023
DS111	Made Ground	Organic matter within the made ground	3	0.4 (0.0)	0.5 (0.5)	13.9	0.0	1.53 – Dry	1008 - 1023
DS112	Made Ground/ Tidal Flat Deposits	Organic material within the made ground and organic rich layers within the Tidal Flat Deposits	3	0.0 (0.0)	3.9 (3.9)	1.0	0.7 (0.1)	2.32 – 2.69	1008 - 1023
DS113	Tidal Flat Deposits	Organic rich Tidal Flat Deposits	3	0.0 (0.0)	3.8 (3.8)	9.7	2.4 (0.4)	0.83 – 1.34	1007 - 1020

4.5.3 While monitoring has been undertaken during variable atmospheric and temporal conditions, generally atmospheric pressures of greater than 1000mb have been recorded as a result of monitoring during the summer months. As a result, monitoring undertaken to date may not include data which has been collected during reasonable worst-case conditions.

Borehole Hazardous Gas Flow Rate (Q_{hg})

4.5.4 A preliminary hazardous gas flow rate (Q_{hg}) for each borehole on each individual monitoring event undertaken to date has been calculated in accordance with BS8485:2015. Following an assessment of all the Q_{hg} data for each borehole in conjunction with the conceptual site model, a representative Gas Screening Value (GSV) for each borehole has been derived, together with the resulting implied maximum Characteristic Situation (CS) for each borehole location. The full data is presented within Appendix G.

Worst Case Check

4.5.5 The plausible worst case condition Gas Screening Value (GSV) has also been calculated for each gas by multiplying the maximum recorded steady state flow and maximum total gas concentration (for standpipes located in the same strata at the site), to provide the worst-case implied CS, as summarised in Table 4.7.

4.5.6 Peak instantaneous flows were recorded in DS102 to DS107, DS110, DS112, DS113, WS07 and WS10. These peak flows have been judged to be unrepresentative due to an instantaneous drop in flow rate recorded within the first 15 seconds of the monitoring, suggesting that the elevated flows were caused by the release of borehole pressure upon opening the gas tap. The mechanism for this can be explained by reviewing the groundwater monitoring data, which indicates that groundwater is present within, or in some cases (DS107, DS113 and WS07) above the top of the response zone.

4.5.7 Within DS113, the instantaneous peak flow was recorded as 2.4l/hr and recorded to drop to a steady flow of 0.4l/hr after 15 seconds. Within WS07, the instantaneous peak flow was recorded as 41.4l/hr and recorded to drop to 8.7l/hr after 15seconds and noted to gradually drop to a steady flow rate of 0.1l/hr after 120 seconds.

Table 4.7: Worst Case Check – Ground Gas

Response Zone/ Strata	Max. Steady Flow Rate (l/hr)	Max. Methane Conc. (%)	Max. Carbon Dioxide Conc. (%)	Maximum Methane - Hazardous Flow Rate CH_4 GSV (l/hr) Q_{hgs}	Maximum Carbon Dioxide – Hazardous Flow Rate CO_2 GSV (l/hr) Q_{hgs}	Plausible worst-case CH_4 CS	Plausible worst-case CO_2 CS
Made Ground	0.1	0.4	2.7	0.0004	0.0027	CS1	CS1
Tidal Flat Deposits	0.4	0.1	4.7	0.0004	0.0188	CS1	CS1
Wind Blown Sand	0.1	0.1	3.4	0.0001	0.0034	CS1	CS1
Made Ground/ Tidal Flat Deposits	0.1	1.9	8.5	0.0019	0.0085	CS1	CS1
Made Ground/ Wind Blown Sand	0.1	0.1	5.8	0.0001	0.0058	CS1	CS1

4.5.8 Furthermore, ground gas monitoring undertaken by TEC during a previous phase, dated between 9 May 2022 and 24 May 2022 can be viewed within the previous report *PROJECT DRAGON: PDZ – Exploratory Ground Investigation Report' report ref: 2111006.003.01 Rev D. dated June 2022 and revised in August 2023.*

4.5.9 Within the previous ground gas monitoring and assessment, a worst-case check was undertaken on all the installed boreholes and reported that boreholes with a response zone within the Alluvial Fan Deposits recorded a maximum flow rate of 3.4l/hr, a maximum methane concentration of 81% and a maximum carbon dioxide concentration of 6.7%. The implied Characteristic Situation for the recorded methane was reported as CS3 and for carbon dioxide was reported as CS2.

4.5.10 Within boreholes in which the targeted response zones included made ground and tidal flat deposits both the implied Characteristic Situation for methane and carbon dioxide was reported as CS-1.

Gas Screening Values (GSVs)

4.5.11 It is considered that there is currently insufficient data to adequately characterise the site. The recent initial results indicate the site may be CS1, although it has been noted that the previous ground gas monitoring and assessment indicated an implied Characterisation of CS3 for methane and CS2 for carbon dioxide. However, further monitoring would be recommended (during reasonable worst case temporal conditions) to fully characterise the ground gas regime at the site, taking account of all monitoring data, and to inform the scope of ground gas protection measures required for the proposed development.

4.5.12 Additional ground gas monitoring is currently being undertaken to fully characterise the ground gas regime at the site, a final gas risk assessment will be completed in due course and will and inform the scope of ground gas protection measures required for the proposed development.

4.6 Geophysical Survey

4.6.1 The geophysical test data is presented in Appendix H and summarised below with test locations shown on Figure 7. Further interpretation of the survey results is provided in detail within Section 5 of this report.

Cross-Hole Seismic Survey

4.6.2 The combined P and Sv-wave seismic cross-hole surveys undertaken by Terradat provide seismic velocity information from the surface to a depth of just under 30mbgl. Terradat report that the overall quality of both the P-wave and the Sv-wave was very good to excellent.

4.6.3 The P and Sv-wave velocity profiles are considered to be very consistent between both tested clusters and the overall range of P-wave (~200 to 3500 m/s) and Sv-wave (~100 to 700 m/s) velocities, which are considered to suggest soft to moderately dense and stiff sediments, overlying weak to competent mudstone rock material. The most notable observations are the local velocity variations within the superficial deposits, particularly within the alluvium and the sharp increase in velocity towards the base of the boreholes, which correlates with the transition into the mudstone bedrock.

4.6.4 The derived Poisson's ratios are consistent with the modelled velocities and lithologies encountered. However, a zone of lower Poisson's ratio was recorded between ~15m and 21mbgl within the cobble layer.

4.6.5 The calculation for the Shear (G), Young's (E) and Bulk (K) moduli reveal some variabilities, which are governed to some degree by the local variations in the P and Sv-wave velocities.

Soil Resistivity Survey

4.6.6 Terradat report that the quality of the soil resistivity data was good, and for most of the test locations, the apparent resistivity profiles are consistent and appear to show a near-surface band of high resistivity values (~110 ohm.m) that decreases to around ~5 ohm.m at around 5m depth. Beyond the 5m depth range, the resistivity is relatively steady and suggests a gradual increase to around 15 ohm.m at depth. It is noted that the results reflect the variation in near-surface made ground materials. However, below 8m, the profiles are very similar; the only exception being VES 2A, which displays slightly elevated values. It is uncertain if this is more representative of the local geology or is subject to some form of interference from buried structures.

Cone penetration / Seismic testing

4.6.7 Lankelma provided the results of 4No seismic cone penetration tests with pore pressure measurement (CPTu) and interpret the data providing correlated undrained shear strength, coefficient of volume change, over-consolidation ratio, equivalent SPT N_{60}, peak friction angle, relative density, Young's modulus and SBT descriptions & SBT index Ic (Robertson (1990)) values with depth for each material type.

5 GROUND ENGINEERING

5.1 Proposed Development

5.1.1 The site currently comprises a roughly rectangular disused parcel of land that features a large central concrete slab surrounded by dense overgrown vegetation, situated in part of the dock area owned by Associated British Ports (ABP).

5.1.2 The proposed development is understood to comprise the erection of a Sustainable Aviation Fuel (SAF) production facility with associated structures, access routes, car parking etc. as specified within the statutory planning application). The proposed development layout is present in drawing referenced: Drawing No. 2143.01-IA-ZZ-ST-DR-A-0225. Revision P12, dated 13.10.2023 provided by the Client.

5.1.3 Although indicative single pile resistance requirements have been provided by Technip, no details have been provided to TEC regarding loads for the proposed structures. However, at this preliminary stage, general recommendations with regards to the ground engineering have been provided below.

5.2 Site Preparation

5.2.1 Areas of concrete hardstanding were observed within the central site area, north-eastern boundary and south-eastern site area. It is understood that the existing concrete hardstanding will be removed during the construction works.

5.2.2 No services have been identified within the site itself and understood to only run parallel to the road, Crown Wharf, located north of the site. Notwithstanding this, evidence of assumed services were identified in a number of exploratory hole locations, in the northern part of the site adjacent to Crown Wharf during the current phase of investigation and consideration to these may be required during the construction works.

5.2.3 A number of ecological constraints has been identified on site with significant areas of Japanese Knotweed observed across the majority if the site. A number of areas across the site, particularly within the eastern site area, an invasive species, *Montbretia*, has also been identified.

5.3 UXO Mitigation Measures

5.3.1 The majority of the site has been assessed as a Moderate Risk from German UXBs and as a result, prior to the start of construction, the following recommendations have been made by the appointed UXO specialist for this phase of the works (Brimstone Site Investigation Ltd):

- A UXO Safety Awareness Briefing should be carried out prior to all intrusive works commencing;
- A watching brief of all open excavations;
- A non-intrusive magnetometer survey should undertaken across the site and, in particular, within the areas of undeveloped open ground identified on the WWII mapping;
- Where anomalies are recorded there would be the need for further investigation to confirm/remove the risk. (although it should be noted that the recorded presence of slag within the made ground materials, may reduce the effectiveness of a magnetometer survey); and
- Once a piling layout has been finalised, an intrusive magnetometer survey would be required, Where anomalies are recorded there would be the need for further investigation to confirm/remove the risk.

5.4 Geotechnical Test Data Summary

5.4.1 Laboratory test data are presented Appendix E while in situ test results are presented on the engineering logs (Appendix C). A summary of the data is presented in the following sections.

Made Ground

Density

5.4.2 Density testing undertaken on samples of the Made Ground gave bulk densities in the range of 1.71 Mg/m^3 to 1.81 Mg/m^3, with an average of 1.76 Mg/m^3 being determined.

Plasticity

5.4.3 Atterberg Limit tests were undertaken on 6No. samples of the made ground and are summarised in Table 5.1 below.

Table 5.1: Summary of Plasticity Test Results – Made Ground

Moisture Content (%)	Plasticity Index (%)	% passing 425µm sieve	Modified Plasticity Index(1) (%)	Volume Change Potential(1)
16 – 48	13 – 34	34 – 98	4.8 – 33	Non-Shrinkable to Medium

Note 1: Based on recommendations provided in the NHBC Standard

Particle Size Distribution

5.4.4 Particle Size Distribution (PSD) testing was undertaken on 9No. samples of the more granular made ground material with a clay component of 1.1% to 7.9%, a silt component of 7.4% and 22.3%, sand component of 29.22% and 82.06%, a gravel component of 14.67% and 49.07% and a cobble content of 0.0% and 25.4% recorded.

Soil Strength

5.4.5 As required by EN 1990:2002, material strength properties are introduced into design as characteristic values with a prescribed probability of not being exceeded in a hypothetically unlimited test series. In this case a confidence of level of 90% has been used. Soil strength data for the made ground are present in Table 5.2 below. Standard corelations with the SPT data are provided in Appendix O.

Table 5.2: Summary of Strength Data – Made Ground

Test Data	Number of Tests	Range of Results	Derived Design Strength Parameter Values
SPT uncorrected N value	59	0 - >50	Undrained Strength(1) 90% Confidence value, Su = 18.0kN/m^2 (Average 18.5kN/m^2)
N_{60}		0 – 159.6(2)	Effective angle of shearing resistance(3) 90% Confidence value, ϕ' = 25.0° (Average 25.9°)
$(N_1)_{60}$		0 – 668.3(2)	
SCPT - N_{60}	-	4 - 38	Typical value - N_{60} = 8
SCPT – Undrained strength, Su	-	10 - 60kN/m^2	Typical value Su = 40kN/m^2
SCP - Effective angle of shearing resistance, ϕ'	-	33° - 50°	Typical value ϕ' = 35°
Correlation with Plastic Limit(4)	41	22.9° – 28.1°13% – 34%	Effective angle of shearing resistance 90% Confidence value, ϕ' = 25.9° (Average 26.0°)
Correlation with Liquidity Index(5)	41	7.5 - 105kN/m^2-0.2 – 0.8	Undrained Strength 90% Confidence value, Su = 26.3kN/m^2 (Average minimum 21.0kN/m^2) (Average maximum 34.1kN/m^2)

Notes:
1. Stroud (1975) for cohesive materials
2. Extrapolated data
3. Peck, Hanson and Thornburn (1974) and Wolff (1989)
4. BS8002.2015
5. Carter and Bentley (1991)

Deformability

5.4.6 Standard correlations with the SPT data have been used to establish a coefficient of volume compressibility for the cohesive made ground materials (Stroud and Butler (1975)) and the deformability of the more granular made ground materials (Stroud (1989) and Begemann (1974)). Correlated parameters for the deformability of the soils that are given in Table 5.3 below.

Table 5.3: Summary of Deformability – Made Ground

Test Data	Number of Tests	Range of Results	Derived Design Strength Parameter Values
SPT uncorrected N value	10	0 – 36 (Average 6.0)	Coefficient of volume compressibility, m_v = 0.25 – 2.22[(1)] m^2/MN (Average 0.70m^2/MN)
Undrained Modulus[(2)], E_u	49	0 – 43MPa43Mpa	8.5MPa
Drained Modulus[(3)], E'	49	0 – 43.7MPa	7.3MPa
SCPT - Coefficient of volume compressibility, m_v	-	0.02 – 0.5 m^2/MN	Typical value m_v = 0.4m^2/MN
SCPT – Young's Modulus	-	10 – 220MPa	Typical value E' = 25MPa

Notes: 1: Stroud and Butler (1975)
2. CIRIA 134
3. Stroud (1989)

Thermal Conductivity

5.4.7 Thermal Conductivity testing was undertaken on 3No. cohesive made ground samples. A thermal conductivity of between 0.61W/(mk) and 1.66 W/(mk) with a thermal resistivity of 0.78(mk)/W and 1.66 was recorded.

Tidal Flat Deposits

Density

5.4.8 Density testing undertaken on samples of the Tidal Flat Deposits gave bulk densities in the range of 1.4 Mg/m^3 (Peat) to 2.18 Mg/m^3, with an average of 1.76 Mg/m^3 being determined.

5.4.9 Estimated densities derived from the cross-hole seismic survey indicate values of between 1.08 Mg/m^3 and 1.78 Mg/m^3 for these materials.

Plasticity

5.4.10 Atterberg Limit tests were undertaken on 19No. cohesive samples of the Tidal Flat Deposits, furthermore, during the previous phase undertaken 13No. samples were tested. A summary of this data is presented in Table 5.4 below.

Table 5.4: Summary of Plasticity Test Results – Tidal Flat Deposits

Moisture Content (%)	Plasticity Index (%)	% passing 425µm sieve	Modified Plasticity Index[(1)] (%)	Volume Change Potential[(1)]
Current Phase:				
29 – 52[(2)]	15 – 73	80 – 100	15.0– 33.0[(2)]	Low to Medium
Previously Reported:				
22 – 58	10 - 24	86 – 100	10 – 22.1	Low to Medium

Notes: 1: Based on recommendations provided in the NHBC Standard
2: Excluding results for Peat deposits

Soil Organic Matter

5.4.11 Soil organic matter was tested within 4No. samples of the peat rich cohesive material with total organic content (TOC) recorded between 5.4% and 20%. In addition, 3No. samples of the cohesive deposits was tested and recorded a TOC of between 2.0% and 3.3%. A single sample of the more granular deposits of the Tidal Flat Deposits was tested and recorded a TOC of 0.6%.

5.4.12 Within the previous phase carried out by TEC, 8No. samples of the Tidal Flat Deposits between depths of 3.9m and 12mbgl were tested and recorded a Soil Organic Matter of between 2.6% and 15%

Particle Size Distribution

5.4.13 Particle Size Distribution (PSD) testing was undertaken on 6No. samples of the more cohesive deposits with a clay component of 9.8% to 19%, a silt component of 46.2% and 66.3%, sand component of 14.33% and 37.67%, a gravel component of 0.28% and 18.35% and no cobble content recorded.

5.4.14 In addition, 2No. samples comprising a more granular material recorded a clay component of 8.5% to 10.2%, a silt component of 17.6% and 23.6%, sand component of 60.77% and 65.13%, a gravel component of 2.79% and 11.48% and no cobble content.

5.4.15 Within the previous phase of works carried out by TEC, the more granular deposits from the Tidal Flat Deposits were tested and recorded a fines component (>0.063mm) of between 4.7% and 8.7%, a sand component of between 30.4% and 90.9% and a gravel component of 0.7% and 64.8%.

Soil Strength

5.4.16 As required by EN 1990:2002, material strength properties are introduced into design as characteristic values with a prescribed probability of not being exceeded in a hypothetically unlimited test series. In this case a confidence of level of 90% has been used. Soil strength data for the made ground are present in Table 5.5 below. Standard corelations with the SPT data are provided in Appendix O.

Table 5.5: Summary of Strength Data – Tidal Flat Deposits

Test Data	Number of Tests	Range of Results	Derived Design Strength Parameter Values
SPT uncorrected N value	122	0 – 36 (Average 6.0)	Undrained Strength(1) 90% Confidence value 26.6kN/m^2 (Average 26.9kN/m^2)
N_{60}		0 – 33 (Average 3.5)	
$(N_1)_{60}$		0 – 39.5 (Average 5.6)	
Hand shear vane	30	1.3 – 28.4	Undrained Strength 90% Confidence value 9.5kN/m^2 (Average 9.7kN/m^2)
In situ vane tests	57	9.0 – 91.0	Undrained Strength 90% Confidence value 39.2kN/m^2 (Average 39.5kN/m^2)
SCPT - N_{60}	-	3 - 14	Typical value - N_{60} = 4
SCPT – Undrained strength, S_u	-	10 - 140kN/m^2	Typical value S_u = 15 - 20kN/m^2
Lab Triaxial test data	15	4.3 – 52.0kN/m^2	Undrained Strength 90% Confidence value 18.0kN/m^2 (Average 18.46kN/m^2)
Correlation with Plastic Limit(3)	40	Plasticity Index 15% – 73%	Effective angle of shearing resistance 90% Confidence value, ϕ' = 23.8° (Average 23.9°)

Test Data	Number of Tests	Range of Results	Derived Design Strength Parameter Values
Correlation with Liquidity Index[4]	40	Liquidity Index 0.4 – 1.6	Undrained Strength 90% Confidence value Su = 19.2kN/m^2 (Average minimum 13.8kN/m^2) (Average maximum 26.4kN/m^2)

Notes: 1. Stroud (1975) for cohesive materials
2. Peck, Hanson and Thornburn (1974) and Wolff (1989) for granular soils
3. BS8002.2015
4. Carter and Bentley (1991)

Compressibility and Deformability

5.4.17 Oedometer testing was undertaken on samples of the Tidal Flat Deposits to determine the compressibility and consolidation characteristics of these materials. In addition, standard correlations with the SPT data have been used to establish appropriate design values.

5.4.18 In addition, the geophysical test results provide correlated data for the deformability of the soils that are also given in Table 5.6.

Table 5.6: Summary of Deformability Data – Tidal Flat Deposits

Test Data	Number of Tests	Range of Results	Derived Design Strength Parameter Values
SPT uncorrected N value	122	0 – 36 (Average 6.0)	Coefficient of volume compressibility, m_v = 0.06 – 2.22[1] m^2/MN (Average 0.65m^2/MN)
Oedometer Tests at 100kN/m^2	12	m_v = 0.44 -1.65 m^2/MN c_v = 0.35 – 2.0 m^2/yr	Coefficient of volume compressibility, Average m_v = 0.83m^2/MN Coefficient of Consolidation, Average c_v = 0.96m^2/yr
Undrained Modulus, E_u[2]	122	0 -36 MPa	Average E_u = 3.5MPa
Undrained Modulus, E_u[2]	122	0 -36 MPa	Average E_u = 3.5MPa
SCPT - Coefficient of volume compressibility, mv	-	0.04 – 0.9 m^2/MN	Typical value mv = 0.7m^2/MN

Notes: 1: Stroud and Butler (1975)
2. CIRIA 134

Dynamic Geotechnical Parameters

5.4.19 The dynamic data derived from the cross-hole geophysical survey gave the following design parameters:

Table 5.7: Summary of Dynamic parameters – Alluvial Fan Deposits

Density (kN/m^3)	Velocity – P (m/s)	Velocity – S (m/s)	Poisson Ratio	Shear, G (MPa)	Young's, E (MPa)	Bulk, K (MPa)
1.23 – 1.79 Average 15.1	688 – 1703 Average 1176	122 - 212 Average 152	0.47 – 0.50 Average 0.49	15 – 64 Average 35	46 – 191 Average 103	769 – 5035 Average 2166

5.4.20 A ratio of 8.0 was recorded for Vp/Vs for the Tidal Flat Deposits.

Thermal Conductivity

5.4.21 Thermal Conductivity testing was undertaken on 2No. cohesive samples of the Tidal Flat Deposits and recorded a thermal conductivity of between 1.64W/(mk) and 2.3 W/(mk), with a thermal resistivity of 0.43(mk)/W and 0.61 (mk)/W recorded.

Wind Blown Sand

Density

5.4.22 Density testing undertaken on samples of the Wind Blown Sands gave bulk densities in the range of 1.87 Mg/m^3 to 1.95 Mg/m^3, with an average of 1.91 Mg/m^3 being determined.

5.4.23 Estimated densities derived from the cross-hole seismic survey indicate values of between 1.28 Mg/m^3 and 1.85 Mg/m^3 for these materials.

Soil Organic Matter

5.4.24 Soil organic matter was tested within a single sample of the granular deposits and recorded a total organic content (TOC) of 0.5%.

5.4.25 It should be noted that testing within the uppermost materials of the Alluvial Fan Deposits recorded total organic content (TOC) and soil organic matter contents of between 3.5% and 4.6%. it is considered that this would represent a mix of the tidal Flat Deposits and the alluvial Fan deposits.

Particle Size Distribution

5.4.26 Particle Size Distribution (PSD) testing was undertaken on 5No. samples of the granular deposits with a clay component of 0.2% to 0.7%, a silt component of 0.6% and 2.9%, sand component of 96.39% and 99.19%, no gravel component and a no cobble content recorded.

5.4.27 Within the previous phase of works carried out by TEC, the Wind Blown Sands were tested and recorded a fines component (>0.063mm) of between 1.9% and 25.4%, a sand component of between 73.3% and 97.8% and a gravel component of 0.3% and 22.3%.

Soil Strength

5.4.28 As required by EN 1990:2002, material strength properties are introduced into design as characteristic values with a prescribed probability of not being exceeded in a hypothetically unlimited test series. In this case a confidence of level of 90% has been used. Soil strength data for the made ground are present in Table 5.8 below. Standard corelations with the SPT data are provided in Appendix O.

Table 5.8: Summary of Strength Data – Wind Blown Sands

Test Data	Number of Tests	Range of Results	Suggested Strength Parameter
SPT uncorrected N value	29	1 – 41 Average 10.1	Effective angle of shearing resistance, ϕ' = 26.9°– 39.5°(1) 90% Confidence value, ϕ' = 29.3° (Average 30.3°)
N_{60}		0.8 – 33.8 Average 8.7	
$(N_1)_{60}$		1.1 – 41.7 (Average 11.9)	
Shear box tests	To follow		

Notes: 1. Peck, Hanson and Thornburn (1974) and Wolff (1989)

Deformability

5.4.29 Standard correlations with the SPT data have been used to establish the deformability of the Wind Blown Sands (Stroud (1989) and Begemann (1974)). Based on these correlations, deformability parameters are given in Table 5.9.

Table 5.9: Summary of Deformability – Wind Blown Sands

Test Data	Number of Tests	Range of Results	Derived Design Parameter Values
SPT uncorrected N value	29	1 – 41 (Average 10.1)	Drained Modulus(1), E' = 8.7MPa

Notes: 1.CIRIA 134

Dynamic Geotechnical Parameters

5.4.30 The dynamic data derived from the cross-hole geophysical survey gave the following design parameters:

Table 5.10: Summary of Dynamic parameters – Wind Blown Sands

Density (kN/m^3)	Velocity – P (m/s)	Velocity – S (m/s)	Poisson Ratio	Shear, G (MPa)	Young's, E (MPa)	Bulk, K (MPa)
1.28 – 1.85 Average 16.4	214 – 1206 Average 672	18 – 137 Average 113	0.39 – 0.50 Average 0.47	15 – 33 Average 23	45 – 98 Average 68	192 – 2097 Average 876

5.4.31 A ratio of 5.9 was recorded for Vp/Vs for the Wind Blown Sands.

Thermal Conductivity

5.4.32 Thermal Conductivity testing was undertaken on a single granular sample of the Wind Blown Sand, which recorded a thermal conductivity of 1.67 W/(mk), with a thermal resistivity of 0.60(mk)/W recorded.

Alluvial Fan Deposits

Density

5.4.33 Density testing undertaken on samples of the Alluvial Fan Deposits gave bulk densities in the range of 1.92 Mg/m^3 to 2.31 Mg/m^3, with an average of 2.06 Mg/m^3 being determined.

5.4.34 Estimated densities derived from the cross-hole seismic survey indicate values of between 1.16 Mg/m^3 and 2.07 Mg/m^3 for these materials.

Particle Size Distribution

5.4.35 Particle Size Distribution (PSD) testing was undertaken on 7No. samples of the granular deposits with a clay component of 0.2% to 2.68%, a silt component of 0.5% and 10.5%, sand component of 5.55% and 23.87%, a gravel component of 62.05% and 82.3% and a cobble content of 0.0% and 23.8% recorded.

5.4.36 Within the previous phase of works carried out by TEC, the more granular deposits from the Alluvial fan Deposits were tested and recorded a fines component (>0.063mm) of between 1.4% and 57.3%, a sand component of between 14.9% and 72.3% and a gravel component of 0.0% and 79.4%.

Soil Strength

5.4.37 As required by EN 1990:2002, material strength properties are introduced into design as characteristic values with a prescribed probability of not being exceeded in a hypothetically unlimited test series. In this case a confidence of level of 90% has been used. Soil strength data for the made ground are present in Table 5.11 below.

Table 5.11: Summary of Strength Data - Alluvial Fan Deposits

Test Data	Number of Tests	Range of Results	Suggested Strength Parameter
SPT uncorrected N value	152	0 - >50	Effective angle of shearing resistance, $\phi' = 27.1° – 62.5°$[2] 90% Confidence value, $\phi' = 43.2°$ (Average 43.8°)
N_{60}		7.4 – 212.8[1] Average 104.5	
$(N_1)_{60}$		6.2 – 170.4[1] (Average 77.3)	

Notes: 1. Extrapolated data
2. Peck et al / Wolff

Deformability

5.4.38 Standard correlations with the SPT data have been used to establish the deformability of the Alluvial Fan Deposits (Stroud (1989) and Begemann (1974)). Based on these correlations, deformability parameters are given in Table 5.12.

Table 5.12: Summary of Deformability - Alluvial Fan Deposits

Test Data	Number of Tests	Range of Results	Derived Design Parameter Values
SPT uncorrected N value	152	7 – 212 (Average 104.5)	Drained Modulus(1), E' = 104.5MPa

Notes: 1.CIRIA 134

Dynamic Geotechnical Parameters

5.4.39 The dynamic data derived from the cross-hole geophysical survey gave the following design parameters:

Table 5.13: Summary of Dynamic parameters – Alluvial Fan Deposits

Density (kN/m^3)	Velocity – P (m/s)	Velocity – S (m/s)	Poisson Ratio	Shear, G (MPa)	Young's, E (MPa)	Bulk, K (MPa)
11.6 – 21.2 Average 17.5	602 – 2478 Average 1022	140 – 307 Average 245	0.40 – 0.50 Average 0.45	34 – 176 Average 108	102 – 515 Average 312	488 – 12683 Average 2033

5.4.40 A ratio of 4.3 was recorded for Vp/Vs for the Alluvial Fan Deposits.

Coal Measures

Densities

5.4.41 Estimated densities derived from the cross-hole seismic survey indicate values of between 1.42 Mg/m^3 and 2.25 Mg/m^3 for these materials.

Rock Strength

5.4.42 A summary of the geotechnical laboratory test data for the Coal Measures is provided in Table 5.14 below.

Table 5.14: Summary of Geotechnical Test Data – Coal Measures

Point Load Test Results				
Strata (depth)	**Number of Tests**	**Is (50)**	**Approximate Correlated Undrained Compressive Strength(1) (qu, Mpa)**	**Rock Strength Classification(2)**
South Wales Middle Coal Measures Formation – Siltstone and Mudstone with Rare thin Bands of Coal (32 – 44m): Diametral	23	0.14 – 1.79 (Average 0.77)	3.32 – 42.42 (Average 18.23)	Very weak to medium strong
South Wales Middle Coal Measures Formation – Siltstone and Mudstone with Rare thin Bands of Coal (32 – 44m): Axial	25	0.42 – 2.7 (Average 1.18)	9.95 – 63.99 (Average 27.93)	Weak to medium strong
South Wales Middle Coal Measures Formation – Siltstone and Mudstone with Rare thin Bands of Coal (32 – 44m): Irregular Lump	7	0.42 – 1.1 (Average 0.74)	9.95 – 26.07 (Average 17.47)	Weak to medium strong
South Wales Middle Coal Measures Formation – Sandstone with Interbedded Siltstone (*BH117 only*) (27 – 42m): Diametral	9	0.66 – 3.96 (Average 2.37)	15.65 – 93.85 (Average 56.14)	Weak to very strong
South Wales Middle Coal Measures Formation – Sandstone with Interbedded Siltstone (*BH117 only*) (27 – 42m): Axial	6	0.92 – 7.26 (Average 3.95)	21.80 – 172.06 (Average 93.62)	Weak to very strong

Uniaxial Compression Test Results				
Strata (depth)	**Number of Tests**	**Bulk Density (Mg/m^3)**	**Uniaxial Compression Strength(1) (qu, Mpa)**	**Rock Strength Classification(2)**
South Wales Middle Coal Measures Formation – Siltstone and Mudstone with Rare thin Bands of Coal (32 – 44m)	6	2.49 - 2.89	3.1 - 43	Very weak to medium strong
South Wales Middle Coal Measures Formation – Sandstone with Interbedded Siltstone (*BH117 only*) (27 – 42m)	4	2.62 – 2.66	31 - 42	Medium strong

Note 1: BS5930:2015/ BS EN ISO 14688-2:2004
Note 2: Based on published correlations (Broch and Franklin, 1972).

Dynamic Geotechnical Parameters

5.4.43 The dynamic data derived from the cross-hole geophysical survey gave the following design parameters:

Table 5.15: Summary of Dynamic parameters – Alluvial Fan Deposits

Density (kN/m^3)	**Velocity – P (m/s)**	**Velocity – S (m/s)**	**Poisson Ratio**	**Shear, G (MPa)**	**Young's, E (MPa)**	**Bulk, K (MPa)**
14.1 – 20.7 Average 17.9	1002 – 3559 Average 2244	218 – 756 Average 449	0.45 – 0.49 Average 0.48	85 – 1052 Average 408	251 – 3097 Average 1204	1628 – 22528 Average 9601

5.4.44 A ratio of 5.0 was recorded for Vp/Vs for the Coal Measures.

5.5 Suggested Design Parameters

5.5.1 In accordance with EC-7, characteristic geotechnical parameters shall be selected as a cautious estimate of the value affecting the occurrence of the limit state. As a result, the limit states where applied to these characteristic values refer mainly to the failure of foundations. The estimation of these values is an application of engineering judgment and experience in similar situations together with an evaluation of data and is often a cautious estimate of the mean of a range of values shown in the previous sections of this report.

5.5.2 Based on the findings of the ground investigation works to-date, the following design parameters are suggested for each material type Table 5.16 to Table 5.19).

Table 5.16: Indicative Design Parameters – Made Ground

Parameter		MADE GROUND	
		Silty Sand/sandy gravel	Silty Clay / Sandy Clay
Bulk Density (Mg/m^3)		1.90	
Particle density (Mg/m^3)		2.60	
Plasticity Index (%)		-	13 – 34
% passing 425µm sieve		-	34 – 98
Volume change potential		-	Non-Shrinkable to Medium
Modified Plasticity Index (%)		-	4.8 - 33
pH Value		8.2 – 9.2	7.8 – 8.2
Particle Size Distribution	% Very Coarse	0.0 – 25.40	-
	% Gravel	14.67 – 49.07	-
	% Sand	29.22 – 82.06	-
	% Silt	7.40 – 22.30	-
	% Clay	1.10 – 7.90	-
Total Organic Content (TOC)		2.2 - 6.0	15.0
Total Sulphate as SO_4 (mg/l)		62.4 – 1507.02	
Water Soluble SO_4 (mg/l in soil)		20 - 1460	
Uncorrected SPT 'N' value		8.5	
N_{60}		7.4	3.5
$(N_1)_{60}$		13.5	5.5
Undrained strength (kN/m^2)		-	18
Shearing resistance, ϕ'		25.5°	-
Undrained Modulus, E_u (MPa)		-	8.5
Drained Modulus, E' (MPa)		7.4	-
Coefficient of Volume Compressibility, m_v (m^2/MN)		-	0.7

Table 5.17: Indicative Design Parameters – Tidal Flat Deposits

Parameter		TIDAL FLAT DEPOSITS		
		Silty Sand	**Silty Clay / Sandy Clay**	**Peat / organic clay**
Bulk Density (Mg/m^3)		1.76		
Particle density (Mg/m^3)		2.54		
Plasticity Index (%)		19	11 – 39	63 – 112
% passing 425µm sieve		95	80 – 100	80 - 100
Volume change potential		Low	Low to Medium	High to Very High
Modified Plasticity Index (%)		18.1	10.7 – 39	50.4 - 104
pH Value		8.4 – 8.7	7.6 – 8.7	7.1 – 8.8
Particle Size Distribution	% Very Coarse	0.00	0.00	-
	% Gravel	2.79 – 11.48	0.28 – 18.35	-
	% Sand	59.40 - 65.13	14.33 – 37.67	-
	% Silt	17.60 – 31.00	46.20 – 66.30	-
	% Clay	8.50 – 10.20	9.80 – 19.00	-
Total Organic Content (TOC) %		0.6	2.0 – 3.3	5.4 – 20.0
Total Sulphate as SO_4 (mg/l)		176.7 – 5371.6		
Water Soluble SO_4 (mg/l in soil)		3.3 - 1230		
Uncorrected SPT 'N' value		6		
N_{60}		3.5		
$(N_1)_{60}$		5.6		
Shearing resistance, ϕ'		24.0˚		
Coefficient of Volume Compressibility, m_v (m^2/MN)		0.65		
Undrained Modulus, E_u (MPa)		3.5		

Table 5.18: Indicative Design Parameters – Wind Blown Sands

Parameter		WIND BLOWN SAND
		Sand
Bulk Density (Mg/m^3)		1.90
Particle density (Mg/m^3)		2.66
Plasticity Index (%)		-
% passing 425µm sieve		-
Volume change potential		Non-Shrinkable
Modified Plasticity Index (%)		-
pH Value		8.5 – 8.6
Particle Size Distribution	% Very Coarse	0.00
	% Gravel	0.00
	% Sand	96.39 – 99.19
	% Silt	0.60 – 2.90
	% Clay	0.20 – 0.70
Total Organic Content (TOC) %		0.5
Total Sulphate as SO_4 (mg/l)		20
Water Soluble SO_4 (mg/l in soil)		2.6 – 43
Uncorrected SPT 'N' value		10.1
N_{60}		8.7
$(N_1)_{60}$		11.9
Undrained strength (kN/m^2)		-
Drained cohesion, c' (kN/m^2)		0
Shearing resistance, ϕ'		29.4°
Drained Modulus, E' (MPa)		8.7

Table 5.19: Indicative Design Parameters – Alluvial Fan Deposits

Parameter		ALLUVIAL FAN DEPOSITS	
		Gravelly Sand	Sandy Gravel
Bulk Density (Mg/m^3)		2.06	
Particle density (Mg/m^3)		2.68	
Plasticity Index (%)		-	-
% passing 425µm sieve		-	-
Volume change potential		-	-
Modified Plasticity (%)		-	-
pH Value		8.2 – 8.9	7.5 – 9.3
Particle Size Distribution	% Very Coarse	0.00 – 23.80	
	% Gravel	62.05 – 90.68	
	% Sand	5.55 – 23.87	
	% Silt	0.50 - 10.50	
	% Clay	0.20 - 2.68	
Total Organic Content (TOC)		4.6 (localised upper boundary)	3.5 (localised upper boundary)
Total Sulphate as SO_4 (mg/l)		5856.42	
Water Soluble SO_4 (mg/l in soil)		22 - 853	
Uncorrected SPT 'N' value		>50	
N_{60}		104.5	
$(N_1)_{60}$		77.3	
Drained cohesion, c' (kN/m^2)		0	
Shearing resistance, ϕ'		43.1°	
Drained Modulus, E' (MPa)		104.5	

5.6 Foundations

5.6.1 It is considered that conventional foundations for all but very lightly loaded structures are unlikely to be suitable for the proposed development without deep soil improvement and it is considered likely that a piled foundation will be required for the more heavily loaded structures.

Ground Improvement

Pavement / General Formation Level

5.6.2 As a result of the recorded generally poor ground conditions recorded across the site together with the need to provide a level development area, it may be more economical to treat the site won materials to allow them to be easily incorporated into the earthworks and it is considered that while the advice of a specialist ground improvement contractor should be sought the materials could be improved using cement stabilisation to provide a suitable formation level that potentially may be suitable as a piling platform.

5.6.3 It should be noted that due to the low clay content of the Wind Blown Sand that tends to form the higher ground in the south and south-west of the site and the generally high recorded organic content of both the Tidal Flat Deposits and the Made Ground, lime stabilisation is considered unlikely to be appropriate.

Structures

5.6.4 Estimated settlements have been derived using Rocscience's SETTLE3D based on the requirements of the Technip Specification and are presented in Appendix K and are given below in Table 5.20 to Table 5.22. The assessment assumes an infinitely rigid footing/slab of varying size as specified by Technip and has been modelled assuming no Wind Blown Sands, 5m of Wind Blown Sands and the presence of localised ground improvement where no settlement (immediate or primary) occurs in the top 5m.

Table 5.20: Anticipated Settlement (No Wind Blown Sands modelled)

Foundation Size (m)	Settlement (mm)				
	0kN/m²	25kN/m²	50kN/m²	100kN/m²	200kN/m²
0.6m x 0.6m	0	10.9	21.8	43.5	87.0
1m x 1m	0	17.1	34.2	68.4	137.0
2m x 2m	0	31.3	62.7	125.4	250.7
3m x 3m	0	43.7	87.5	175.0	349.9
5m x 5m	0	65.7	130.6	259.6	519.2
7.5m x 7.5m	0	88.4	176.8	353.5	707.0
10m x 10m	0	105.7	211.3	422.7	845.4

Table 5.21: Anticipated Settlement (Wind Blown Sands modelled to 5m depth)

Foundation Size (m)	Settlement (mm)				
	0kN/m²	25kN/m²	50kN/m²	100kN/m²	200kN/m²
0.6m x 0.6m	0	1.1	2.1	4.2	8.4
1m x 1m	0	2.2	4.5	9.0	17.9
2m x 2m	0	6.5	13.1	26.1	52.4
3m x 3m	0	13.3	26.7	53.4	106.7
5m x 5m	0	26.1	52.1	104.1	208.6
7.5m x 7.5m	0	40.9	81.8	163.6	327.3
10m x 10m	0	53.4	106.9	213.8	427.6

Table 5.22: Anticipated Settlement (Ground Improvement modelled to 5m depth)

Foundation Size (m)	Settlement (mm)				
	0kN/m²	25kN/m²	50kN/m²	100kN/m²	200kN/m²
0.6m x 0.6m	0	1.7	3.3	6.6	13.2
1m x 1m	0	3.2	6.4	12.8	25.7
2m x 2m	0	8.4	16.8	33.6	67.2
3m x 3m	0	14.7	29.5	59.0	117.9
5m x 5m	0	28.2	56.5	112.9	225.8
7.5m x 7.5m	0	44.1	88.2	176.4	352.7
10m x 10m	0	57.4	114.8	229.7	459.4

5.6.5 In addition, Moduli of Sub-grade Reaction have been calculated for each soil model and are presented in Appendix K. A summary of the derived moduli of sub-grade reaction is given in Table 5.23 below.

Table 5.23: Modulus of Sub-Grade Reaction

Foundation Size[1] (m)	Modulus of Sub-Grade Reaction (Total) (kPa/m)		
	Wind Blown Sands	No Wind Blown Sands	Ground Improvement (5m depth)
0.6m x 0.6m	11072	1304	28310
1m x 1m	5616	862	10182
2m x 2m	2032	483	2747
3m x 3m	1083	340	1318
5m x 5m	490	227	587
7.5m x 7.5m	322	172	347
10m x 10m	238	142	251

5.6.6 As a result of the anticipated large settlements, even when considering a shallow ground improvement (ie soil mixing, stone or concrete column etc), it is considered that all but very lightly loaded structures will require either deep ground improvement or a piled foundation.

5.6.7 Soil mixed columns may be a viable option to improve the general bearing resistance of the ground and may be single or overlapping column where a cementitious binder is introduced into the peat, silts and soft clays to produce a 'soilcrete'.

5.6.8 It should be noted that localised contamination, including the presence of Japanese Knotweed, has been identified across the site and therefore the requirements of Natural Resources Wales (NRW) will need to be taken into account when determining the suitability of soil mixing as a viable ground improvement technique at the site.

Piled Foundations

5.6.9 While details of design loads have not been provided to TEC, it is understood that design pile resistance of 600kN and 1000kN are required in compression. In addition, it is understood that for some of the structures high shear loads are calculated in excess of that provided by the weight of the foundation and therefore the piles will be required to work in tension.

5.6.10 It is understood that at this stage a Fundex pile system is proposed by Technip which comprises a full section cast-in-place reinforced concrete soil displacement pile, installed by torque and down pressure and is free of vibration and with no piledriving noise. Notwithstanding this, it is suggested that a specialist piling contractor should be consulted regarding the piling options and detailed design of most appropriate option.

5.6.11 As a result of the potentially high loads imposed, it is considered that pile groups may be required to support the proposed structures, although the exact configuration will be dependent on the pile type, depth and diameter (and potentially on the construction type). While full details of the proposed loads have not been provided as part of the current assessment, for budgetary and indicative purposes only, anticipated pile resistances, calculated using Oasys PILE, for a single bored pile to a depth of up to 2m, 4m and 5m below the top of Alluvial Fan Deposits when assuming the absence of Wind Blown Sands, have been provided in Table 5.24. In addition, pile resistances when working in tension are provided below.

Table 5.24: Summary of Pile Resistances (excluding WBS)

410mm Pile Diameter			510mm Pile Diameter	
Depth in Alluvial Fan Deposits (m)	Compression	Tension	Compression	Tension
2m	1065kN/m^2	90[1]kN/m^2	1625kN/m^2	110[2]kN/m^2
4m	1840kN/m^2	750kN/m^2	2710kN/m^2	820kN/m^2
5m	2710 kN/m^2	1290 kN/m^2	3160 kN/m^2	1310 kN/m^2

Notes 1. Increasing by approximately 330kN/m embedment
2. Increasing by approximately 400kN/m embedment

5.6.12 When including the presence of the Wind Blown Sands, typically recorded to an elevation of 2.5mAOD, the pile resistances in both tension and compression, calculated using Oasys PILE for a single bored pile to a depth of up to 4m below the top of Alluvial Fan Deposits are provided in Table 5.25 below.

Table 5.25: Summary of Pile Resistances (including WBS)

410mm Pile Diameter			510mm Pile Diameter	
Depth in Alluvial Fan Deposits (m)	**Compression**	**Tension**	**Compression**	**Tension**
2m	1200kN/m^2	190$^{(1)}$kN/m^2	1795kN/m^2	240$^{(2)}$kN/m^2
4m	1945kN/m^2	870kN/m^2	2850kN/m^2	1080kN/m^2
5m	2280kN/m^2	1210kN/m^2	3300kN/m^2	1500kN/m^2

Notes 1. Increasing by approximately 340kN/m embedment
2. Increasing by approximately 420kN/m embedment

5.6.13 It should be noted that the average top of the Alluvial Fan Deposits has been taken at -4.5mAOD, although it can be seen to vary between approximate elevations of -2.5mAOD and -8.0mAOD (Figure 6).

5.6.14 Further, it should be noted that potential negative skin friction from the materials overlying the Alluvial Fan deposits has not been included within the model as the inclusion of the anticipated low additional pressures beyond that of the structures, i.e., derived from changes in level, pavement construction etc, to be overly conservative. However, for completeness calculated pile resistances when including maximum negative skin frictions have been modelled and are included in Appendix J. Pile resistance including negative skin friction are provided below in Table 5.26 and Table 5.27.

Table 5.26: Summary of Pile Resistances (excluding WBS)

410mm Pile Diameter			510mm Pile Diameter	
Depth in Alluvial Fan Deposits (m)	**Compression**	**Tension**	**Compression**	**Tension**
2m	935kN/m^2	0$^{(1)}$kN/m^2	1460kN/m^2	0$^{(2)}$kN/m^2
4m	1710kN/m^2	630kN/m^2	2550kN/m^2	800kN/m^2
5m	2580kN/m^2	990kN/m^2	3000kN/m^2	1200kN/m^2

Notes 1. Increasing by approximately 330kN/m embedment
2. Increasing by approximately 400kN/m embedment

5.6.15 When including the presence of the Wind Blown Sands, typically recorded to an elevation of 2.5mAOD, and potential negative skin friction, the pile resistances in both tension and compression, calculated using Oasys PILE for a single bored pile to a depth of up to 4m below the top of Alluvial Fan Deposits are provided in Table 5.27 below.

Table 5.27: Summary of Pile Resistances (including WBS)

410mm Pile Diameter			510mm Pile Diameter	
Depth in Alluvial Fan Deposits (m)	**Compression**	**Tension**	**Compression**	**Tension**
2m	910kN/m^2	0$^{(1)}$kN/m^2	840kN/m^2	0$^{(2)}$kN/m^2
4m	1655kN/m^2	680kN/m^2	1590kN/m^2	840kN/m^2
5m	1990kN/m^2	1020kN/m^2	1925kN/m^2	1260kN/m^2

Notes 1. Increasing by approximately 340kN/m embedment
2. Increasing by approximately 420kN/m embedment

5.6.16 Calculations to Eurocode 7 are included in Appendix J for comparison and as anticipated show general agreement with the British standard approach giving piles resistance in both compression and tension some 5% to 10% higher.

Impact of Potential Contamination

5.6.17 The method of piling must avoid the creation of a new potential contamination migration pathway and, given the site's environmental setting and the presence of significant thicknesses of made ground as well as localised hydrocarbon impacted ground and the presence of potentially contaminated groundwater, a Foundation Works Risk Assessment is likely to be required by NRW.

5.6.18 It should be noted that localised hydrocarbon impact of soils/groundwater was recorded at (U1/DS112) recorded Diesel Range Organics (C10 – C25) within water samples and as the strength gain of concrete in contact with hydrocarbon impacted soils and or groundwater may be reduced by 20% to 25%, these potential effects may need to be considered within the design.

5.7 Frost Susceptibility

5.7.1 While frost susceptibility testing in accordance with BS 812:Part 124:2009 & SHW Clause 801 was not required as part of the current commission, the results of the particle size distribution testing (Appendix E), indicate the percentage by weight finer than 0.02mm to range from around 7% to 44% for the Made Ground Materials, 40% to 62% for the Tidal Flat Deposits and 1% to 3% for the Wind Blown Sands.

5.7.2 As a result, heave in excess of 15mm may be possible for the Made Ground and the Tidal Flat Deposits, while the Wind Blown Sands would not be considered as being frost susceptible. Therefore, unless treated, the Made Ground and Tidal Flat Deposits should not be used within 450mm of the designed final surface of a road or paved areas, or 350 mm if the Mean Annual Frost Index (MAFI) of the site is less than 50.

5.8 Ground Floor Slabs to Buildings

5.8.1 Given the presence of shrinkable soils and significant thicknesses of made ground in some areas together with the anticipated depth/type of foundations, the use of suspended floor slabs may be appropriate for the scheme, which should incorporate the minimum void dimensions as outlined in the NHBC Standards.

5.9 Cut and Fill / Earthworks

Testing

5.9.1 The acceptability for materials re-use has been assessed on the basis of the DoT Specification for Highway Works (SHW) Volume 1 Series 600 "Acceptable Earthworks Material: Classifications and Compaction Requirements" which details the properties of each material type. Table 6/2 of this document ("Grading Requirements for Acceptable Earthworks Materials") details the range of particle size distribution required for each material class.

5.9.2 Earthworks testing, including compaction testing was undertaken on samples of the made ground, Wind Blown Sand and Tidal Flat Deposits as summarised in Table 5.28 below:

Table 5.28: Summary of Light Compaction Test Results

Stratum	Depth Tested (mbgl)	Particle Density (Assumed – Mg/m3)	Maximum Dry Density (Mg/m^3)	Optimum Moisture Content (%)	Earthworks Classification
Made ground	0.0 – 2.0	2.60	1.43 -1.77	11 - 21	1A; 1B; locally 2A; 2B
Wind Blown Sand	0.8 – 3.0	2.66	1.63 – 1.75	13 - 16	1B; locally 2A
Tidal Flat Deposits	0.6 – 3.5	2.52	1.63 – 1.80	13 - 17	2A

Made Ground

5.9.3 Testing undertaken within the made ground material indicated a Maximum Dry Density of 1.43Mg/m^3 and 1.77Mg/m^3 and Optimum Moisture Contents (OMC) of between 11% and 21%.

5.9.4 A review of the site material for the made ground indicates the of the materials to a combination of 4No. classes including primarily Class 1A (well graded granular material) requiring Method 1 compaction; Class 1B (uniformly graded granular material) requiring method 3 compaction; Class 2A (wet cohesive material), requiring method 1 and to a lesser extent, Class 2B (dry cohesive material), requiring method 2 compaction.

5.9.5 It should be noted that the single granular sample classed as Class 2A recorded a higher percentage fine (>0.63mm) of 27%, of which 22.3% silt was recorded.

Wind Blown Sand

5.9.6 The tested samples from the Wind Blown Sand recorded a Maximum Dry Density of 1.63Mg/m^3 and 1.75Mg/m^3 and Optimum Moisture Contents (OMC) of between 13% and 16%.

5.9.7 The majority of the samples tested within the Wind Blown Sand indicated to be Class 1B (uniformly graded granular material) requiring Method 3 compaction and locally Class 2A (wet cohesive material), due to a higher percentage fine (>0.63mm) recorded within a single sample, therefore requiring method 1 compaction.

Tidal Flat Deposits

5.9.8 The testing undertaken of the Tidal Flat Deposits indicated a Maximum Dry Density of 1.63Mg/m^3 and 1.8Mg/m^3 and Optimum Moisture Contents (OMC) of between 13% and 17%.

5.9.9 Following a review of the Tidal Flat Deposits tested, the material indicates to be of Class 2A, requiring method 1 compaction. However, due to a liquid limit of greater than 50% recorded in the majority of the Tidal Flat Deposits deemed as Class 2A, when compacting, only deadweight tamping, or vibratory tamping rollers or grid rollers should be used as specified by BS 1377: Part 2.

Organic Content

5.9.10 The recorded organic content within the shallow made ground generally within the western site area, ranged between 2.2% and 6.0%. In addition, within the Tidal Flat Deposits, organic content of between 2.0% and 3.3% have been recorded within the cohesive deposits. Within the granular Tidal Flat Deposits and Wind Blown Sand, organic content of between 0.5% and 0.6% were recorded.

5.9.11 As a result of the locally high organic contents recorded within the Tidal Flat Deposits, site won materials from this stratum may be unsuitable for re-use on site.

5.9.12 All soft spots, including soft organic clays and peat deposits should be removed during the initial stages of site stripping.

Settlements

5.9.13 It is understood that it is proposed to provide a generally level site as part of the enabling works such that (with the exception of the removal of unacceptable materials) there is an earthwork balance. This being the case, it is understood that the construction formation level would be at around 8.1mAOD and there would therefore be some areas, particularly within the northern part of the site that would be raised, potentially by up to 1m.

5.9.14 Estimates of anticipated settlement resulting from the potential land raising are provided in Appendix K for UDLs of 10kN/m^2, 20kN/m^2 and 30kN/m^2 and are summarised below in Table 5.29.

5.9.15 In addition, settlements when assuming a 5m deep zone of ground improvement, such as soil mixing, has been modelled and is included in the table below for comparison when assuming a UDL of 20kN/m^2.

Table 5.29: Anticipated Land-raise Settlement

Uniformly Distributed Load	Soil Profile	Anticipated Settlement
10kN/m^2	2m – Made Ground 8m – Tidal Flat Deposits 15m – Alluvial Fan Deposits	~60mm
20kN/m^2		~120mm
30kN/m^2		~175mm
20kN/m^2	5m – Improved Ground 5m – Tidal Flat Deposits 15m – Alluvial Fan Deposits	~65mm

5.9.16 Further analysis indicates that when increasing the thickness of the Tidal Flat Deposits to 12m, an additional ~50% total consolidation settlement is anticipated.

5.9.17 **I**t should be noted that the presence of Japanese Knotweed has been identified across the site and would need to be considered within any designs as part of the development.

5.10 Preliminary Pavement Design

5.10.1 Plate load tests were undertaken at locations requested by Technip (TP101 to TP112). In addition, Dynamic Cone Penetration (TRL-DCP) tests were undertaken across the site to provide addition data for pavement design. The locations of the test are provided in Figure 8.

Made Ground: Plate Loading Tests

5.10.2 In situ plate loading tests of the made ground materials were completed at 12No. locations across the site (TP101 to TP112), at depths of 0.3m, 0.6m and 0.9m, utilising a 14-tonne excavator as kentledge. The results are provided in Appendix M and a summary of the test results for the made ground is presented in Table 5.30:.

Table 5.30: Summary of Plate Load Tests – Made Ground

Test ref	Depth (mmbgl)	Pressure (kN/m^2)	Settlement (mm)	Modulus (kN/m^2/m)	CBR (%)
TP101	300	75.03	1.25	26514	2.8
	600	301.48	1.25	106529	31
	900	753.92	1.25	266405	>100
TP102 *(Natural: 0.3; 0.6; 0.9m)*	300	100.93	1.25	35665	1.7
	600	51.8	1.25	18304	1.5
	900	36.55	1.25	12916	0.8
TP103	300	286.47	1.25	101226	29
	600	270.32	1.25	95522	26
	900	133.50	1.25	47173	7.7
TP104 *(Natural:0.9m)*	300	63.75	1.25	22528	2.1
	600	67.33	1.25	23790	2.3
	900	68.03	1.25	24040	2.4
TP105	300	118.17	1.25	66492	14
	600	Test aborted due to unstable ground conditions			
	900	589.59	1.25	211519	>100
TP106	300	79.63	1.25	28138	3.1
	600	51.46	1.25	18184	1.5
	900	60.16	1.25	21259	1.9
TP107	300	81.62	1.25	28840	3.3
	600	38.85	1.25	13727	0.9
	900	Test aborted due to rapid ingress of groundwater			
TP108	300	129.13	1.25	45629	7.2
	600	135.12	1.25	47744	7.8
	900	Test aborted due to rapid ingress of groundwater			
	300	180.75	1.25	63868	13

Test ref	Depth (mmbgl)	Pressure (kN/m²)	Settlement (mm)	Modulus (kN/m²/m)	CBR (%)
TP109 *(Natural: 0.6; 0.9m)*	600	170.67	1.25	60307	12
	900	Test aborted due to unstable ground conditions			
TP110 *(Natural:0.9m)*	300	39.87	1.25	14090	0.9
	600	250.4	1.25	88480	23
	900	Test aborted due to rapid ingress of groundwater			
TP111 *(Natural:0.9m)*	300	134.07	1.25	47374	7.7
	600	118.07	1.25	41721	6.2
	900	150.83	1.25	53296	9.5
TP112	300	159.08	1.25	56211	10
	600	136.59	1.25	48264	8.0
	900	192.77	1.25	68116	14.0

5.10.3 CBR values of between 0.9% and 31% were recorded within the made ground materials, with corresponding Moduli of Sub-Grade Reaction between 14090kN/m²/m and 106529kN/m²/m. CBR values greater than 100% were recorded at TP101 and TP105 due to encountered variability of the underlying made ground. Corresponding Moduli of Sub-Grade Reaction were 211519 kN/m²/m.and 266405kN/m²/m.

5.10.4 Furthermore, within the natural material CBR values of between 0.8% and 12% were recorded with corresponding Moduli of Sub-Grade Reaction of between 12916kN/m²/m and 60307kN/m²/m.

TRL-DCP (Dynamic Cone Penetrometer) Tests

5.10.5 The CBR results are summarised in Table 5.31 including recommended values for preliminary design purposes based upon these initial findings. The results are presented in Appendix N.

Table 5.31: Summary of CBR Data

Stratum	Method	Derived CBR Values (%)	Recommended CBR for Preliminary Design (%)
Made Ground at assumed formation level >450mmbgl	DCP(1)	2.8 - >20	3.0
	Correlations with plasticity indices(2)	3 – 6	

Note 1: Jones CR and R Jolt (1991)
Note 2: CD225 (2020) Design for new pavement foundations (formerly IAN 73/06 revision 1 (2009), HD 25/94) and LR1132 (1984), assumes low water table and average and well drained construction conditions

5.10.6 Notwithstanding this, given the recorded thickness of made ground across the site, a CBR of <2.5% would be recommended where formations are within this material.

5.10.7 It should be noted that all road formations should be proof rolled and soft spots removed and replaced with selected granular fill and, where adoptable, a pavement of sufficient thickness (>450mm) to prevent the penetration of frost should be employed.

5.10.8 CBR values of the subgrade should be confirmed by in situ testing when final formation levels are known.

5.11 Excavations

5.11.1 Shallow excavations may be achievable using conventional equipment, although it is anticipated that breakers may be required at relatively shallow depth should excavation within the former concrete footings and or slabs be required.

5.11.2 Groundwater seepages were recorded at depths between 0.35m and 4.0mbgl, although generally around 1.0mbgl. Based on observations made during the ground investigations, groundwater ingress into excavations is considered highly likely to be significantly problematic and dewatering may be required, particularly where excavations are left open for any length of time. It would be recommended that formation levels are protected to mitigate against softening associated with any such water ingress.

5.11.3 It should be noted that groundwater levels might fluctuate according to the season and from year to year. This may have implications on recommendations, including those for foundations and excavations. Accordingly, a careful watch should be maintained during any future groundworks and the recommendations presented in this report may be subject to amendment should additional information becoming available.

5.11.4 It is recommended that appropriate shoring/temporary works are used in accordance with current Health and Safety requirements where access for personnel is required into excavations.

5.11.5 In addition, due to the potential for UXO at the site, appropriate mitigation measures will be required in this respect when breaking ground.

5.12 Protection of Buried Concrete

Test Results

5.12.1 Following the guidance provided in BRE Special Digest 1, the desk study and observations of the encountered ground materials during the intrusive works indicate the site would be categorised as 'Brownfield locations', excluding potential aggressive materials or leachates, that contain pyrite. However, it should be noted that in accordance with the BRE guidance the Tidal Flat Deposits may be derived from the Coal measures and therefore there is the potential for pyrite to be present.

5.12.2 In addition, observations made during the intrusive works suggest the groundwater conditions to be 'mobile', as flow is likely to be into excavations or is percolating through the ground.

5.12.3 The results of the testing of the soil samples, together with the resulting Aggressive Chemical Environment for Concrete (ACEC) Class and Design Sulphate (DS) Class, as derived in accordance with BRE Special Digest 1, are presented in Table 5.32. The full laboratory results are presented Appendix E.

Table 5.32: Summary of ACEC based on Soil Samples

Stratum	Made Ground	Tidal Flat Deposits	Wind Blown Sand	Alluvial Deposits
No. of tests	78	36	11	11
pH	7.1 – 9.5	7.0 – 8.8	7.5 – 9.4	7.5 – 9.3
Water Soluble Sulphate (mg/l)	1.9 - 1460	3.3 - 1230	2.6 - 43	22 - 853
Water Soluble Magnesium	0.2	0.1 – 1.8	-	0.0
Oxidisable Sulphides (%)	0.12 – 5.87	0.04 – 7.89	-	-
Total Potential Sulphates (%)	0.15 – 6.0	0.06 – 8.1	-	-
ACEC[(1)]	AC-5	AC-5	AC-1[(2)]	AC-2
DS Class[(1)]	DS-5	DS-5	DS-1[(2)]	DS-2

Note 1: Based on a characteristic value derived for a data set of ≥10 samples per stratum (mean of the highest 20% of the sulphate test results and lowest 20% of the pH tests)

Note 2: Based on a characteristic value derived for a data set of <5 samples per stratum (maximum water-soluble sulphate concentration/ lowest pH) as per BRE SD1

5.12.4 It should be noted that within BH119-follow on, rare to occasional very thin veins of pyrite were observed within the bedrock between depths of 30.6m and 31.85mbgl.

5.12.5 In addition, the results of the testing of the perched and groundwater samples, together with the resulting Aggressive Chemical Environment for Concrete (ACEC) Class and Design Sulphate (DS) Class, as derived in accordance with BRE Special Digest 1, are presented in Table 5.33. The full laboratory results are presented in Appendix E.

Table 5.33: Summary of ACEC based on water samples.

Stratum	Shallow Boreholes	Deep Boreholes
	Made Ground/ Tidal Flat Deposits/ Wind Blown Sand	Alluvial Deposits
No. of tests	31	27
pH	6.8 – 8.8	6.9 – 8.4
Water Soluble Sulphate (mg/l)	4.73 - 492	9.9 - 317
Water Soluble Chloride (mg/l)	19 - 1500	260 - 3300
Magnesium (Dissolved) (mg/l)	11 - 98	47 - 220
ACEC(1)	AC-1	AC-1
DS Class(1)	DS-1	DS-1

Note 1: Based on a characteristic value derived for a data set of ≥10 samples per stratum (mean of the highest 20% of the sulphate test results and lowest 20% of the pH tests)

5.12.6 It should be noted that the water testing suggests that the groundwater recorded at the site would not be considered to be brackish groundwater which typically would have a chloride content between 12 000 mg/l and 17 000 mg/l.

Assessment

5.12.7 It should be noted that in accordance with the guidelines provided by BRE, concrete piles may be designed to DS-3, based on the recorded soluble Sulphate concentrations as the soils would not be 'disturbed' (resulting in oxidation of the pyrite) during piling activities. However, where soils are disturbed, ie for near surface concrete structures, a design sulphate class of DS-5 would be required within the Made Ground and Tidal Flat Deposits due to the high Total Potential Sulphate concentrations recorded. Where concrete is within the Wind Blown Sands, a design class of DS-1 may be used.

5.12.8 A localised area (U1/DS112) recorded Diesel Range Organics (C10 – C25) within water samples from borehole, U1, with an initial screened concentration of 17mg/l and at a later stage, 0.46mg/l. In addition, BH112 recorded Diesel Range Organics (C10 – C25), the water samples tested recoded concentrations ranging between 0.3mg/l and 0.7mg/l.

5.12.9 Furthermore, based on research, it should be noted that strength gain of concrete in contact with the observed hydrocarbon impacted spoils/groundwater may be reduced by 20% to 25% and therefore these potential effects will need to be considered within the design.

5.13 Drainage -Open Double Ring *Infiltrometer Testing*

5.13.1 Infiltration testing was undertaken at 6No. locations (Figure 9) in accordance with BS EN ISO 22282-5:2012. 2No. tests (SA101 and SA105) failed to drain overnight. It should also be noted that the tests were carried out within the uppermost undisturbed surface across the site, observed as made ground.

5.13.2 A summary of the findings is presented in Table 5.34 with the full in-situ test results presented in Appendix L.

Table 5.34**: Summary infiltration Results.**

SA101(1)			
	Time (minutes)	Depth (mm)	Infiltration Rate (m/s)
Start	0	210	$>1.69 \times 10^{-6}$
End	1173	119	

SA102			
	Time (minutes)	**Depth (mm)**	**Infiltration Rate (m/s)**
Start	0	180	$1.71x10^{-6}$
End	156	16	
SA103			
	Time (minutes)	**Depth (mm)**	**Infiltration Rate (m/s)**
Start	0	170	$1.44x10^{-6}$
End	127	11	
SA104			
	Time (minutes)	**Depth (mm)**	**Infiltration Rate (m/s)**
Start	0	179	$2.54x10^{-6}$
End	210	32	
SA105(1)			
	Time (minutes)	**Depth (mm)**	**Infiltration Rate (m/s)**
Start	0	168	$>1.50x10^{-6}$
End	1064	97	
SA106			
	Time (minutes)	**Depth (mm)**	**Infiltration Rate (m/s)**
Start	0	160	$4.80x10^{-5}$
End	8/9	23/dry	

Note 1 – Location failed to drain more than 50% of water during test period

5.13.3 In addition, it should be noted that while vertical infiltration rates of between 1.4×10^{-6} m/s and 4.8×10^{-5} m/s have been derived from the testing, observations made during the ground investigation (March 2023 to May 2023) indicate high groundwater levels during the winter period with the site noted to have numerous areas of standing water and saturated marsh areas.

5.14 Construction Issues

Groundwater / Surface Water

5.14.1 The data recorded to-date for the site indicates that perched water levels within the made ground / Tidal flat Deposits may be close to the current ground level. In addition, the data suggests the groundwater/ perched water to be tidally influenced. As a results, additional continuous groundwater level monitoring is recommended to determine the maximum groundwater levels across the site, capturing both spring high tides and the winter groundwater peak.

5.14.2 In addition, observations made during the ground investigation (March 2023 to May 2023) indicate high groundwater levels during the winter period with the site noted to have numerous areas of standing water and saturated marsh areas.

5.14.3 As a result of the above together with the recorded poor surface conditions recorded at the site, construction activities will need to be carefully planned to allow the proposed development.

5.14.4 Further, as a result of the recorded generally poor ground conditions recorded across the site together with the need to provide a level development area, it may be more economical to treat the site won materials to allow them to be easily incorporated into the earthworks and it is considered that while the advice of a specialist ground improvement contractor should be sought the materials could be improved using cement stabilisation to provide a suitable formation level that potentially may be suitable as a piling platform.

5.14.5 In addition, the proposed drainage scheme for the site and any underground structures will need to take account of the potential high water levels.

Ground Settlement

5.14.6 It is understood that it is proposed to provide a generally level site as part of the enabling works such that a construction formation level would be at around 8.1mAOD potentially resulting in some areas being raised by up to 1m. The analysis suggests that this may result in potentially significant long-term settlement. As a

result, it is recommended that in these areas and where possible, non-piled settlement critical elements, such as drainage, are constructed as late in the construction programme as possible to reduce long-term maintenance.

Potential for Inundation Settlement of the Wind Blown Sands

5.14.7 Observations made during the site investigation suggest that the addition of concentrated flows of water may result in inundation settlement of the Wind Blown Sands which are present across the southern part of the site. While it is recommended that inundation testing is undertaken, it is recommended that the drainage design avoids any concentrations of flow to ground within these materials.

Japanese Knotweed / Contamination

5.14.8 Localised ground contamination, including the presence of Japanese Knotweed and localised asbestos, has been identified across the site and therefore the requirements of NWR will need to be taken into account when determining the suitability of potential ground improvement techniques at the site.

5.14.9 The presence of hydrocarbon impacted ground, while likely requiring suitable remediation, may affect the strength of concrete, which will need to be considered within the design.

5.14.10 The method of piling must avoid the creation of a new potential contamination migration pathway and, given the site's environmental setting and the presence of significant thicknesses of made ground as well as localised hydrocarbon impacted ground and the presence of potentially contaminated groundwater, a Foundation Works Risk Assessment is likely to be required by NRW.

UXO

5.14.11 With respect to the recorded UXO risk, the following is required:

- A watching brief of all open excavations;
- A non-intrusive magnetometer survey across the site, in particular, within the areas of undeveloped open ground identified on the WWII mapping; and
- An intrusive magnetometer survey within the purposed pile layout.

TEC

Figures and Drawings

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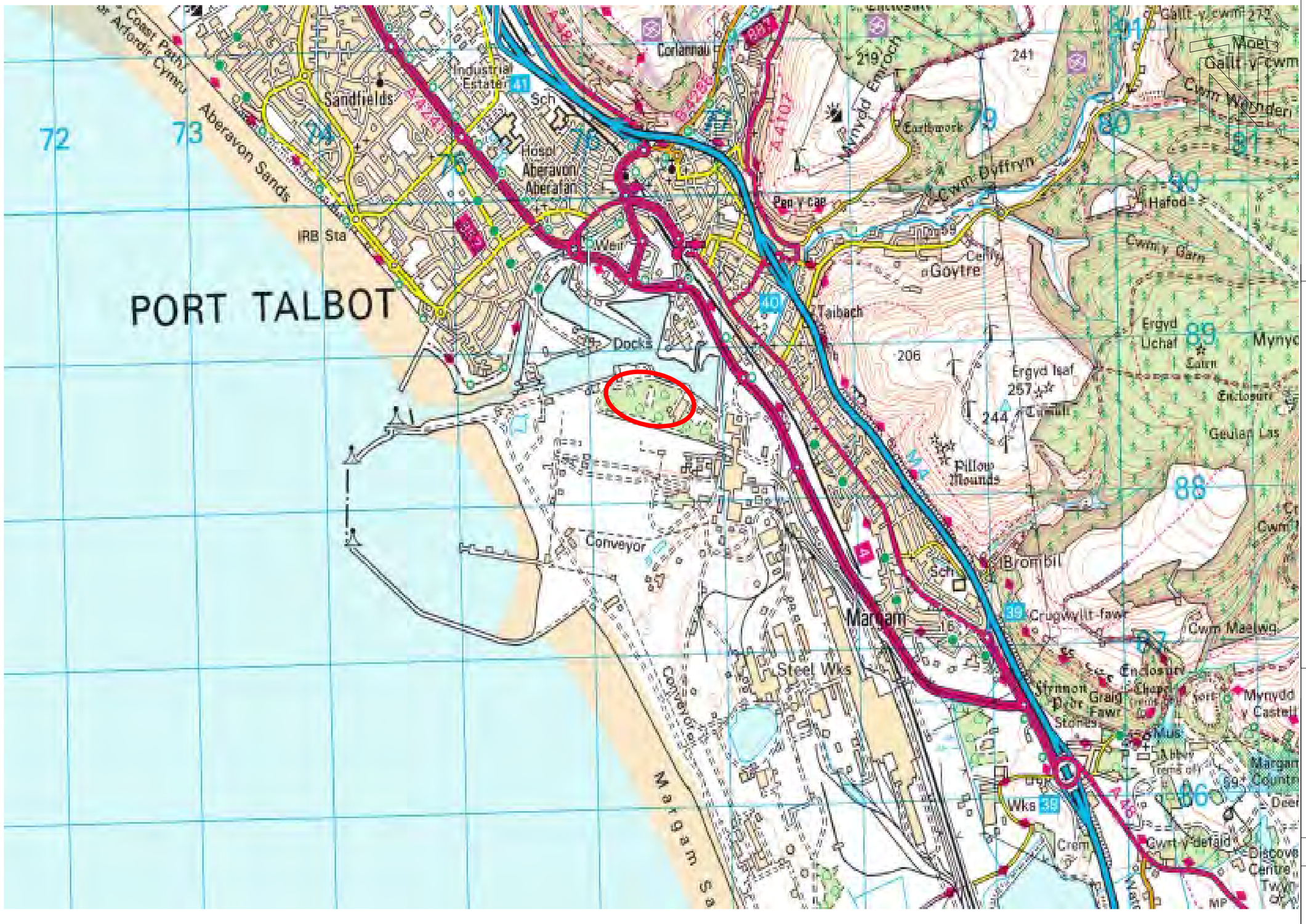

KEY:

Site Location

PROJECT DRAGON

Site Location Plan

DATE: July 2023		
SCALE: N/A	DRN: RJE	CHKD: CH
PROJECT No: 2111006.005	DATE: 31-07-2023	DATE: 04-08-2023
DRAWING No. Report Figure 1		Rev. -

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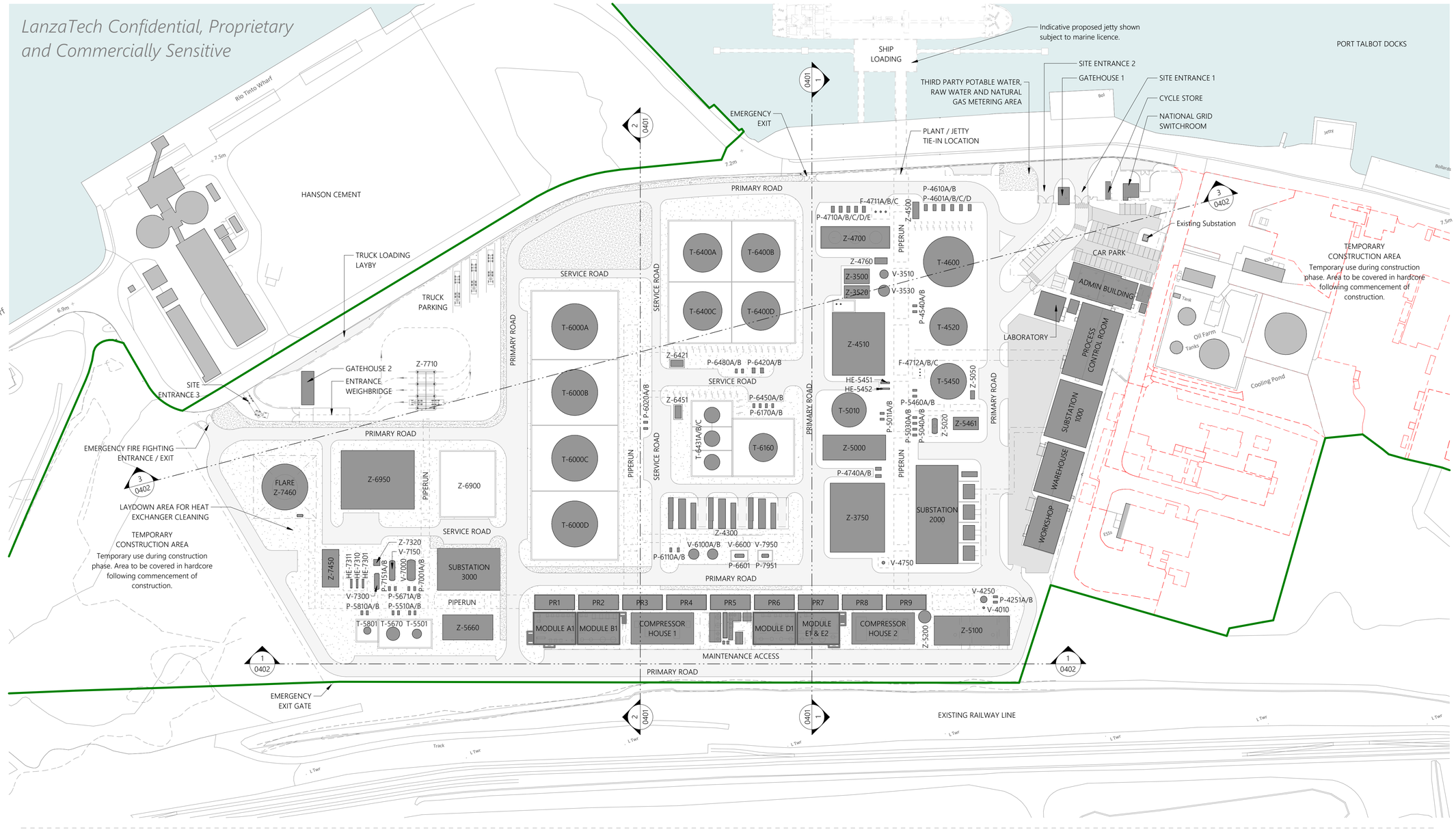

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www.inspirearchitects.co.uk

Sophem Limited t/a Inspire Architects
Heywood House, Heywood. BA13 4NA
01749 605006

0m 20m 40m 60m 80m 100m

GENERAL NOTES

- All works proposed shall be conducted in accordance with the related H&S and CDM regulations. Where doubt arises over any aspect of safety, consult Inspire Architects.
- Should any discrepency be found on this drawing or related project information then the matter should be brought to the attention of Inspire Architects for resolution as soon as possible.
- This drawing may be based on a measured survey or Ordinance Survey information. Do not scale from this drawing unless for planning purposes.
- All dimensions are in millimetres unless otherwise stated. Do not scale from this drawing. All information and layouts detailed on this drawing are subject to site dimension checks.
- Copyright - All Inspire Architects drawings are the property and copyright of Sophem Limited and are not to be used for any purpose without prior written agreement.

NOTES

- Survey information taken directly from drawings issued on December 2021 by AP Land Surveys.
- Inspire Architects are not responsible for the design of the plant equipment identified on this drawing.

LEGEND

- EIA Study Area Boundary
- Existing Buildings
- Proposed Plant / Buildings
- Existing buildings to be demolished

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Revision	Drawn	Checked	Date
P12	CH	CH	13.10.2023
P11	CH	CH	12.10.2023
P10	CH	CH	11.10.2023
P9	CH	NC	11.08.2023
P8	CH	NC	09.08.2023
P7	CH	NC	25.07.2023
P6	CH	NC	17.07.2023
P5	CH	NC	13.07.2023

INSPIRE Architects

PROJECT NAME
Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility

CLIENT
LanzaTech UK Limited

SHEET NAME
Proposed PDZ Layout & Equipment List - EIA Boundary Shown

SHEET SIZE: A1
SCALE: 1 : 1000 @ A1
STATUS CODE: S2
STATUS: PLANNING
REVISION DATE: 13.10.2023
REVISION: P12

DRAWING NUMBER
2143.01-IA-ZZ-ST-DR-A-0225

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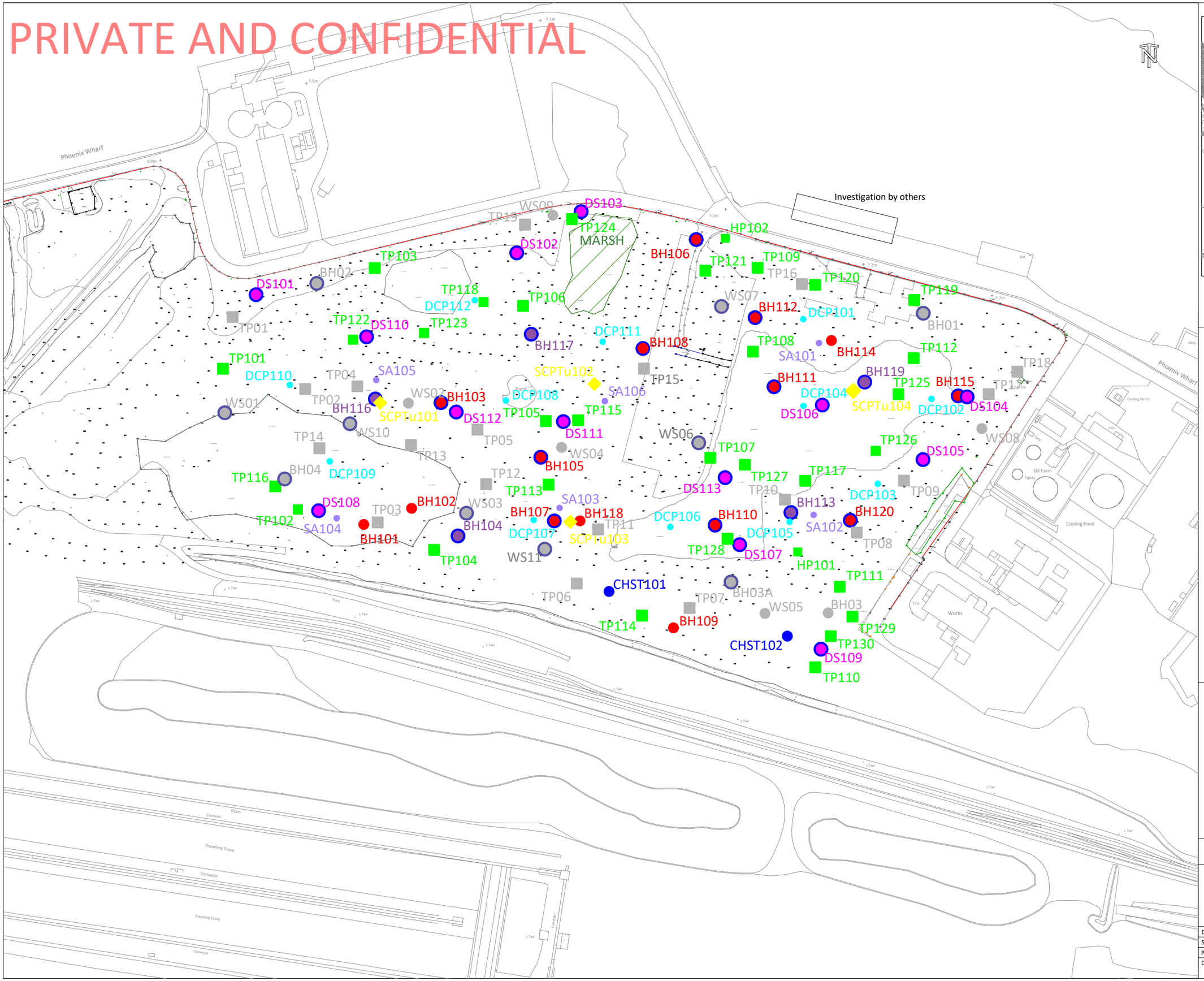
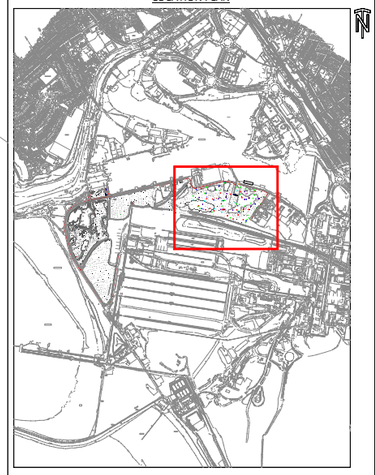


LOCATION PLAN



KEY:

- 2022 Trial Pit (approximate only)
- Trial Pit
- Deep Borehole (with monitoring well)
- 2022 Borehole (with monitoring well)
- Borehole
- Borehole (with monitoring well)
- 2022 Dynamic Sample Hole (approximate only)
- 2022 Dynamic Sample Hole (with monitoring well)
- Dynamic Sample (with monitoring well)
- SCPTu Location
- Downhole Seismic Test Location
- Dynamic Cone Petetration Test
- Hand Dug Pit
- Infiltration Testing

PROJECT DRAGON

Geotechnical/Geoenvironmental Exploratory Hole Plan

DATE: July 2023		
SCALE: N/A	DRN: RJE	CHKD: CH
PROJECT No: 2111006.005	DATE: 31-07-2023	DATE: 04-08-2023
DRAWING No. Report Figure 3		Rev. -

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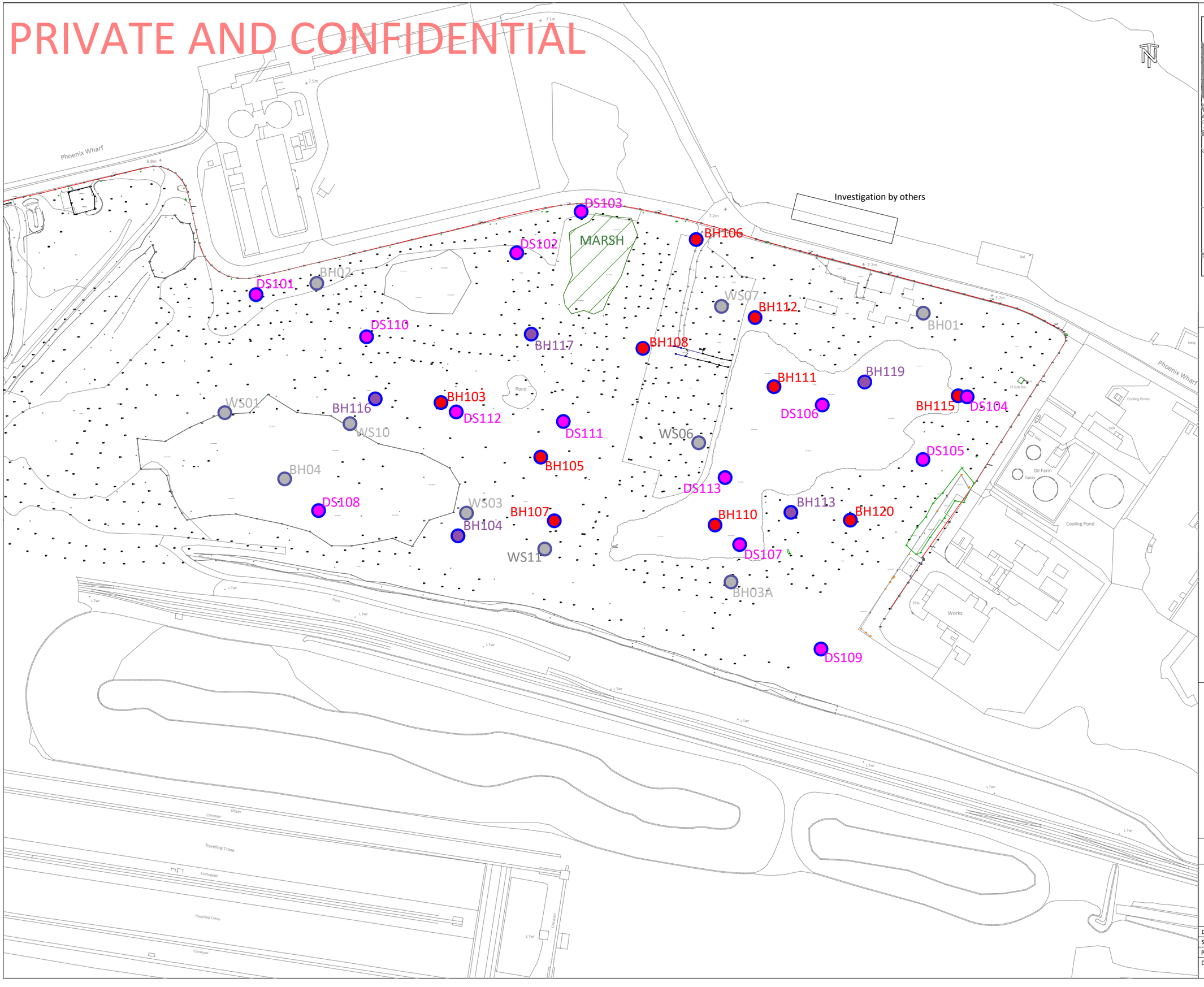

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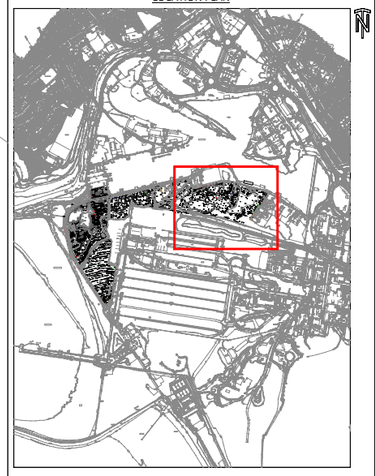

KEY:

- Deep Borehole (with monitoring well)
- 2022 Borehole (with monitoring well)
- Borehole (with monitoring well)
- 2022 Dynamic sample hole (with monitoring well)
- Dynamic Sample Hole (with monitoring well)

PROJECT DRAGON

Groundwater and Ground Gas Montoring Well Plan

DATE: July 2023		
SCALE: N/A	DRN: RJE	CHKD: CH
PROJECT No: 2111006.005	DATE: 31-07-2023	DATE: 04-08-2023
DRAWING No. Report Figure 4		Rev. -

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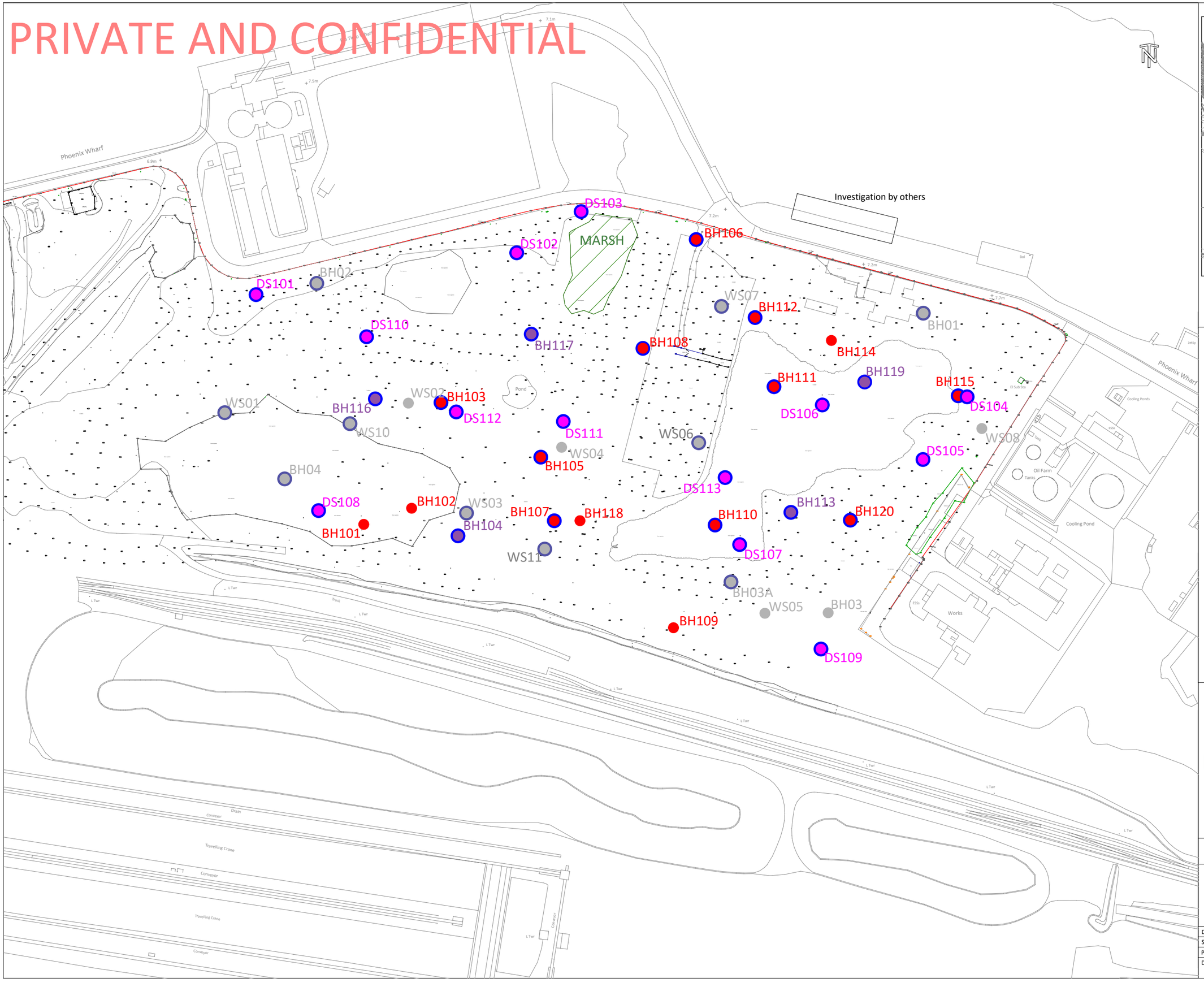

LOCATION PLAN

KEY:

- Deep Borehole (with monitoring well)
- 2022 Borehole (with monitoring well)
- Borehole
- Borehole (with monitoring well)
- 2022 Dynamic Sample Hole (approximate only)
- 2022 Dynamic Sample Hole (with monitoring well)
- Dynamic Sample Hole (with monitoring well)

PROJECT DRAGON

Borehole Location Plan

DATE: July 2023		
SCALE: N/A	DRN: RJE	CHKD: CH
PROJECT No: 2111006.005	DATE: 31-07-2023	DATE: 04-08-2023
DRAWING No. Report Figure 5		Rev. -

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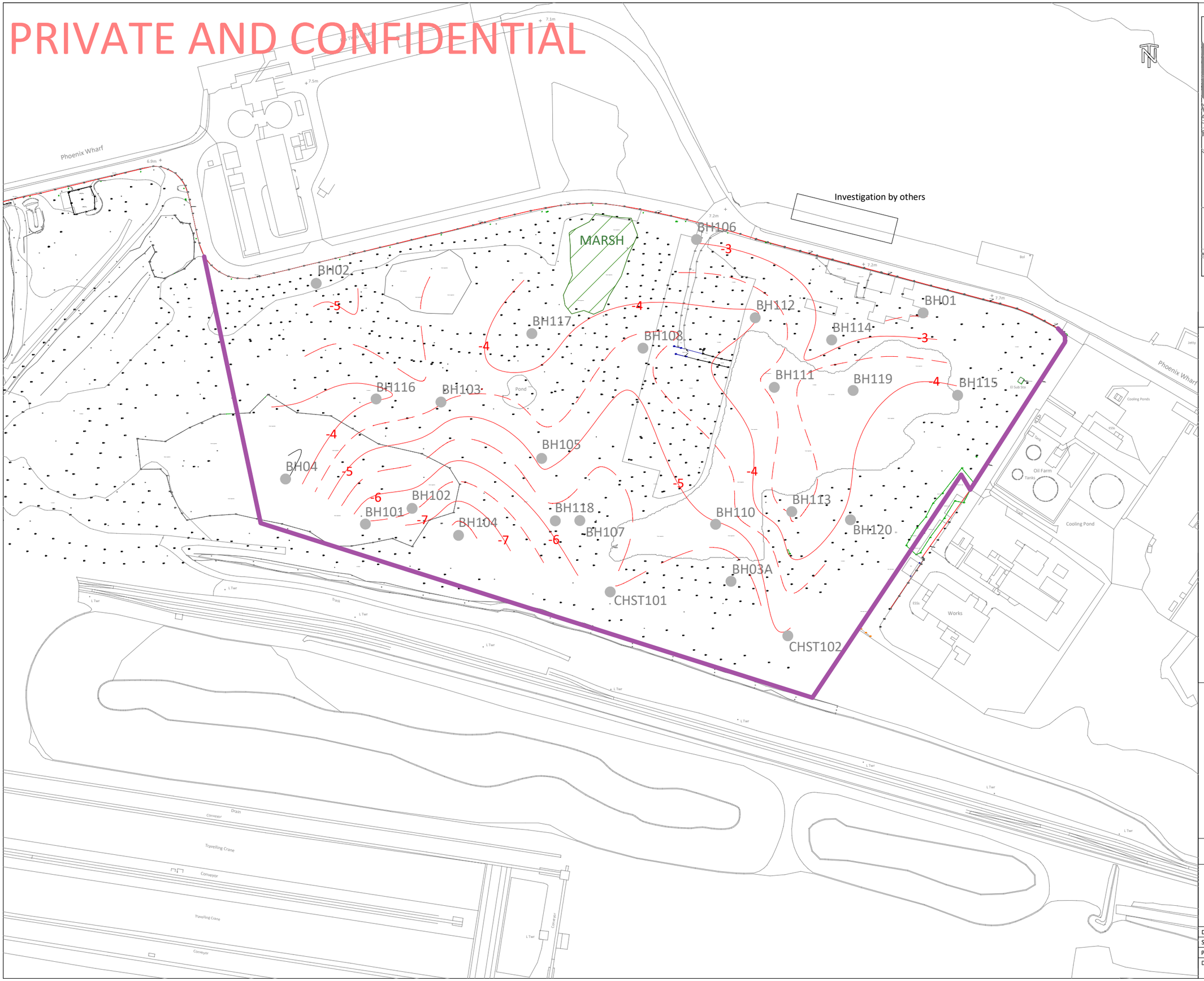

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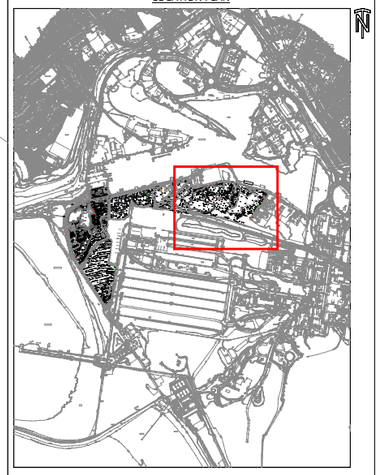

Borehole Location

Upper Surface of the Alluvial Fan Deposits (mAOD)

PROJECT DRAGON

Upper Surface of the Alluvial Fan Deposits (Sands and Gravels)

DATE: July 2023		
SCALE: N/A	DRN: RJE	CHKD: CH
PROJECT No: 2111006.005	DATE: 25-07-2023	DATE: 02-08-2023
DRAWING No. Report Figure 6		Rev. -

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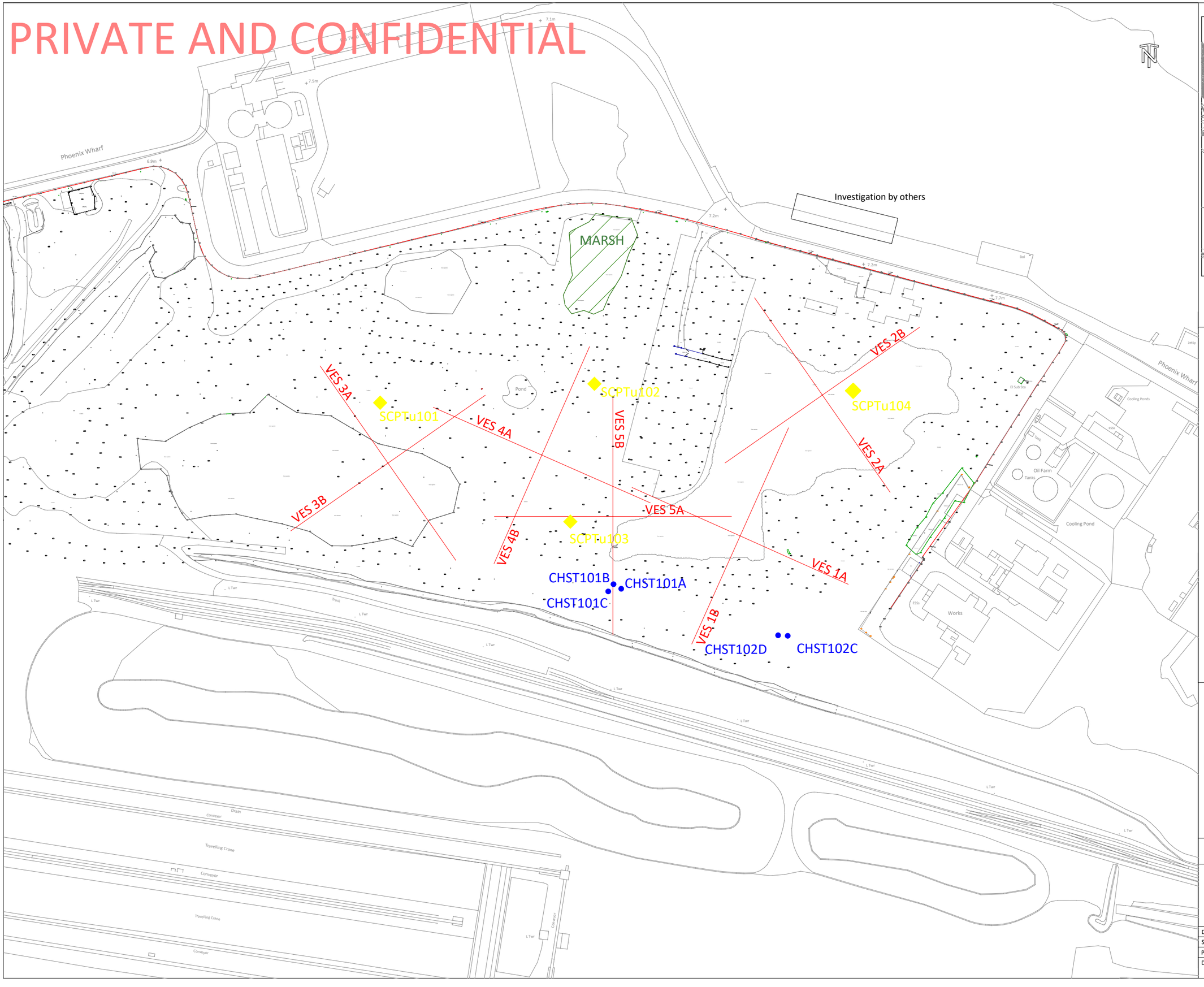

LOCATION PLAN

KEY:

- SCPTu Location
- Downhole Seismic Test Location
- Resistivity Survey Line

PROJECT DRAGON

Geophysical Test Location Plan

DATE: July 2023		
SCALE: N/A	DRN: RJE	CHKD: CH
PROJECT No: 2111006.005	DATE: 31-07-2023	DATE: 04-08-2023
DRAWING No. Report Figure 7		Rev. -

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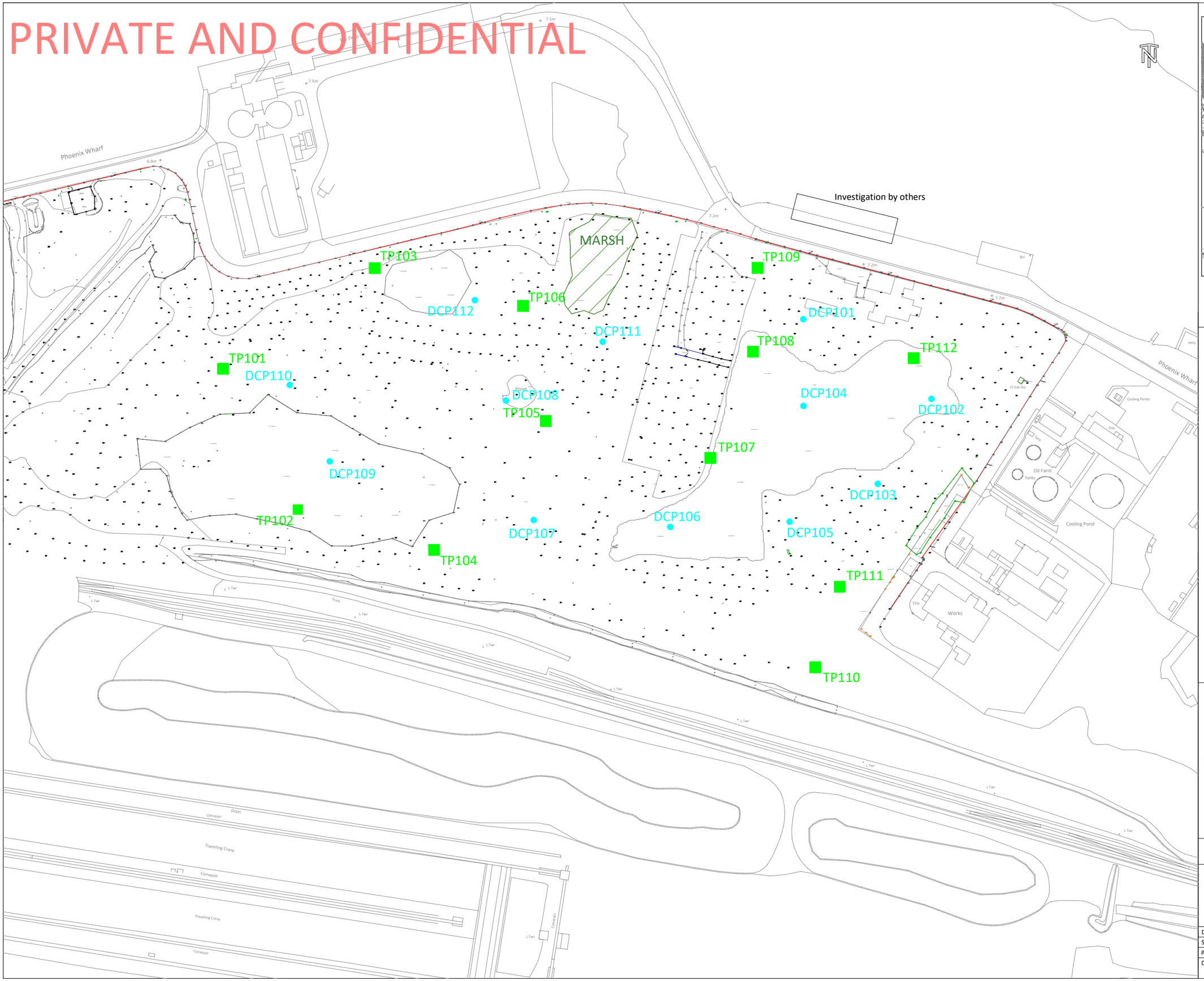
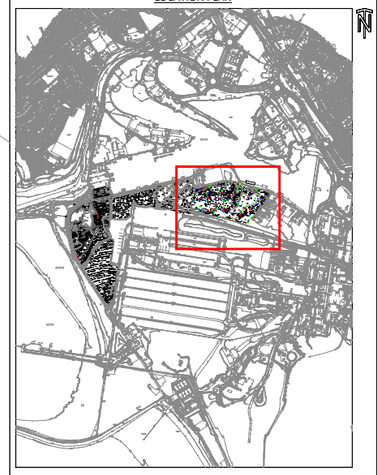


LOCATION PLAN



KEY:

- Trial Pit (with plate load test)
- Dynamic Cone Penetration Test

PROJECT DRAGON

Plate Load Test and
Dynamic Cone Penetration Plan

DATE: July 2023		
SCALE: N/A	DRN: RJE	CHKD: CH
PROJECT No: 2111006.005	DATE: 31-07-2023	DATE: 04-08-2023
DRAWING No. Report Figure 8		Rev. -

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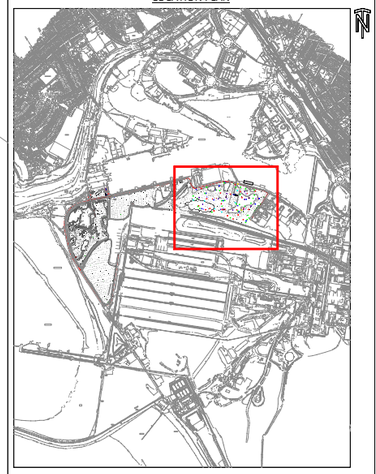
Investigation by others

SA101
SA102
SA103
SA104
SA105
SA106

Phoenix Wharf

LOCATION PLAN



KEY:

- Infiltration Testing

PROJECT DRAGON

Infiltration Testing Locations

DATE: July 2023		
SCALE: N/A	DRN: RJE	CHKD: CH
PROJECT No: 2111006.005	DATE: 31-07-2023	DATE: 04-08-2023
DRAWING No. Report Figure 9		Rev. -

Appendix A

Site Photographs

Photograph 1: View across site, from the site entrance facing south. *(Photograph taken 30 March 2023)*

Photograph 2: View across site, from the site entrance facing south. *(Photograph taken 11 July 2023)*

Photograph 3: View across western site area, facing south-west (location WS10) *(Photograph taken 30 March 2023)*

Photograph 4: View across western site area, facing south-west (location WS10) *(Photograph taken 30 July 2023)*

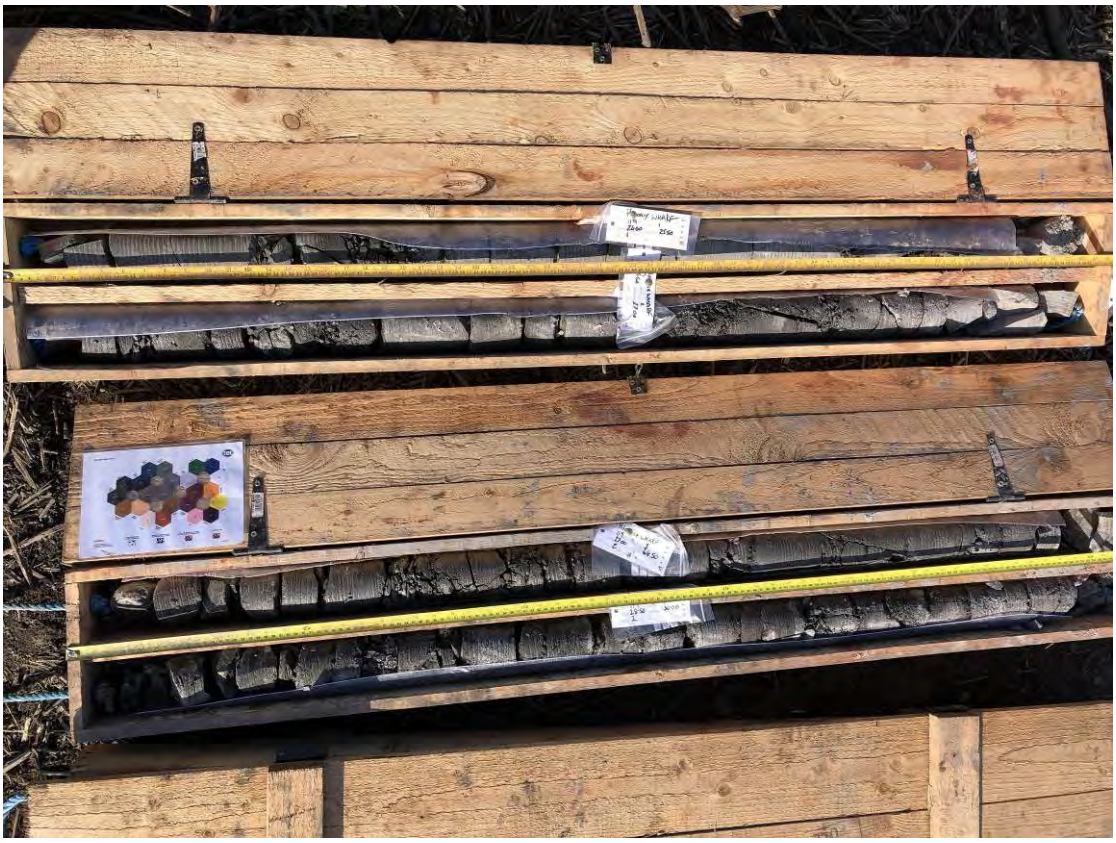
Photograph 5: Encountered rock core samples within BH104 from 25m to 35mbgl.

Photograph 6: Encountered rock core samples within BH113 from 30m to 36mbgl.

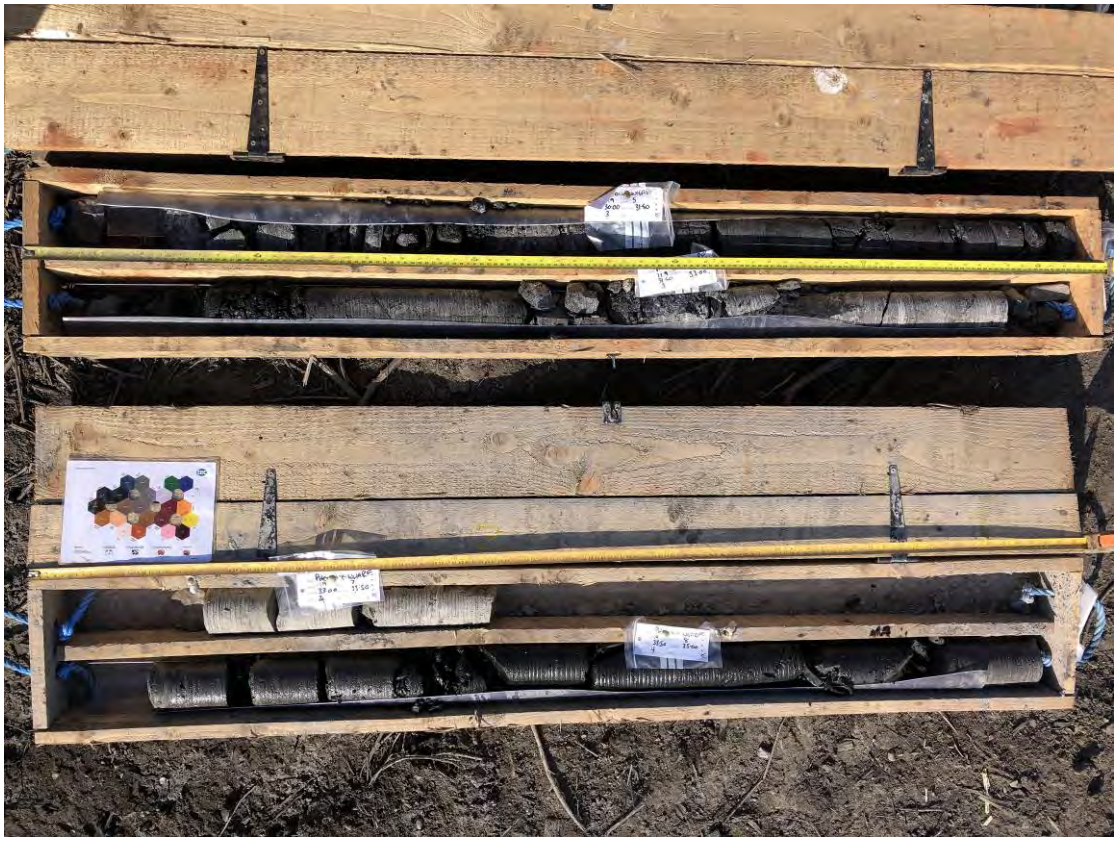
Photograph 7: Encountered rock core samples within BH113 from 36m to 42mbgl.

Photograph 8: Encountered rock core samples within BH116 from 30m to 45mbgl.

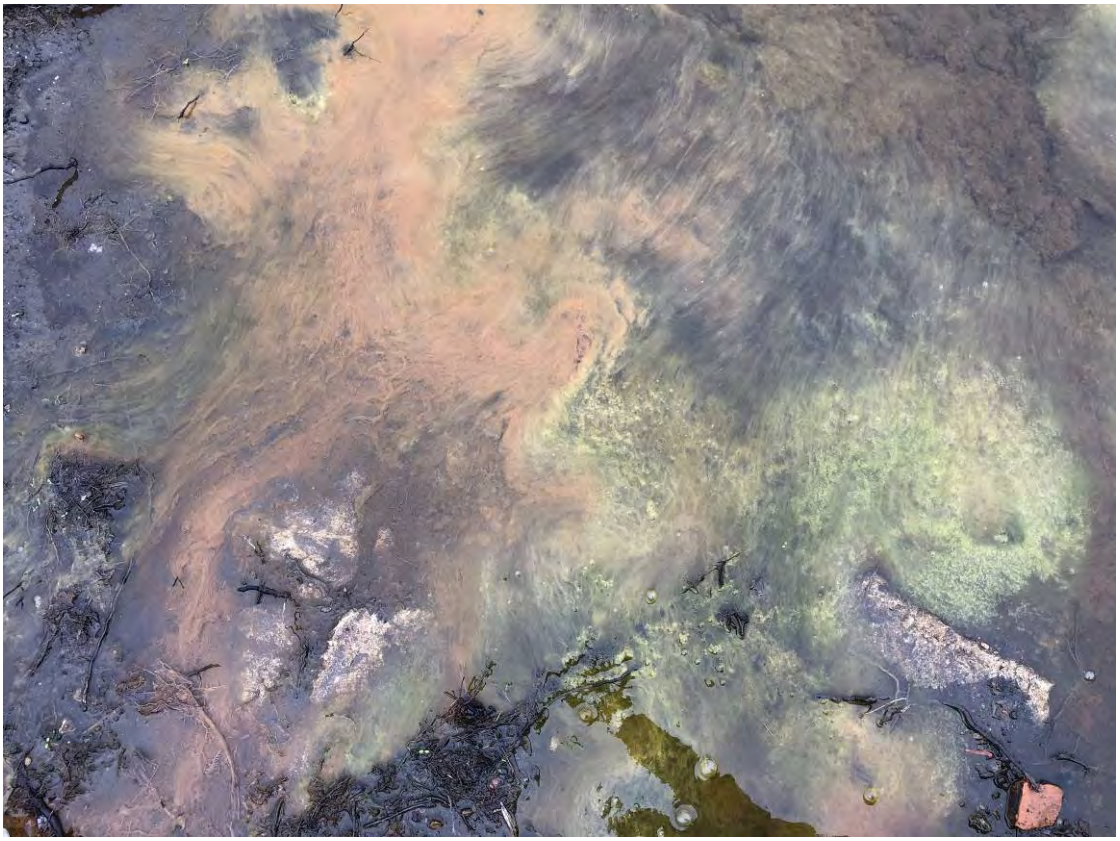
Photograph 9: Encountered rock core samples within BH117 from 27m to 42mbgl.



Photograph 10: Encountered rock core samples within BH119 from 24m to 30mbgl.



Photograph 11: Encountered rock core samples within BH119 from 30m to 35mbgl.



Photograph 12: Standing water (algae bloom) around hand pit, HP102.

Photograph 13: View of trial pit TP101, showing the natural groundwater level.

Photograph 14: Encountered ground conditions within TP101.

Photograph 15: View of trial pit TP102.

Photograph 16: Encountered ground conditions within TP102.

Photograph 17: View of trial pit TP103, encountered blue service tape.

Photograph 18: TP103 reinstatement.

Photograph 19: View of trial pit TP103A.

Photograph 20: Encountered ground conditions within TP103A.

Photograph 21: View of trial pit TP104.

Photograph 22: Encountered ground conditions within TP104.

Photograph 23: View of trial pit TP105.

Photograph 24: Encountered ground conditions within TP105.

Photograph 25: View of trial pit TP106.

Photograph 26: Encountered ground conditions within TP106.

Photograph 27: View of trial pit TP107.

Photograph 28: Encountered ground conditions within TP107.

Photograph 29: View of trial pit TP108.

Photograph 30: Encountered ground conditions within TP108.

Photograph 31: View of trial pit TP109.

Photograph 32: Encountered ground conditions within TP109.

Photograph 33: View of trial pit TP110.

Photograph 34: Encountered ground conditions within TP110.

Photograph 35: View of trial pit TP111.

Photograph 36: Encountered ground conditions within TP111.

Photograph 37: View of trial pit TP112.

Photograph 38: Encountered ground conditions within TP112.

Photograph 39: Encountered light blue and pink crystalised salts within TP113.

Photograph 40: Encountered ground conditions within TP113.

Photograph 41: View of trial pit TP114.

Photograph 42: Encountered ground conditions within TP114.

Photograph 43: View of trial pit TP115.

Photograph 44: Encountered ground conditions within TP115.

Photograph 45: View of trial pit TP116.

Photograph 46: Encountered ground conditions within TP116.

Photograph 47: View of trial pit TP117.

Photograph 48: Encountered ground conditions within TP117.

Photograph 49: View of trial pit TP118.

Photograph 50: Encountered ground conditions within TP118.

Photograph 51: View of trial pit TP119.

Photograph 52: Encountered ground conditions within TP119.

Photograph 53: View of trial pit TP120.

Photograph 54: Encountered ground conditions within TP120.

Photograph 55: View of trial pit TP121.

Photograph 56: Encountered ground conditions within TP121.

Photograph 57: View of trial pit TP122.

Photograph 58: Encountered ground conditions within TP122.

Photograph 59: View of trial pit TP123.

Photograph 60: Encountered ground conditions within TP123.

Photograph 61: View of trial pit TP124.

Photograph 62: Encountered ground conditions within TP124.

Photograph 63: View of trial pit TP124A – encountered electricity danger tape.

Photograph 64: Encountered ground conditions within TP124A.

Photograph 65: View of trial pit TP125.

Photograph 66: Encountered ground conditions within TP125.

Photograph 67: View of trial pit TP126.

Photograph 68: Encountered ground conditions within TP126.

Photograph 69: View of trial pit TP127.

Photograph 70: Encountered ground conditions within TP127.

Photograph 71: View of trial pit TP128.

Photograph 72: Encountered ground conditions within TP128.

Photograph 73: View of trial pit TP129.

Photograph 74: Encountered ground conditions within TP129.

Photograph 75: View of trial pit TP130.

Photograph 76: Encountered ground conditions within TP130.

Appendix B

Stage 2 Detailed UXO Risk Assessment

BRIMSTONE

DETAILED
UXO RISK ASSESSMENT

INTEGRITY PROFESSIONALISM KNOWLEDGE

STAGE 2 DETAILED UXO RISK ASSESSMENT

Client:	TEC Ltd
Project Ref:	TWEE89R
Site:	Project Dragon, Port Talbot
Report Ref:	DRA-23-1532-TWEE89R-ProjectDragon,PortTalbot
Revision:	2
Status:	Final
Release Date:	6th September 2023

Written By:	Alfie Hanford	Project Researcher	alfie.hanford@brimstoneuxo.com
Reviewed By:	Harry Smith	Senior Project Researcher	harry.smith@brimstoneuxo.com
Authorised By:	Aaron Florence	Managing Director	

EXECUTIVE SUMMARY

RESULT: Brimstone concludes that German UXBs and unexploded HAA shells poses a **LOW, LOW-MODERATE** and **MODERATE RISK** to the proposed works. See **FIGURE 7** for risk mapping.

THE SITE: The Site comprises three separate areas, known as Site A (west), Site B (centre) and Site C (east). These will be referred to collectively as 'the Site' for the purposes of this assessment, when not discussed individually.

The Site (approximately centred on the National Grid Refs: SS 76385 88669 (Site A), SS 76750 88541 (Site B) SS 77018 88747 (Site C)) is located in Port Talbot, within the county borough of Neath Port Talbot, Wales. Port Talbot Parkway railway station is located approximately 700m north of the Site.

Site A primarily comprises undeveloped land – consisting of grassy areas and mature vegetation – intermixed with brownfield land. It is bound to the north by an unlabelled roadway and a cement works factory, to the east by a thin parcel of undeveloped land and Site B, while open/wooded ground lies to the west and south.

Site B consists of undeveloped land with mature vegetation in the south, particularly along the border, while areas of hardstanding complete with industrial infrastructure, low-rise industrial warehouses and other structures lie in the north and west. Most of the ground in the north and west is laid to hardstanding, mainly used for open air storage and car parking purposes.

Site C consists of hardstanding brownfield land with an entrance to an unnamed roadway in the south and the entrance to a river runoff in the north. It is bound to the north by the hardstanding river run off, to the east by an unnamed roadway connecting to Harbour Way, to the south by an unnamed roadway and to the west by a vegetated border to the docks.

THE PROPOSED WORKS: Ground investigation works are proposed, although specific works were not provided.

Brimstone was not made aware of any future redevelopment works.

UXO RISK ASSESSMENT:

German UXO:

- Port Talbot was a key industrial hub during World War II, with its steelworks and coal production facilities playing a vital role in supporting the British war effort. The Margam Steelworks, within which Site C was located, were involved in the production of steel for munitions, tanks, ships, and other war materials. Consequently, the town and its industries became targets for German air raids carried out by the Luftwaffe. Indeed, Luftwaffe target photography indicates industries on Site and nearby were identified as primary bombing targets. A railway yard/storage station was recorded on target photography (Site B) and a steel works which made up Site C. This is further recorded within Luftwaffe target mapping, which highlights the copper works (Kupferworke) and hard coal briquettes (Steinkohlenbrikettebrik) within Site A as bombing targets, as well as the iron foundry (Eisengießerel) within which Site C was located.
- The majority of the official records obtained for Port Talbot did not specifically state the location of the incidents occurring, with many entries merely referring to bombing occurring over the town as a whole. It is of note, however, that one of the records reports an incident occurring at a copper works, a facility which consulted OS mapping confirms was present on and immediately adjacent to the north of Site A, as well as waste ground and railway sidings in the vicinity (partially included within / adjacent to Sites A and B), suggesting that bombing may have occurred on Site or in the immediate surrounds. Furthermore, bombing at the docks appears to have occurred on several occasions, with the south side referenced as sustaining a number of bombs, some of which were delayed action. A failure with the clockwork mechanism within the fuze of the delayed-action bombs is one cause of UXBs remaining in-situ. Sites A and B were located on the south side of the docks. The Margam Steelworks and/or its surrounding area is also stated to have been bombed on several occasions.

- No evidence of bomb damage to the copper works in Site A, the structure in the south-east of Site B, nor the section of the steelworks in Site C has been identified within historical aerial imagery and OS mapping, i.e. areas of clearance, missing roofs, repair works. Similarly, no obvious evidence of bomb damage was evident in the areas of open/undeveloped ground on Site; however, such evidence is typically less easily identifiable amongst open ground.
- However, evidence of repair works to the metal refinery in Site A has been observed within 1940 and 1946 aerial imagery, suggesting that bomb damage may have occurred early during WWII. The extent of this possible damage cannot be accurately discerned, although the whole roof appears to have been replaced. The coal briquette works, located within the north of Site B, may have sustained serious damage as identified within aerial vertical imagery. However, given the homogenous nature of this potential damage, as seen within **FIGURE 5.4**, it may be that the structure itself is incomplete or the intended design. A possible bomb crater has been identified approximately 30m south-west of Site A.
- Wartime conditions across the Site varied during WWII. Site A comprised a metal refinery, a section of a copper works, railway infrastructure and undeveloped open ground. Site B comprised a briquetting works in the north, small structure in the south-east, railway infrastructure and undeveloped open ground. Site C comprised a section of the Margam Steelworks. Any UXB strike to the undamaged structures on each of the Sites would have caused incontrovertible evidence of its incidence as it passed the structures and into the ground beneath. Similarly, a UXB strike to the railway sidings on/adjacent to each of the Sites is likely to have been identifiable at the time. Fire watchers were likely present at the industries located within each of the Sites, while the railway infrastructure located within/adjacent to each was likely subject to post-raid checks for evidence of UXO. Indeed, given the lack of identified damage in Site C within high-resolution 1946 aerial imagery, as well as to the copper works in the north-west of Site A and briquetting works in Site B, access is likely to have remained frequent in these areas. These factors increase the likelihood of bombing and subsequent evidence of UXO being observed in these areas.
- However, visual evidence of repair works to the metal refinery in Site A (white/brighter roofing) suggests that bomb damage may have occurred at this location. Evidence of a subsequent UXB strike at this location, which may have been damaged early during WWII, could conceivably have been obscured amongst existing damage and debris. It is conceivable that access may have been reduced for a time, depending on the extent of the damage. The majority of both Site A and Site B also comprised undeveloped open ground during WWII. Subsequently, any potential evidence of UXO is thought likely to have been less noticeable, with a UXB's descent into open land less obvious than through a structure or roadway, for example. Indeed, the entry hole of a 50kg UXB may be as little as 20cm in diameter and can therefore become easily obscured by growing vegetation. Furthermore, it is unlikely that the undeveloped open ground which comprised the majority of Sites A and B will have been accessed to a significant degree; these areas appear largely unused and unmaintained in 1940s aerial imagery. Evidence of a UXB strike in these areas may not have been observed, becoming obscured over time.
- In summary, factors pertinent to the risk of UXO contamination vary across each Site. As discussed above, the ground conditions within the majority of Sites A and B were unconducive to the detection of UXO. Bombs, including those with delayed-action fuzes, are recorded across the south of the docks, potentially on Sites A and B. Indeed, potential repair works indicative of bomb damage has been observed to the metal refinery in Site A. As a result, the majority of Site A and Site B has been assessed at a **Moderate Risk** from German UXBs. While evidence of a UXB will have been more readily observed amongst the undamaged structures and railway infrastructure within this zone, the potential for the J-Curve effect, whereby a UXB may travel laterally from its point of penetration, indicates that the risk from the open ground also presents at the footprint of the WWII structures and railway sidings. A buffer zone has therefore been added to account for this possibility.
- No evidence of damage to the copper works in Site A, railway infrastructure in both Site A and B, nor the structures in Site C, has been identified. The presence of significant and important infrastructure in these locations indicate that a UXB strike will have been observed and dealt with at the time. However, given recorded bombing to the copper works, south side of the docks and the steelworks, the risk from German UXBs is slightly elevated and has been assessed as **Low-Moderate**.

- Similar to the copper works and railway infrastructure within Site A, as well as structures in Site C, no confirmed visual evidence of damage has been observed to the briquetting works in Site B. A UXB strike is likely to have been observed at this location during WWII. Given this, a **Low Risk** has been assessed at the footprint of this structure, with the zone accounting for the possibility of J-Curve causing a UXB to come to rest beneath. As a result, this zone is smaller than the structure itself.

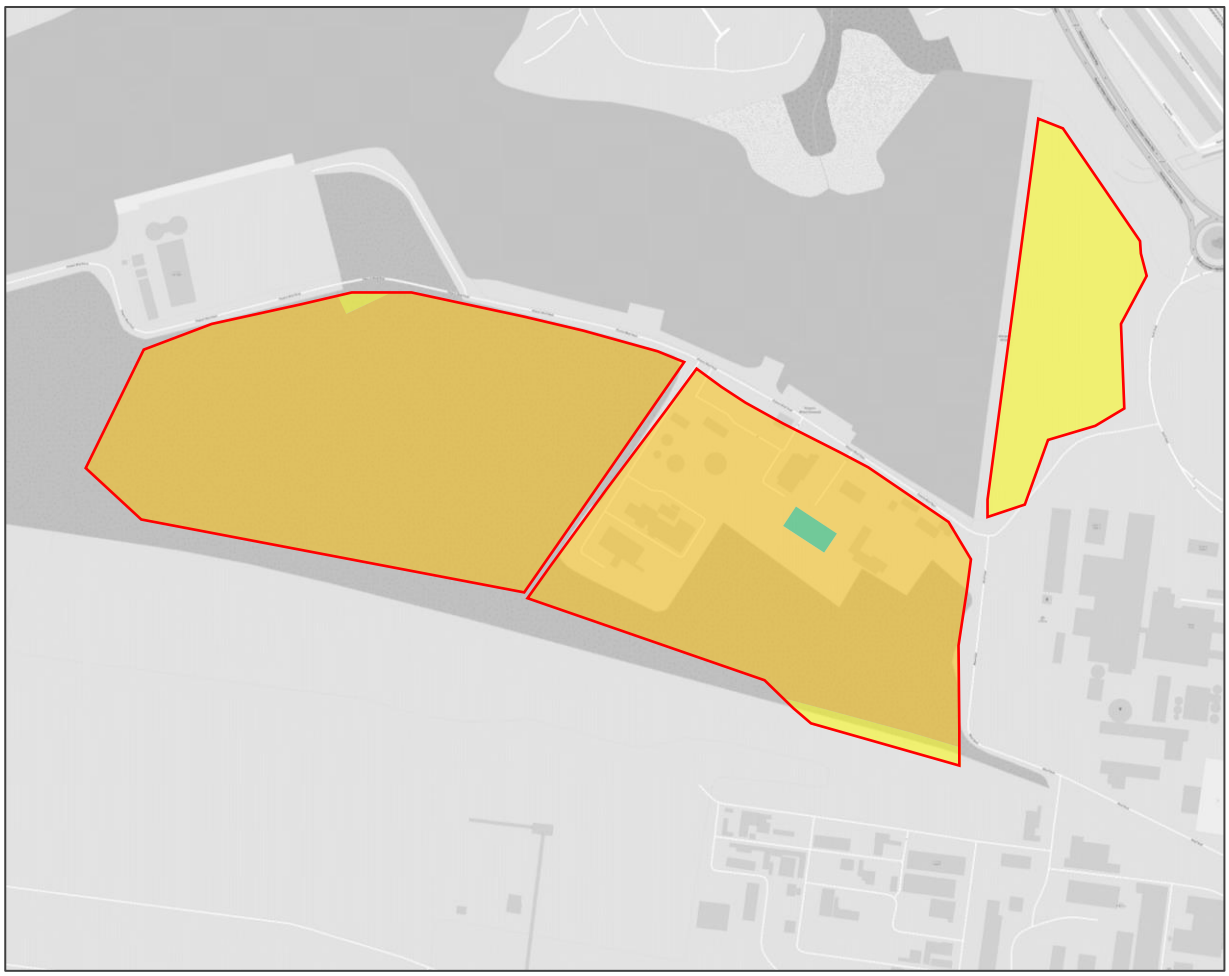
British / Allied UXO:

- Evidence indicates that the Margam Steelworks, within which Site C was located during WWI and WWII, was purpose built during WWI for war production. Further research suggests that the steelworks produced steel utilised for munitions, tanks, ships and other war materials. Three WWII-era bombs/shells have been uncovered at Tata Steel in the 21st century (none have been recorded on Site, although specific locations are unknown). No evidence has been found to suggest that shells were filled at the steelworks in Port Talbot. It is likely that the aforementioned shells consisted solely of the outer casing, given that each of them was certified inert and no mention was made of a high-explosive fill. Therefore, the risk from Allied UXO is assessed to be **Low** across the Site.
- Although all shells uncovered within the wider Tata Steel works have been found to be inert and are believed to be shell casings only, not ordnance, it cannot be assumed to be the case for any potential future items that are encountered. Any suspicious items should be assumed to be live / hazardous. If such an item is encountered on Site, the relevant authorities should be contacted in order to carry out an immediate investigation and initiate the necessary safety procedures.
- 16 permanent HAA batteries were active within range of the Site during WWII. LAA guns likely defended Port Talbot, within which the Site was located. Luftwaffe activity in the region was relatively infrequent. It is possible that an unexploded AA shell struck the open areas of the Site, and the risk is considered to be analogous to that of German UXBs.

Likelihood of UXO Remaining and UXO Encounter:

- Post-conflicts ground works for all three Sites have comprised the clearance of all WWII-era structures and railway lines. This would have consisted of grubbing out the foundations of the former structures, likely mitigating the risk in these areas to shallow depths (1-2m bgl). It is possible that the clearing of some structures may have required deep (>2m) intrusions, although this has not been possible to confirm. The open areas of the Site are likely to have to received minimal post-WWII ground works, which will likely have been to very shallow depths (<1m bgl). Site B has seen the construction of various low-rise structures, infrastructure and the addition of hardstanding across large areas in the north and west. The depths associated with these ground works likely range from very shallow to shallow.
- The risk associated with (any) very shallow and shallow buried UXO will have been partially mitigated in areas of WWII-era structures and infrastructure, as well as post-WWII ground works. The risk associated with (any) deep buried UXO likely remains unmitigated.

Risk Map:



Low Risk from German UXBs & HAA Shells
Low-Moderate Risk from German UXBs & HAA Shells
Moderate Risk from German UXBs & HAA Shells

RECOMMENDED RISK MITIGATION MEASURES: The measures detailed below are recommended to mitigate the risk to ALARP level.

Risk Mitigation Measure	Recommendation
UXO Safety Awareness Briefings	Prior to all intrusive works commencing.
Non-Intrusive Magnetometer Probe Survey	Open excavations on greenfield land within the **Moderate Risk** zone.
Intrusive Magnetometer Probe Survey	Of all pile positions within the **Moderate Risk** zone.
EOD Engineer - On Site Supervision	Watching brief of all open excavations and magnetometer survey of all borehole locations within the **Moderate Risk** zone.

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FIGURES

FIGURE 1: Site Location Maps

FIGURE 2: Recent Aerial Photograph

FIGURE 3: Current Site Plan

FIGURE 4: Historical OS Mapping

FIGURE 5: Historical Aerial Photography

FIGURE 6: Luftwaffe Target Map – September 1940

FIGURE 7: Risk Mapping

APPENDICES

APPENDIX 1: Recent UXO Incidents and Historical Analysis

APPENDIX 2: Data Sheets - German WWII Air-Delivered Munitions

APPENDIX 3: Data Sheet - British WWII Anti-Aircraft Munitions

APPENDIX 4: Glossary

APPENDIX 5: Bibliography

QUALITY MANAGEMENT

Brimstone is committed to the provision of UXO risk mitigation services, including the safe removal and disposal, in the UK and overseas. Since our inception in 2016 it has been our goal to provide unsurpassed UXO risk mitigation services. Brimstone is a client-driven organisation, we aim to provide the client the services they need, to the agreed requirement, in accordance with national and international standards.

We are committed to providing a safe, cost-effective and quality service, underpinned by our three core values;

- Integrity in advice, information and the manner in which we conduct ourselves and our operations,
- Professionalism in the way we handle our operations, people and processes, and
- Knowledge in new skills and information, to ensure we remain at the forefront of innovation and strategy.

We are committed to the applicable requirements of the ISO 9001 standards. We set and review quality monitoring objectives to measure the performance of our quality management system. Brimstone wholly endorses the ethos of 'continual improvement efforts' and allocates resources to meet this requirement.

This policy applies to the whole of the Brimstone services and affects roles from the managing director down. All staff are responsible for helping manage quality, seeking improvement through constant review, and by encouraging supplier and subcontractor involvement. We are committed to achieving customer satisfaction using quality procedures, which will be operated to meet or exceed the applicable requirements of ISO 9001.

Aaron Florence
Founder and Managing Director
Brimstone

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1 INTRODUCTION

1.1 Background

TEC Ltd (the Client) has commissioned Brimstone to carry out a Stage 2 Detailed Unexploded Ordnance Risk Assessment (DRA) of the proposed redevelopment works at the Project Dragon, Port Talbot site (the Site).

1.2 Legislation

There are no regulations that specifically govern the UXO risk mitigation industry in the UK. There are however two pieces of legislation that require consideration. It is industry best practice (and common sense) to frame your site in the context of UXO, and to put in place measures to protect people from risks. In 2009, CIRIA published Unexploded Ordnance (UXO) - A Guide for the Construction Industry C681. This publication, though not legally binding, provides the gold-standard framework to which UXO and construction companies operate.

1.2.1 Construction Design and Management Regulations (CDM) 2015

The regulations identify the client, the CDM coordinator, the designer, and the principal contractor as responsible parties. Under the regulations, responsible parties are held accountable for the way a construction project is managed and for the health and safety of workers. Responsible parties must:

- Provide an appropriate assessment of potential UXO risks, or ensure an assessment is completed by another party.
- Put in place appropriate risk mitigation measures if necessary.
- Supply all parties with information relevant to the risks.
- Ensure the preparation of an emergency response plan.

1.2.2 The Health and Safety at Work Act 1974

The Health and Safety at Work Act 1974 had a transformative impact on health and safety, saving thousands of lives since its enactment. Employers must consider their employees, workers not in their employment, and members of the public. The act places a duty on every employer 'as far as is reasonably practicable' to protect workers from risks. It also says that information must be provided about aspects of health and safety that affect their role.

1.3 Commercial Contractor and the Authorities

1.3.1 Commercial Contractors

If your site has been given a moderate or high-risk rating, then control measures will be recommended. The measures will be specific to the scope of works on site, usually in relation to the depth and extent of excavations, piling and similar activities. There are a range of different methods at Brimstone's disposal, including:

- Non-intrusive surveying (including drone surveying)
- Intrusive surveying
- Search and clear
- Watching brief
- Support to geotechnical investigations
- Target investigation
- Site-specific training packages
- Site safety briefings

Our UXO Engineers can assess suspicious items on site when they are found. This will avoid unnecessary site evacuations. If our engineer(s) decide the item is UXO, they will coordinate with the authorities, manage disruptions, and advise on control measures, such as evacuations and a cordon.

1.3.2 UK Authorities

If Brimstone is not on site and a suspicious item is found, the local police must be immediately called on the non-emergency number. Police will visit the site. They will then inform the Joint Services Explosive Ordnance Disposal (JSEOD) office, which will coordinate the callout of an army or navy response team.

A precautionary cordon will initially be put into effect, with possible evacuation of homes and businesses, road and rail closures. The cordon may be extended following the advice from JSEOD's response team.

To manage their resources, JSEOD triages incidents. A consideration of the type, size and location of the UXO is made. If an incident is not given a high priority rating, a team may not be available for up to two days following the initial report.

The use of JSEOD is under the Military Aid to Civil Authorities (MACA) framework, therefore the budget and personnel is limited, and there are no statutory obligations made of the MOD. Often the MOD will recommend involvement of a commercial UXO contractor to manage the ongoing risk – this is especially true of former airfields and training areas where contact with land service ammunition can be frequent.

1.4 UXO Risk in the UK

Fortunately, to the best of our knowledge, there has not been a single post-war incident in the UK where a construction worker has been killed or injured because of an item of UXO exploding. There have been cases in mainland Europe where UXO had been struck and then exploded, killing workers. In 2019 a WWII general purpose bomb spontaneously detonating in a field north of Frankfurt, Germany.

However, the incident in Frankfurt is not comparable to the UK, due to the way different countries manufactured ordnance. Bombs made in different countries have different associated hazards. British WWII bombs, for example, have a fuzing system which uses chemicals which makes them very unsafe. Please see **APPENDIX 1** for recent examples of UK UXO incidents.

Between 2013 and 2016 JSEOD responded to 7,500 callouts. These callouts range from falsely identified objects, inert objects, small items of UXO and large WWII German unexploded bombs (UXBs). Each year the construction industry inadvertently unearths UXO; often this goes unreported. UXO contamination comes from three main sources:

- **Enemy action:** during WWI and WWII the air forces of Germany, and to a lesser extent Italy, bombed targets throughout the UK. The German navy bombarded several coastal targets in eastern England during WWI and then in WWII German long-range artillery on the French coast bombarded parts of Kent.
- **Allied military activity:** during WWI and WWII several Allied nations used the UK as a staging area for military action in the European Theatre; predominantly the US and Canada.
- **UK military activity:** domestic British Army, Royal Air Force (RAF) and Royal Navy (RN) training activities during peacetime and conflict as well as anti-aircraft gun and rocket batteries during WWI and WWII.

1.5 UXO Detonations

A detonation is a violent chemical reaction which creates a huge volume of gas. This reaction appears to happen instantaneously – the velocity of the shockwave moving is up to 9000m per second. This chemical reaction is started using a small amount of very sensitive explosives called primary explosives. These types of explosives are highly sensitive to shock, friction, heat, and spark. As the explosive charge undergoes high order decomposition (detonation), the brisance, or shattering effect, causes the casing to splinter, projecting razor-sharp shrapnel across long distances.

The blast wave effect and the shrapnel effect can cause significant damage. Calculating safety distances is a complex process. As a rule of thumb, in open ground, a 250kg explosive charge (as would be found inside a typical 500kg bomb) would require an omnidirectional safety distance of at least 1.6km.

Bombs work by amplifying the explosive charge from the sensitive primary explosive through to the main charge or fill of the item. This process is called an explosive train, if any link in that chain is broken, the item will fail to

function as intended. This can be due to mechanical, electrical, or manufacturing tolerances or faults. Amongst other reasons, detonation of UXO could occur under the following circumstances:

- **UXO body impact:** A substantial impact onto the main body of a UXO; borehole rigs, piling rigs, jack hammers and mechanical excavator buckets.
- **Fuse impact:** Environmental conditions during decades of burial can result in the primary explosives located in the fuse pocket to crystallise and become shock sensitive. It would then take a relatively small impact or friction impact to cause the fuse to function and detonate the UXO.
- **Re-starting a timer:** A small proportion of German WWII bombs used clockwork fuses. In 2002 an Army EOD Engineer reported that the clockwork fuse in a UXB re-started. Decades of burial cause substantial corrosion in WWII German UXBs and therefore an incident such as this is extremely rare.

2 ASSESSMENT METHODOLOGY

2.1 Introduction

This assessment has been produced in accordance with the relevant CIRIA guidelines; *Unexploded Ordnance (UXO) - A Guide for the Construction Industry C681* (published in 2009). CIRIA C681 is a publication which originated from round table best practice discussions from industry leaders.

2.2 SPRC Risk Model

The Source, Pathway, Receptor, Consequence (SPRC) risk model can be applied to buried UXO as follows:

- **Sources:** UK and allied UXO sources include military firing ranges, bases, storage depots, munitions factories, anti-aircraft batteries, amongst others. There are many wartime causes of UXO contamination. The source for enemy contamination is overwhelmingly from WWII German air raids.
- **Pathways:** the pathway describes how the UXO reaches receptors. Usually UXO is buried and therefore pathways can be any activity which involve breaking ground. Examples include ground investigation works, site enabling works and excavations.
- **Receptors:** receptors are the people, assets and infrastructure that can be adversely affected by UXO exposure. This includes site personnel, plant, equipment, buildings, the general public, , and the environment.
- **Consequence:** the consequences of an inadvertent UXO detonation are catastrophic. They include injury and loss or life, as well as damage to property. Fortunately, the likelihood of UXO detonating is low, even when it is uncovered during works. Another consequence to consider however is delays to works, which itself can be a risk.

2.3 Assessment Structure

In accordance with CIRIA C681 this assessment addresses the following considerations in the appropriate order:

- The likelihood that the site was contaminated with UXO.
- The type of UXO that could have contaminated the site, and their associated hazards.
- The likelihood that UXO remains on the site.
- Theoretical bomb penetration depths.
- The likelihood that UXO will be uncovered during the proposed works.
- Risk rating and risk mapping (as appropriate).
- Risk mitigation recommendations.

2.4 Information Sources

To complete this risk assessment Brimstone has gathered information from a wide range of sources. Brimstone's research team has completed detailed historical research, including access of original archived records. The following is a general list of information sources that are consulted during the research process:

- The National Archives,
- Local archive centres,
- Ministry of Defence,
- The Council for British Archaeology,
- Groundsure mapping services,
- Historical aerial photography (Historic England, Britain From Above, Bluesky),
- Google open-source mapping,
- The British Geological Society,
- Open sources; published book, articles, web resources,
- Site specific information supplied by the Client,
- Brimstone's library and historical database, and
- Brimstone's former armed forces employees.

2.5 ALARP Principle

The ALARP (as low as reasonably practicable) principle corresponds to the actions that should be taken to reduce risks. The term 'ALARP' is in the Health and Safety at Work Act 1974, which says that risks must be controlled in a reasonable way.

Infinite time, effort and money could be spent trying to eliminate risk entirely. HSE uses the example that spending £1m to prevent five employees bruising their knees is disproportionate, whereas spending the same amount to prevent an explosion which could kill 150 people is proportionate.

Using this principle, Brimstone aims to reduce client costs by recommending strategies that are proportionate to the assessed risks, if any elevated risk is found at all.

2.6 Risk Tolerances

The Brimstone risk assessment process divides UXO risk into two tolerances:

- **Tolerable:** negligible risk or low risk ratings are tolerable. Where the risk cannot be completely discounted, it may be a useful strategy to opt for a low-cost measure, such as a UXO safety briefing from a qualified UXO engineer.
- **Intolerable:** moderate risk or high-risk ratings are intolerable. Proactive risk mitigation measures should be put in place. Various strategies are at Brimstone's disposal to meet your project-specific needs.

2.7 Reliance and Limitations

This report has been prepared using published information and information provided by the Client. Brimstone is not liable for any information which has become available following the publication of this report. No third-party liability or duty of care is extended. Any third-party using information contained in this assessment do so at their own risk.

3 THE PROJECT

3.1 The Site

The Site comprises three separate areas, known as Site A (west), Site B (centre) and Site C (east). These will be referred to collectively as 'the Site' for the purposes of this assessment, when not discussed individually.

The Site (approximately centred on the National Grid Refs: SS 76385 88669 (Site A), SS 76750 88541 (Site B) SS 77018 88747 (Site C)) is located in Port Talbot, within the county borough of Neath Port Talbot, Wales. Port Talbot Parkway railway station is located approximately 700m north of the Site.

Site A primarily comprises undeveloped land – consisting of grassy areas and mature vegetation – intermixed with brownfield land. It is bound to the north by an unlabelled roadway and a cement works factory, to the east by a thin parcel of undeveloped land and Site B, while open/wooded ground lies to the west and south.

Site B consists of undeveloped land with mature vegetation in the south, particularly along the border, while areas of hardstanding complete with industrial infrastructure, low-rise industrial warehouses and other structures lie in the north and west. Most of the ground in the north and west is laid to hardstanding, mainly used for open air storage and car parking purposes.

Site C consists of hardstanding brownfield land with an entrance to an unnamed roadway in the south and the entrance to a river runoff in the north. It is bound to the north by the hardstanding river run off, to the east by an unnamed roadway connecting to Harbour Way, to the south by an unnamed roadway and to the west by a vegetated border to the docks.

FIGURE 1: Site Location Maps **FIGURE 2:** Recent Aerial Photograph

3.2 The Proposed Works

Ground investigation works are proposed. All buildings on Site B are to be demolished. Once cleared, twelve trial pits, fifteen cable percussive boreholes and fifteen window samples are planned. Brimstone was not made aware of any future redevelopment works.

FIGURE 3: Existing Site Plan

4 SITE HISTORY

4.1 Site Introduction

Site-specific history can be assessed by reviewing historical mapping, historical aerial photography and by carrying out additional Site-specific research where appropriate. Below are descriptions of a selection of records relevant to the Site:

4.2 Mapping

Period	Map Date	Map Scale	Review
Pre-WWI	1896-1897	1:10,560	Site A comprises mud and heathland. Site B comprises mud and heathland with a small area of open water in the north. Site C comprises heathland, railway sidings and two minor structures, with small areas of open water in the west.
Pre-WWI / WWI	1913-1914	1:10,560	The composition of Site A varies. A coal works lies within the central section, with a small section of a copper works within the north-west, encompassed by undeveloped open ground. Both of these works are linked to extensive railway infrastructure, some of which lies within the south and west of Site A. The majority of the rest of Site A consists of undeveloped open ground. The dock and copper works lie to the north of Site A, railway infrastructure and heathland lie to the east and west with solely railway sidings to the south. Mud is no longer recorded. Site B mainly comprises heathland and an area of wet open land, with an unnamed structure in the south-east, and railway sidings which bisect Site B south-west to north-east in the south-eastern section. Site B is bound to the north by a tramway, railway infrastructure lies to the east and south, while undeveloped open ground lies to the west. Site C comprises railway sidings and undeveloped heathland, as well as a section of Military Road.
WWII	1939-1940	1:2,500	**FIGURE 4.1:** A metal refinery works has replaced the coal works in Site A. The open ground is now all labelled as heathland, while a large railway embankment and associated sidings lie within the south. An unlabelled large structure is now present in the northern section of Site B. No other changes are recorded. Site C now comprises a section of the Margam steel works, with associated industrial buildings in the eastern and northern areas, as well as railway sidings in the north. The west/south-west of the Site comprises undeveloped open ground. Railway infrastructure lies to the north, additional industrial buildings to the east and partially to the south alongside heathland, while the Copper Works Railway lies to the west.
Post-WWII	1947-1949	1:2,500	**FIGURE 4.2:** Additional railway infrastructure, a new structure in the east, and an extension to the metal refinery works (now labelled as a Steel Ceilings Factory) are recorded within Site A. A large section of railway has also been cleared, while several ponds and gravel pits are now recorded in the west. The previously unlabelled structure in the south-east of Site B is now recorded as an electrical substation, whilst the larger structure in the northern section is labelled as the Phoenix Briquetting Works. Additional railway sidings are now present in the south-east and north-east of the Site. Structures in the north-west of Site C have been cleared, with a travelling crane replacing them and the previously undeveloped open ground in the west/south-west. The east of Site C remains occupied by industrial structures; however, the structural layout has changed in areas, with several structures replaced as well as newer additions recorded.

4.3 Photography/Aerial Photography

Period	Photo Date	Review
WWII	21st December 1940	**FIGURE 5.1 & 5.2:** This low-resolution photograph was taken early during WWII. The layout of each Site aligns with pre-WWII OS mapping. Site A mainly comprises open ground, as well as railway infrastructure and two industrial works in the centre and north-west. Site B also consists mainly of open ground, as well as two structures in the north and south-east, respectively. Railway sidings are also present. Site C comprises numerous structures associated with a large steelworks. Possible repair works have been identified to the metal refinery in Site A, as well as potential severe damage to the structure in the north of Site B. A possible bomb crater is located approximately 30m south-west of Site A.
Post-WWII	7th June 1946	**FIGURE 5.3:** No significant change has been observed within this high-resolution photograph, taken less than a year after the end of WWII. No evidence of bombing or associated damage, other than that already discussed above, has been identified.
	1947	**FIGURE 5.4:** This oblique aerial image shows the vast majority of the Site two years after the end of WWII. The north of Site C is not visible. The briquette works in the north of Site B is shown in high-resolution within this image. What appeared to be damage in the images discussed above now appears more similar to the design of the building or still under construction. No obvious debris or ruins have been identified.

4.4 Additional Site-Specific History

Some sites will have been occupied by landmarks or significant buildings historically and in such cases specific written histories including significant wartime details are occasionally available in the public domain. Site C was located within the Margam Steelworks during WWII, which played a significant role in munitions production during World War II. The steel produced at Margam was used for various purposes, including the manufacturing of munitions, tanks, ships, and other war materials. The steelworks, along with the wider industrial infrastructure of Port Talbot, contributed to the British war effort.

5 UXO RISK - GERMAN BOMBING

5.1 WWII Bombing History of the Site

5.1.1 Port Talbot

Port Talbot, a town in South Wales, was a key industrial hub during World War II, with its steelworks and coal production facilities playing a vital role in supporting the British war effort. The Margam Steelworks, in particular, were involved in the production of steel for munitions, tanks, ships, and other war materials. Consequently, the town and its industries became targets for German air raids carried out by the Luftwaffe.

During the course of the war, Port Talbot experienced several air raids by the Luftwaffe, resulting in damage to its infrastructure, industries, and residential areas. While the town did not face the same level of bombardment as some larger British cities, it still faced disruption and destruction due to its strategic importance.

The air raids on Port Talbot led to the loss of lives, damage to property, and disruption of vital industrial operations. The local community faced significant challenges in coping with the aftermath of the bombings, including rebuilding efforts and the ongoing threat of further attacks. Despite these setbacks, the town and its industries continued to contribute to the British war effort throughout the conflict.

5.1.2 Site Specific

Luftwaffe target photography indicates that Port Talbot, within which the Sites are located, was a primary target. A railway yard/storage station was recorded on target photography (Site B) and a steel works which made up

Site C. This is further recorded within Luftwaffe target mapping (**FIGURE 6**), which highlights the copper works (Kupferworke) and hard coal briquettes (Steinkohlenbrikettebrik) within Site A as bombing targets, as well as the iron foundry (Eisengießerel) within which Site C was located.

5.1.3 Bombing Decoy Sites

In mid-1940 bombing decoys were introduced. The decoys used either;

- A system of lighting to simulate an urban area or a military airfield's runway
- Deliberately started fires to simulate a previously bombed target
- Dummy buildings and vehicles to simulate a military facility

792 static decoy sites were built at 593 locations in Britain. They were estimated to have drawn at least 5% of the total weight of bombs away from their intended targets. No decoys were operational within a significant radius of the Site during WWII. The closest was approximately 2.5km to the south.

5.2 WWII Bombing Records

5.2.1 Introduction

The bomb census recorded the location and type of bomb strikes to help with intelligence gathering and planning. It was compiled using information recorded by ARP wardens. These records were gathered by the Ministry of Home Security to calculate bombing density within administrative areas.

The bomb census was unreliable in the early stages of the war, though by 1941 procedures had been standardised. The quality of the census records also depended on where in the UK the records were produced. Some records are held at the National Archives and some are held at local borough archives.

Relevant records held at the National Archives and the West Glamorgan Archive Service were obtained for this risk assessment.

5.2.2 Bombing Density Statistics

The table below records the Ministry of Home Security's bombing density calculation for the Municipal Borough of Port Talbot. It gives a breakdown of the types of large German bombs reported and is understood to not include UXBs.

Admin Area	**Port Talbot**
Area Acreage	23,444
High Explosive Bombs (all types/weights)	87
High Explosive Parachute Mines	1
Flam (Oil) Bombs	3
40kg Phosphorus Incendiary Bombs (IBs)	0
40kg 'Fire Pot' IBs	0
V1 Flying Bomb	0
V2 Long Range Rocket	0
Total (excluding V-Weapons and 1kg / 2kg IBs)	91
Bombs Per 1,000 Acres	**3.9**

1kg / 2kg incendiary bombs (IBs) and 2kg anti-personnel (AP) bombs were often too numerous to record accurately and therefore are not included in the above figures.

5.2.3 Wales Air Raid Summaries of Occurrences

These summaries, obtained from the National Archives, provide general summaries of air raids across Wales. Only vague locations are recorded, with the number of bombs sometimes listed.

Port Talbot is mentioned on three occasions, affected by incendiary bombing, a UXB and HE bombing. No specific details are provided.

5.2.4 Air Raid Summaries of Occurrences

This record set, obtained from the National Archives, provides specific details pertaining to air raids across Wales. These details include the place, assumed target, number of bombs, and the specifics regarding damage caused. One record was found related to the Site, see below for details.

Place	Assumed Target	No. of Bombs	Details
Port Talbot	Morgam Steel Works	9	Most of the nine bombs appear to have affect residential areas, although bombs 7 and 8 were dropped on 'waste ground (G.W.R)' and bomb 9 was dropped 'on railway siding'.

5.2.5 Luftwaffe Attacks On South Wales And Surrounding Bridgend Area[1]

This online source provides a timeline of air raids in south Wales, providing specific details where possible. See below for relevant incidents pertaining to the Site.

Date	Bomb(s)	Location (*relevant to the Site)*
29/06/1940	1 x UXB	Port Talbot. *Precise location unknown.*
29/06/1940	1 x HE	Near the Grand Hotel. *Located approximately 710m to the north-west of Site C.*
29/06/1940	1 x HE	In the station approach. *Located approximately 710m to the north-west of Site C.*
29/06/1940	1 x HE	On the railway sidings near Port Talbot Steelworks. *Precise location unknown, railway sidings were located immediately to the west of Site C and within Site B; however, the bomb could have affected railway sidings on the eastern side of the works.*
29/06/1940	1 x HE	Between Margam Coke Ovens and Richard Thomas Steelworks. *Precise location unclear, likely within either the Margam Steel Works, in close proximity to Site C, or the Port Talbot Steel Works, approximately 550m to the north of Site A.*
29/06/1940	1 x HE	Talbot House. *Precise location unknown.*
29/06/1940	1 x HE	Between the Steelworks and Dock Ferry. *Precise location unknown, potentially near the Site.*
29/07/1940	3 x HE	Port Talbot harbour gates. *Located approximately 470m to the west of Site A.*
20/08/1940	HEs (number unspecified)	Port Talbot Docks. *Precise location unknown, potentially on/near Site A & B.*

[1] http://www.islandfarm.wales/Luftwaffe_Attacks_On_South_Wales.htm

24/08/1940	HEs (number unspecified)	Aluminium and Copper Works and docks at Port Talbot. *Precise location unknown, the affected copper works may be located partially within the north-west of Site A. Bombs on the docks could conceivable be on near Site A.*
25/08/1940	HEs (number unspecified)	Port Talbot. *Precise location unknown.*
26/09/1940	HEs (number unspecified)	Port Talbot. *Precise location unknown.*
09/10/1940	HEs (number unspecified)	Swansea and Port Talbot bombed. *Precise location unknown.*
17/01/1941	HEs (number unspecified)	Port Talbot Docks. *Precise location unknown, potentially on/near Site A.*

5.2.6 Secondary Source / Anecdotal Evidence

A search of online resources, as well as a review of local history publications was carried out with the intention of locating any eyewitness accounts of local bombing incidents.

An online source detailing the WWII history of the Port Talbot docks provides useful information pertaining to bombing during the period. See below for relevant excerpts.[2]

- 'The docks at Port Talbot were exceedingly fortunate in that they experience very few attacks from the air, and consequently suffered relatively little air-raid damage.'
- 'The first of the air raids occurred in the early hours of 29th June and 1st July 1940, when a number of bombs were dropped on the **docks**, some falling close to Messrs. Guest Keen & **Baldwins' Margam Works**, but fortunately there was not significant damage.'
- 'One lone raider appeared over the docks at 9.52 a.m. on 20th August 1940 and dropped a number of bombs on the **south side of the docks**, causing damage to dock railway lines, electricity cables and wagons of coal, etc.'
- 'Four days later, incendiary bombs and high explosive time bombs were dropped on No. 2 Grid. All traffic working on the **south side of the dock** was held up for two days until the unexploded bombs were recovered.'

5.2.7 Abandoned Bomb Register

Due to the overstretched bomb disposal units during WW2, many bombs were intentionally left undisturbed. UXBs were triaged based on where they were and how big they were. If they didn't pose a significant risk they were 'abandoned'. The locations of these bombs were recorded on the abandoned bomb register.

The abandoned bomb register is a public record document held at the Parliamentary Archives of the House of Commons, from which Brimstone has obtained a copy. The register should not be relied on for completeness or accuracy. The closest abandoned bomb is recorded approximately 11.4km north-west of the Site.

[2] http://www.swanseadocks.co.uk/docksnewsite/ptwar.html

5.3 Likelihood of UXB Contamination

Where detailed bombing records exist, it is possible to predict whether any UXBs could be found on a site. This likelihood is discussed in the following table:

Density of Bombing	
Number of Air Raids in the Vicinity:	A comparison of the bombing incident records confirms that at least eight air raids affected the study area. This number may be higher as no comprehensive official bombing records for Port Talbot have been uncovered.
Intensity of these Air Raids:	All bombs dropped locally were likely part of so called “tip and run” raids; aircraft jettisoning their remaining ordnance loads before the return journey to continental Europe. Small-scale targeted raids may also have taken place.
Bomb Strike Positions	
Closest Bomb Strikes	HE bombs: potentially on Site A/B. 1kg / 2kg IBs: unknown.
Alignment of recorded Bomb Strikes:	For areas with no bomb plot mapping or comprehensive written records, accurate analysis for the alignment of bomb strikes is not always possible. However, evidence obtained within an online source indicates that a stick of delayed-action HE bombs were dropped on the south side of the docks, potentially referring to Sites A and B. Additional attacks on the docks and the Margam steelworks are also referred to. This indicates that multiple aircraft may have flown over each of the Sites, elevating the possibility for a UXB to have been dropped overhead.
Bomb Failure Rate	
Evidence to suggest that the generally accepted failure rate of 10% differs in the vicinity of the site:	None.
UXBs recorded in close proximity to the site:	None.

5.4 Likelihood of Subsequent UXB Detection

A range of circumstances determine whether a UXB strike location would have been identified, during and after the war. This is discussed in the following table.

Historic Access
A UXB falling on a site which was frequently accessed would have had a better chance of being found. ARP Wardens actively searched for UXBs in heavily bombed residential areas. The importance of a site or nearby buildings and infrastructure was also a factor. Many industrial facilities had fire watchers tasked with extinguishing incendiary bombs and reporting UXBs.
As all air raids in the immediate vicinity are thought to have occurred during the hours of darkness, there is a greater probability that any UXB strike to the Site could have occurred unobserved as residents/employees were inside. However, fire watchers were likely present at the industries located within each of the Sites, while the railway infrastructure located within/adjacent to each of the Sites was likely subject to post-raid checks for evidence of UXO. Indeed, given the lack of identified damage in Site C within high-resolution 1946 aerial imagery, as well as to the copper works in the north-west of Site A and briquetting works in Site B, access is likely to have remained frequent in these areas. These factors increase the likelihood of bombing and subsequent evidence of UXO being observed in these areas. However, visual evidence of repair works to the metal refinery in Site A (white/brighter roofing) suggests that bomb damage may have occurred at this location. It is conceivable that access may have been reduced for a time, depending on the extent of the damage. Furthermore, it is unlikely that the undeveloped open ground which comprised the majority of Sites A and B will have been accessed to a significant degree; these areas appear largely unused and unmaintained in 1940s aerial imagery. Evidence of a UXB strike in these areas may not have been observed, becoming obscured over time.

Bomb Damage
As the bombing campaign continued, damaged areas became vulnerable to unreported UXBs. Bomb site wreckage or soil disturbance at a bomb crater could obscure evidence of a subsequent UXB strike.
No evidence of bomb damage to the copper works in Site A, the structure in Site B, nor the section of the steelworks in Site C has been identified within historical aerial imagery and OS mapping, i.e. areas of clearance, missing roofs, repair works. Similarly, no obvious evidence of bomb damage was evident in the areas of open/undeveloped ground on Site; however, such evidence is typically less easily identifiable amongst open ground. Evidence of repair works to the metal refinery in Site A has been observed within 1940 and 1946 aerial imagery, suggesting that bomb damage may have occurred early during WWII. The extent of this possible damage cannot be accurately discerned, although the whole roof appears to have been replaced. The coal briquette works, located within the north of Site B, may have sustained serious damage as identified within aerial vertical imagery (see **FIGURE 5.2**). However, given the homogenous nature of this potential damage, as seen within **FIGURE 5.4**, it may be that the structure itself is incomplete or the intended design. A possible bomb crater has been identified approximately 30m south-west of Site A.

Ground Cover Type
A UXB which falls on open field could easily go unnoticed, whereas a UXB dropped on a hard-surfaced car park would have been easily observed.
Any UXB strike to the undamaged structures on each of the Sites would have caused incontrovertible evidence of its incidence as it passed the structures and into the ground beneath. Similarly, a UXB strike to the railway sidings on/adjacent to each of the Sites is likely to have been identifiable at the time. Evidence of a UXB strike amongst the metal refinery in Site A, which may have been damaged early during WWII, could conceivably have been obscured amongst existing damage and debris. The majority of both Site A and Site B also comprised undeveloped open ground during WWII. Subsequently, any potential evidence of UXO which may have fallen at this time is thought likely to have been less noticeable, with a UXB's descent into open land less obvious than through a structure or roadway, for example. Indeed, the entry hole of a 50kg UXB may be as little as 20cm in diameter and can therefore become easily obscured by growing vegetation.

5.5 Bombing During WWI

During WWI, an estimated 9,000 German bombs were dropped on London, Eastern England and South-Eastern England during some 51 Zeppelin airship raids and 52 fixed-wing aircraft raids. London suffered the worst of the bombing with an estimated 250 tonnes of HE and incendiary bombs recorded across the Capital, over half of which fell on the City of London district.

The WWI bombing campaign waged by Germany was on a far smaller scale than the WWII campaign, in terms of the number of raids, the weight of ordnance dropped during each attack and the size of the bombs used. When coupled with the fact that most WWI bombed locations have since been redeveloped, German WWI UXB finds are extremely rare. Furthermore, most air raids took place during daylight hours and as it was the first time Britain had experienced strategic aerial bombardment, the raids often attracted public interest and even spectators, increasing the chances of any UXBs being reported.

A collection of written reports describing each air raid in the region was reviewed.[3] The wider Site area, however, did not experience any air raids during WWI. As such, the associated UXO risk is considered negligible and will not be further addressed.

6 WWII GERMAN BOMBS

6.1 Bombs Dropped on the UK

Nazi Germany used different types of ordnance against the UK for different effects. Some types were designed to cause fires, others for their destructive blast effect and other for their penetration capability. Each type of ordnance was fitted with at least one fuze. For some bombs multiple fuzes were used. Many different types of fuzes were available for use – each with its own set of associated hazards.

Data sheets on those bombs most likely to be encountered today are included at **APPENDIX 2**.

- **HE bombs – moderate NEQ (net explosive quantity):** the most common types of HE bombs dropped were the SC (general purpose - GP) and SD (semi-armour piercing - SAP) series of bombs. The NEQ is between 30-50%. SAP bombs are engineered to attack light fortifications, whereas GP bombs are used in a mixed destructive blast and anti-personnel fragmentation role. 70% of bombs dropped on the UK were the 50kg type.
- **HE bombs – high NEQ:** blast bombs and parachute mines have bodies made of thin steel, allowing for larger HE charges. These were designed to detonate above ground, maximising the blast effect. Parachute mines were weapons slowed by parachutes and designed to detonate without penetrating the ground. Although, in some marshland areas, partially buried parachute mines have been observed. Consequently, it is highly unlikely that any unexploded blast bombs remain buried in the UK today.

[3] https://www.iancastlezeppelin.co.uk/

- **HE bombs – low NEQ:** The PC series were armour piercing bombs used against heavy fortifications and reinforced bunkers. They were not commonly used over the UK.
- **Small incendiary bombs:** The 1kg and 2kg incendiaries were the most dropped bomb. Up to 620 x 1kg incendiaries could be packed into the largest container unit, which opened at a pre-determined height scattering its payload over a wide area. These small bombs could fully penetrate soft ground due to their small diameter. Variants of the 1kg and 2kg incendiary bombs contained a small HE charge designed for an anti-personnel role, and to increase its incendiary effect.
- **Large incendiary bombs - Thick skinned:** The C50 has a thick body and contained a mixture of incendiary liquids and white phosphorus. Another version of the C50 had a white phosphorus fill. The C50 'firepot' contained thermite incendiary containers (aka firepots) and a small HE charge.
- **Large incendiary bombs - Thin skinned:** The Flam 250 and Flam 500 models had thin steel bodies designed to break up on impact, spreading their oil-incendiary mixture, which was ignited by a small HE charge. Consequently, it is highly unlikely that any unexploded Flam bombs remain buried in the UK today. Their unreliability meant withdrawal from frontline use by January 1941.
- **Submunitions:** The SD2 'butterfly' bomb was a 2kg submunition dropped on several British cities and towns. It contained a 225gram HE charge. SD2s had no ground penetration ability so the vast majority were recovered at the time. However, SD2s are still found across Britain today.
- **V1 flying bombs and V2 rockets:** In the final year of WWII Germany began using pilotless weapons against England. Both V Weapons had 1,000kg HE warheads. Due to their light-body construction, they had no penetration ability and any impact left a noticeable debris field. As such, there is negligible risk from unexploded V weapons today.

6.2 Bomb Failures

Records from September 1940 to July 1941 show that an average of 84 UXBs were dropped on civilian targets each day. Around 8% of these were time delay bombs – designed to strike the ground and start a predetermined countdown which could last days.

There is a generally accepted 10% failure rate for WWII German HE bombs. This is estimated from records gathered by bomb disposal units. These statistics do not account for UXBs that went by unnoticed.

Failures can happen for different reasons, including:

- Equipment or human error in arming the bombs before release,
- Failure of a mechanism within the fuze (out of tolerance),
- Jettisoning payloads if the bomber was under attack or crashing, or
- Partially functioned bombs (e.g. cracks in the cast TNT)

6.3 Bomb Ground Penetration

6.3.1 Introduction

Using data gathered during WWII by the Ministry of Home Security, estimations can be made about how deep a bomb is likely to penetrate the ground. Over one thousand incidents were reported by the bomb disposal units to support this research. Further tests were carried out, dropping bombs of different sizes into chalk and measuring the depths they reached. This research is held at the National Archives. The estimates are:

Bomb weight (kg)	Ground Type (m)							
	Sand		Gravel		Chalk		Clay	
	Average	Max.	Average	Max.	Average	Max.	Average	Max.
50	2.8	7.8	2.8	7.8	3.5	7.7	4.0	9.1
250	4.8	13.7	4.8	13.7	6.0	13.1	6.8	15.8
500	6.0	17.3	6.0	17.3	7.6	16.4	8.7	19.8
1,000	7.6	21.9	7.6	21.9	9.6	20.7	10.9	24.9

Different layers of geology affect penetration depths. For example, 1m of made ground, then 1m of gravel before reaching clay – as is many areas of London – is not easily calculated from the data above.

When calculating how deep a bomb could have reached, we must make three assumptions:

- **Impact velocity:** German bombing raids were carried out at altitudes in excess of 5,000m. The velocity of impact is roughly 313ms^{-1} (not accounting for resistance). It is the same velocity regardless of mass.
- **Impact angle:** strike angles of 10 to 15 degrees to the vertical. It must be assumed that the bomb was stable at the moment of ground penetration.
- **Bomb design:** Some larger German bombs were occasionally fitted with 'kopfrings' - a metal ring, triangular in cross section, fitted around the nose of the bomb to help prevent penetration. It must be assumed that no 'kopfrings' were fitted.

6.3.2 The J-Curve Effect

During WWII BDUs reported that most buried UXBs were found horizontal or upturned. This observation confirmed the 'J-curve effect'. As an HE bomb penetrates the ground, slightly offset from the vertical, its passage underground creates a 'J' shape.

This is relevant because the J-curve effect results in a horizontal offset between the buried UXB and its point of entry. This is distance is estimated to be one third of the theoretical penetration depth. A low altitude attack, meaning a low impact angle, could produce an even greater offset, of up to 15m.

6.3.3 Site Specific Geology

BGS Mapping	**Superficial Deposits:** Tidal Flat Deposits – Clay, Silt and Sand	**Bedrock Deposits:** South Wales Middle Coal Measures Formation - Mudstone
SI Data	Recent SI data was provided by the Client. One of the boreholes on Site (BH01 – April 2022) encountered the following ground conditions: - 0.20m of very gravelly sand. Gravel of slag and concrete (made ground). - 1.00m of gravelly, silty sand with occasional silt. Gravel of slag, mudstone and rare brick fragments (made ground). - 1.00m of gravelly silty sand. Gravel of mudstone. - 2.00m of sandy silt. - 1.00m of sandy gravelly silt with low cobble content. - 0.80m of silt with low cobble content and frequent pockets of peat. - 3.30m of sandy silt. - 0.20m of peat. - 10.10m of sand with medium cobble content.	

6.3.4 Site Specific Maximum Bomb Penetration Depth

During WWII the Luftwaffe dropped many different types of HE bomb. The SC (general purpose) series was by far the most numerous and of this series, the SC 500 model (weighing 500kg) was the largest of the most commonly deployed and therefore this will be used as the benchmark weapon for the Site-specific bomb penetration depth calculations.

To calculate an accurate maximum bomb penetration depth, Brimstone would normally take the average of the averages of the figure for the predominant Site-specific geologies (silt, sand, gravel), in the table above. However, given the lack of BPD data for silt, as well as for mudstone and sandstone, this has not proved possible on this occasion. While dense gravel presents at depths of 10-14m bgl, a UXB will first have travelled through clay, silt or sand beforehand, indicating that the dampening effect of the dense gravel on the descent of a UXB will be marginal and near the tail-end. As a result of the variance of the geological conditions on Site, with areas of predominantly clay, silt and sand identified, the maximum penetration depth could be up to 14.25m.

NB: theoretically penetration depths could be greater if the UXB was larger, however, War Office statistics confirm that between October 1940 and May 1941 the majority of HE UXBs (>90%) were either 50kg or 250kg, with the 500kg bombs making up most of the remaining 10%.

7 UXO RISK - BRITISH/ALLIED ACTIVITY

7.1 Introduction

The table below lists potential sources of UXO (excluding enemy action). Those which are potentially relevant to the Site are discussed in the subsequent section(s).

Potential UXO Source	Potentially Significant
Army or RAF training areas / ranges	✗
Military bases and other installations	✗
Munitions and explosives factories	✗/✓
Military storage depots	✗
Defensive fortifications	✗
Wartime site requisitions	✗
WWII defensive mining (landmines)	✗
WWII Home Guard activity	✗
Wartime anti-aircraft fire	✓

7.2 Potential Sources of UXO

7.2.1 Introduction

Research has not located any evidence of significant British or Allied army, RAF or Royal Navy activity specifically on Site and none is likely to have occurred historically. However, evidence indicates that the Margam Steelworks, within which Site C was located during WWI and WWII, was purpose built during WWI for war production. The potential sources of British UXO contamination are therefore munitions factories and WWII AA artillery fire.

7.2.2 Margam Steelworks

Evidence indicates that the Margam Steelworks, within which Site C was located during WWI and WWII, was purpose built during WWI for war production. Further research suggests that the steelworks produced steel utilised for munitions, tanks, ships and other war materials. Three WWII-era bombs/shells have been uncovered at Tata Steel in the 21st century. The first, referred to as a 'bomb' within an in-house geo dataset, was encountered approximately 1.8km to the south-east of Site A in 2008 during excavation works; the area was

cordoned off and an EOD squad attended the scene, although the device was found to be inert. A 'shell' was discovered near the main railway line in 2011, which is located approximately 170m to the east of Site C at its closest point, although was likely encountered further to the south. It is unclear whether the shell was filled and fuzed and bomb disposal personnel carried out a controlled detonation.[4] Another 'shell' was uncovered in 2020 (precise location unknown) and was declared without a fuze and therefore inert by Army personnel; however, it is unknown whether it was filled with high explosives. [5]

No evidence has been found to suggest that shells were filled at the steelworks in Port Talbot. It is likely that each of the aforementioned shells consisted solely of the outer casing, produced by the Margam Steelworks, given that each of them was certified inert.

7.2.3 WWII Anti-Aircraft Fire

Anti-Aircraft (AA) Command was a British Army command established in 1939 to defend the UK during the anticipated German bombing campaign. It controlled the Territorial Army AA artillery and searchlight units. From 1940 to 1945 BDUs dealt with 7,000 unexploded AA shells in Britain. There were three main types of AA battery used for home defence (see below). Data sheets on these AA defences are included at **APPENDIX 3**.

- **Heavy Anti-Aircraft (HAA):** large calibre guns (3.7" and 4.5") for engaging high altitude bomber formations. Hundreds of permanent batteries were constructed in and around major cities and military bases during the 1930s. Some 2,000 of these guns were available during the Blitz. Each gun could fire between 10 and 20 rounds per minute and consequently HAA batteries could expend large quantities of shells during each engagement.

  British time fuses were poorly manufactured during WWII and this led to high failure rate for HAA shells, up to 30%. Unexploded HAA shells had the potential to land up to 27km from their battery, although more typically landed within a 15km radius.

- **Light Anti-Aircraft (LAA):** smaller calibre guns for engaging dive bombers and low altitude intruders. As such they were mostly used to defend specific industrial and military targets which were subject to precision bomber attack. LAA guns were either .303" calibre machine guns or 20mm and 40mm calibre cannon. The latter were fitted with simply impact fuses and small incendiary or HE bursting charges.

  The 40mm Bofors gun could fire 120 x HE shells / minute to a ceiling of 1,800m. Each shell was designed to self-destruct if it didn't strike an aircraft, however, inevitably some failed and fell back to earth.

- **Z (Rocket) Batteries**: a Z-Battery comprised a grid formation of 64 rocket projectors which fired 2" and later 3" Unrotated Projectile (UP) rockets to a maximum altitude of 5,800m; a ground range of some 9,000m. They were deployed in cities all around the UK from 1941 and proved to be an effective addition to the existing AA guns.

  The rockets measured 0.9m (2") and 1.8m (3") in length with four stabilising fins at the base and were fitted with 3.5kg or 8.2kg HE warheads. The larger warhead had an effective airborne blast radius of up to 20m. Some variants deployed a form of aerial mine described as a "small yellow bomb" which was designed to detach from the rocket at height and descend on a parachute with the objective of becoming snagged on target aircraft and then detonating.

Unlike bombs which were designed to strike the ground, AA projectiles and rockets were designed to function in the air. Due to their shape, and centre of gravity they would often not strike the ground nose first. This coupled with the lower mass of AA UXO resulted in shallower ground penetration depths, compared to UXBs. Although, in very soft conditions, unexploded AA projectiles have been found deeper than 1.5m bgl.

16 permanent HAA batteries were active within range of the Site during WWII. LAA guns likely defended Port Talbot, within which the Site was located. Luftwaffe activity in the region was relatively infrequent. It is possible that an unexploded AA shell struck the open areas of the Site.

[4] https://www.bbc.co.uk/news/uk-wales-south-west-wales-13877272

[5] https://www.walesonline.co.uk/news/local-news/port-talbot-tata-steel-bomb-17621716

8 UXO RISK MITIGATING CIRCUMSTANCES

8.1 Introduction

Works on a UXO contaminated site could result in the partial or complete removal of UXO risk. Construction or earthworks may have uncovered any UXO contamination, which would then have been reported and removed by the authorities. A site may have been subject to an explosive ordnance clearance (EOC) task conducted by the armed forces. EOC tasks involve surveying, subsequent target investigation and removal of UXO. Although the effectiveness of historic EOC tasks will have often been unsatisfactory.

8.2 Explosive Ordnance Clearance Tasks

The division of EOD tasks has been complex throughout British military history. It used to be the case that anything under the water level would be dealt with by navy units, and anything on land would be dealt with by army units. In recent years RAF EOD capability has been discontinued, and now only the Royal Navy and the British Army have EOD units. In the army, the Royal Logistics Corps and Royal Engineer EOD units have been amalgamated to form 29 EOD & Search Group. Often taskings are assigned to either the naval or army elements based on where in the country the threat is and the nature of the threat.

Brimstone has access to a database of historic EOC tasks. This database is only complete up until the early 2000s and therefore does not include recent EOC tasks. No such database for the RAF and Royal Navy EOD units is easily accessible. A search of this database has not resulted in any Army EOC tasks in the vicinity of the Site.

UXO encounters on civilian land are often reported in the media and therefore a web search of local media outlets was also carried out. Three inert bombs/shells have been encountered at Tata Steel in the 21st century, see ***Section 7.2.2*** above for additional information.

8.3 Ground Works

Post-conflicts ground works for all three Sites have comprised the clearance of all WWII-era structures and railway lines. This would have consisted of grubbing out the foundations of the former structures, likely mitigating the risk in these areas to shallow depths (1-2m bgl). It is possible that the clearing of some structures may have required deep (>2m) intrusions, although this has not been possible to confirm. The open areas of the Site are likely to have to received minimal post-WWII ground works, which will likely have been to very shallow depths (<1m bgl). Site B has seen the construction of various low-rise structures, infrastructure and the addition of hardstanding across large areas in the north and west. The depths associated with these ground works likely range from very shallow to shallow.

8.4 Deductions

The risk associated with (any) very shallow and shallow buried UXO will have been partially mitigated in areas of WWII-era structures and infrastructure, as well as post-WWII ground works. The risk associated with (any) deep buried UXO likely remains unmitigated.

9 CONCLUSION

9.1 Accuracy of Historical Records

Occasionally, the accuracy of some historical records can prove to be poor when compared with other sources of information. One significant consequence of this can be the possibility of unrecorded German bomb strikes in the study area. No comprehensive bombing records nor bomb plot mapping was available for the WWII-era Municipal Borough of Port Talbot during the production of this report from national and local archives. While anecdotal accounts provide the locations of various bombing incidents, 87 HE bombs are recorded as falling within the borough during WWII and therefore the locations of the vast majority of these are unknown. While an accurate risk level can be determined without the need for comprehensive records, their unavailability leads to uncertainty regarding whether bombs fell on/near the Site, resulting in an additional risk factor to consider.

9.2 The Risk of UXO Contamination on Site

9.2.1 Key Findings – German UXO Risk

- Port Talbot was a key industrial hub during World War II, with its steelworks and coal production facilities playing a vital role in supporting the British war effort. The Margam Steelworks, within which Site C was located, were involved in the production of steel for munitions, tanks, ships, and other war materials. Consequently, the town and its industries became targets for German air raids carried out by the Luftwaffe. Indeed, Luftwaffe target photography indicates industries on Site and nearby were identified as primary bombing targets. A railway yard/storage station was recorded on target photography (Site B) and a steel works which made up Site C. This is further recorded within Luftwaffe target mapping, which highlights the copper works (Kupferworke) and hard coal briquettes (Steinkohlenbrikettebrik) within Site A as bombing targets, as well as the iron foundry (Eisengießerel) within which Site C was located.
- The majority of the official records obtained for Port Talbot did not specifically state the location of the incidents occurring, with many entries merely referring to bombing occurring over the town as a whole. It is of note, however, that one of the records reports an incident occurring at a copper works, a facility which consulted OS mapping confirms was present on and immediately adjacent to the north of Site A, as well as waste ground and railway sidings in the vicinity (partially included within / adjacent to Sites A and B), suggesting that bombing may have occurred on Site or in the immediate surrounds. Furthermore, bombing at the docks appears to have occurred on several occasions, with the south side referenced as sustaining a number of bombs, some of which were delayed action. A failure with the clockwork mechanism within the fuze of the delayed-action bombs is one cause of UXBs remaining in-situ. Sites A and B were located on the south side of the docks. The Margam Steelworks and/or its surrounding area is also stated to have been bombed on several occasions.
- No evidence of bomb damage to the copper works in Site A, the structure in the south-east of Site B, nor the section of the steelworks in Site C has been identified within historical aerial imagery and OS mapping, i.e. areas of clearance, missing roofs, repair works. Similarly, no obvious evidence of bomb damage was evident in the areas of open/undeveloped ground on Site; however, such evidence is typically less easily identifiable amongst open ground.
- However, evidence of repair works to the metal refinery in Site A has been observed within 1940 and 1946 aerial imagery, suggesting that bomb damage may have occurred early during WWII. The extent of this possible damage cannot be accurately discerned, although the whole roof appears to have been replaced. The coal briquette works, located within the north of Site B, may have sustained serious damage as identified within aerial vertical imagery. However, given the homogenous nature of this potential damage, as seen within **FIGURE 5.4**, it may be that the structure itself is incomplete or the intended design. A possible bomb crater has been identified approximately 30m south-west of Site A.
- Wartime conditions across the Site varied during WWII. Site A comprised a metal refinery, a section of a copper works, railway infrastructure and undeveloped open ground. Site B comprised a briquetting works in the north, small structure in the south-east, railway infrastructure and undeveloped open ground. Site C comprised a section of the Margam Steelworks. Any UXB strike to the undamaged structures on each of the Sites would have caused incontrovertible evidence of its incidence as it passed the structures and into the ground beneath. Similarly, a UXB strike to the railway sidings on/adjacent to each of the Sites is likely to have been identifiable at the time. Fire watchers were likely present at the industries located within each of the Sites, while the railway infrastructure located within/adjacent to each was likely subject to post-raid checks for evidence of UXO. Indeed, given the lack of identified damage in Site C within high-resolution 1946 aerial imagery, as well as to the copper works in the north-west of Site A and briquetting works in Site B, access is likely to have remained frequent in these areas. These factors increase the likelihood of bombing and subsequent evidence of UXO being observed in these areas.

- However, visual evidence of repair works to the metal refinery in Site A (white/brighter roofing) suggests that bomb damage may have occurred at this location. Evidence of a subsequent UXB strike at this location, which may have been damaged early during WWII, could conceivably have been obscured amongst existing damage and debris. It is conceivable that access may have been reduced for a time, depending on the extent of the damage. The majority of both Site A and Site B also comprised undeveloped open ground during WWII. Subsequently, any potential evidence of UXO is thought likely to have been less noticeable, with a UXB's descent into open land less obvious than through a structure or roadway, for example. Indeed, the entry hole of a 50kg UXB may be as little as 20cm in diameter and can therefore become easily obscured by growing vegetation. Furthermore, it is unlikely that the undeveloped open ground which comprised the majority of Sites A and B will have been accessed to a significant degree; these areas appear largely unused and unmaintained in 1940s aerial imagery. Evidence of a UXB strike in these areas may not have been observed, becoming obscured over time.
- In summary, factors pertinent to the risk of UXO contamination vary across each Site. As discussed above, the ground conditions within the majority of Sites A and B were unconducive to the detection of UXO. Bombs, including those with delayed-action fuzes, are recorded across the south of the docks, potentially on Sites A and B. Indeed, potential repair works indicative of bomb damage has been observed to the metal refinery in Site A. As a result, the majority of Site A and Site B has been assessed at a **Moderate Risk** from German UXBs. While evidence of a UXB will have been more readily observed amongst the undamaged structures and railway infrastructure within this zone, the potential for the J-Curve effect, whereby a UXB may travel laterally from its point of penetration, indicates that the risk from the open ground also presents at the footprint of the WWII structures and railway sidings. A buffer zone has therefore been added to account for this possibility.
- No evidence of damage to the copper works in Site A, railway infrastructure in both Site A and B, nor the structures in Site C, has been identified. The presence of significant and important infrastructure in these locations indicate that a UXB strike will have been observed and dealt with at the time. However, given recorded bombing to the copper works, south side of the docks and the steelworks, the risk from German UXBs is slightly elevated and has been assessed as **Low-Moderate**.
- Similar to the copper works and railway infrastructure within Site A, as well as structures in Site C, no confirmed visual evidence of damage has been observed to the briquetting works in Site B. A UXB strike is likely to have been observed at this location during WWII. Given this, a **Low Risk** has been assessed at the footprint of this structure, with the zone accounting for the possibility of J-Curve causing a UXB to come to rest beneath. As a result, this zone is smaller than the structure itself.

9.2.2 Key Findings - British UXO Risk

- Evidence indicates that the Margam Steelworks, within which Site C was located during WWI and WWII, was purpose built during WWI for war production. Further research suggests that the steelworks produced steel utilised for munitions, tanks, ships and other war materials. Three WWII-era bombs/shells have been uncovered at Tata Steel in the 21st century (none have been recorded on Site, although specific locations are unknown). No evidence has been found to suggest that shells were filled at the steelworks in Port Talbot. It is likely that the aforementioned shells consisted solely of the outer casing, given that each of them was certified inert and no mention was made of a high-explosive fill. Therefore, the risk from Allied UXO is assessed to be **Low** across the Site.
- Although all shells uncovered within the wider Tata Steel works have been found to be inert and are believed to be shell casings only, not ordnance, it cannot be assumed to be the case for any potential future items that are encountered. Any suspicious items should be assumed to be live / hazardous. If such an item is encountered on Site, the relevant authorities should be contacted in order to carry out an immediate investigation and initiate the necessary safety procedures.
- 16 permanent HAA batteries were active within range of the Site during WWII. LAA guns likely defended Port Talbot, within which the Site was located. Luftwaffe activity in the region was relatively infrequent. It is possible that an unexploded AA shell struck the open areas of the Site, and the risk is considered to be analogous to that of German UXBs.

9.3 Site-Specific UXO Hazards

Different types of UXO pose differing types of hazard, depending on their structural design, Net Explosive Quantity (NEQ), fill type and likely contamination depth. The table below lists the main types of UXO most often encountered on urban UK sites and their relative hazard levels.

UXO Type	NEQ (NEQ Range)	Likely Burial Depth	Hazard Posed
WWII German General Purpose HE Bombs	25kg - 220kg (most commonly deployed bomb weights)	Likely deep burial (>2m)	HIGH RISK
WWII British Heavy Anti-Aircraft Shells	1.1kg - 1.7kg	Shallow burial (1-2m)	MODERATE-HIGH RISK
WWII British Land Service Ammunition	<2kg	Shallow burial (1-2m)	
WWII German 2kg Incendiary / HE Bombs	680g incendiary hazard + ~500g explosive hazard	Shallow burial (1-2m)	
WWII German 1kg IBs	680g (incendiary, not explosive hazard)	Shallow burial (1-2m)	MODERATE RISK
WWII British Light Anti-Aircraft Shells	4g - 70g	Very shallow burial (<1m)	LOW-MODERATE RISK

9.4 The Likelihood of UXO Encounter

9.4.1 Introduction

This report assesses the risk of UXO in relation to the proposed works, not simply the risk that UXO remains buried on site. The likelihood of UXO encounter during intrusive ground works will vary depending on the type of UXO and the type of construction methods employed during the project. With increased soil disturbance i.e. more excavations, the likelihood of encountering UXO increases.

Within an area of elevated UXO contamination likelihood, the sub-surface volume of potential UXO contamination will comprise the natural soil / geology in between WWII ground level and the maximum bomb penetration depth. Therefore, any intrusions into this layer will be at risk of UXO encounter.

Any post-WWII fill material deposited on a site is unlikely to be contaminated with UXO and therefore the risk of encountering UXO on such a site could vary with depth.

In the wake of the initial nine-month Blitz, many cities and towns were left with vast quantities of bomb site rubble that required removal and relocation. This material was put to use for in a variety of ways, for example >750,000 tons of London's rubble was used to build runways for new RAF and USAAF airfields and much of Liverpool's rubble was used to create and maintain sea / flood defences throughout Merseyside.

It is quite possible that unexploded British AA projectiles and German 1kg incendiaries were overlooked during removal, resulting in UXO contaminated fill material ending up on otherwise low UXO risk sites, possibly many miles from any high bombing density areas.

9.4.2 German UXBs

Although most German UXBs came to rest several metres below WWII ground level, these weapons can be found at any level between just below WWII ground level and the maximum bomb penetration depth. There are a number of reasons why these heavy bombs might be found at surprisingly shallow depths.

- **Tip and run:** When enemy aircraft had to take evasive action to escape RAF fighter intercepts or AA defences, they often dropped their bomb loads from a reduced height, potentially resulting in extreme J-curve effect.

- **Deflection:** the shape of German bomb nose sections meant they were susceptible to deflection when striking surface or shallow sub-surface obstacles, occasionally resulting in shallow burial or even UXBs skidding across hardstanding.
- **Aircraft Crash Site:** if an aircraft was unable to dump its bomb load before impacting the ground, due to mechanical fault, any externally fitted bombs could have become buried on impact.

German 1kg / 2kg incendiaries were cylindrical and approximately 50mm in diameter. They had tail sections, and so landed nose first. Within soft ground this could result in full penetration of the bomb below the surface. Such UXBs are usually found close to the surface.

9.4.3 British / Allied UXO

The nature of British/Allied military activity involving LSA and SAA and the smaller size of these munitions (in relation to German HE bombs) indicates that any resulting UXO contamination on a site will be limited to shallow depths, usually within 1.5m of the surface, notwithstanding added material to raise the ground level.

Domestic military LSA and SAA contamination will either be the result of expending blinds (dud ammunition) which bury into the ground on impact or munitions purposefully buried, for a number of reasons. Either way, these types of UXO are all found at shallow depth.

9.4.4 Deductions

An elevated likelihood of UXO contamination (German) and likelihood of that UXO remaining up to the present day has been identified across the majority of Site A and Site B. Therefore, some of the proposed works are considered to be exposed to a UXO encounter.

10 OVERALL RISK RATING

Ratings for the likelihood of UXO contaminating the Site, remaining within the Site up to the present day and being encountered during the proposed works, inform the overall risk rating. The UXO risk to the proposed works varies. **Low**, **Low-Moderate** and **Moderate Risk** zones for German UXBs and unexploded HAA shells have been identified, with a **Low Risk** from Allied UXO across the Site. These are illustrated within the risk mapping displayed at **FIGURE 7**.

Risk Table: Low Risk				
UXO TYPE (ASSOCIATED HAZARD)	**LIKELIHOOD OF UXO CONTAMINATION**	**LIKELIHOOD OF UXO REMAINING**	**LIKELIHOOD OF ENCOUNTER**	**OVERALL RISK RATING**
WWII German 'Iron' Bombs	Low	n/a		**Low**
WWII British Heavy Anti-Aircraft Shells	Low	n/a		
WWII British Land Service Ammunition	Low	n/a		
WWII German 2kg Incendiary / HE Bombs	Low	n/a		
WWII German 1kg Incendiary Bombs	Low	n/a		
WWII British Light Anti-Aircraft Shells	Low	n/a		
WWII British Small Arms Ammunition	Low	n/a		

Risk Table: Low-Moderate Risk				
UXO TYPE (ASSOCIATED HAZARD)	LIKELIHOOD OF UXO CONTAMINATION	LIKELIHOOD OF UXO REMAINING	LIKELIHOOD OF ENCOUNTER	OVERALL RISK RATING
WWII German 'Iron' Bombs	Low-Moderate	Moderate-High	Moderate	Low-Moderate
WWII British Heavy Anti-Aircraft Shells	Low-Moderate	Moderate-High	Moderate-High	
WWII British Land Service Ammunition	Low	n/a		Low
WWII German 2kg Incendiary / HE Bombs	Low	n/a		
WWII German 1kg Incendiary Bombs	Low	n/a		
WWII British Light Anti-Aircraft Shells	Low	n/a		
WWII British Small Arms Ammunition	Low	n/a		

Risk Table: Moderate Risk				
UXO TYPE (ASSOCIATED HAZARD)	LIKELIHOOD OF UXO CONTAMINATION	LIKELIHOOD OF UXO REMAINING	LIKELIHOOD OF ENCOUNTER	OVERALL RISK RATING
WWII German 'Iron' Bombs	Moderate	Moderate-High	Moderate	Moderate
WWII British Heavy Anti-Aircraft Shells	Moderate	Moderate-High	Moderate-High	
WWII British Land Service Ammunition	Low	n/a		Low
WWII German 2kg Incendiary / HE Bombs	Low	n/a		
WWII German 1kg Incendiary Bombs	Low	n/a		
WWII British Light Anti-Aircraft Shells	Low	n/a		
WWII British Small Arms Ammunition	Low	n/a		

11 RISK MITIGATION RECOMMENDATIONS

Brimstone has identified an elevated UXO risk to some of the proposed works. The measures detailed below are recommended to mitigate the risk to ALARP level.

Risk Mitigation Measure	Recommendation
UXO Safety Awareness Briefings: To all personnel conducting intrusive works on Site. An essential part of the Health & Safety Plan for a site. Conforms to the requirements of CDM2015.	Prior to all intrusive works commencing.
EOD Engineer - On Site Supervision: Watching brief for open excavations below WWII ground level. Portable magnetometer instruments for clearing ground ahead of borehole positions and shallow excavations (where / when appropriate). Positive identification of suspicious (non UXO) objects. Liaison during confirmed UXO incidents. Provision of additional UXO Safety Awareness Briefings.	Watching brief of all open excavations and magnetometer survey of borehole locations within the **Moderate Risk** zone.
Intrusive Magnetometer Probe Survey: A range of intrusive magnetometer methodologies can be deployed to survey the ground (down to the maximum bomb penetration depth) prior to deep intrusive works; pile foundations. The appropriate technique is governed by a number of factors, the most important being the site-specific ground conditions.	Of any pile positions within the **Moderate Risk** zone.
Non-Intrusive Magnetometer Survey: A range of non-intrusive magnetometer methodologies can be deployed to survey large areas of land to a limited depth. Such surveys can typically detect a 50kg WWII bomb at a depth of 4.5m, in “clean” ground. This survey is only appropriate for greenfield land where “magnetic noise” is negligible. To extend survey range, a reduced dig and secondary survey can be carried out.	Open excavations on greenfield land within the **Moderate Risk** zone.

Figures: 1 - 7

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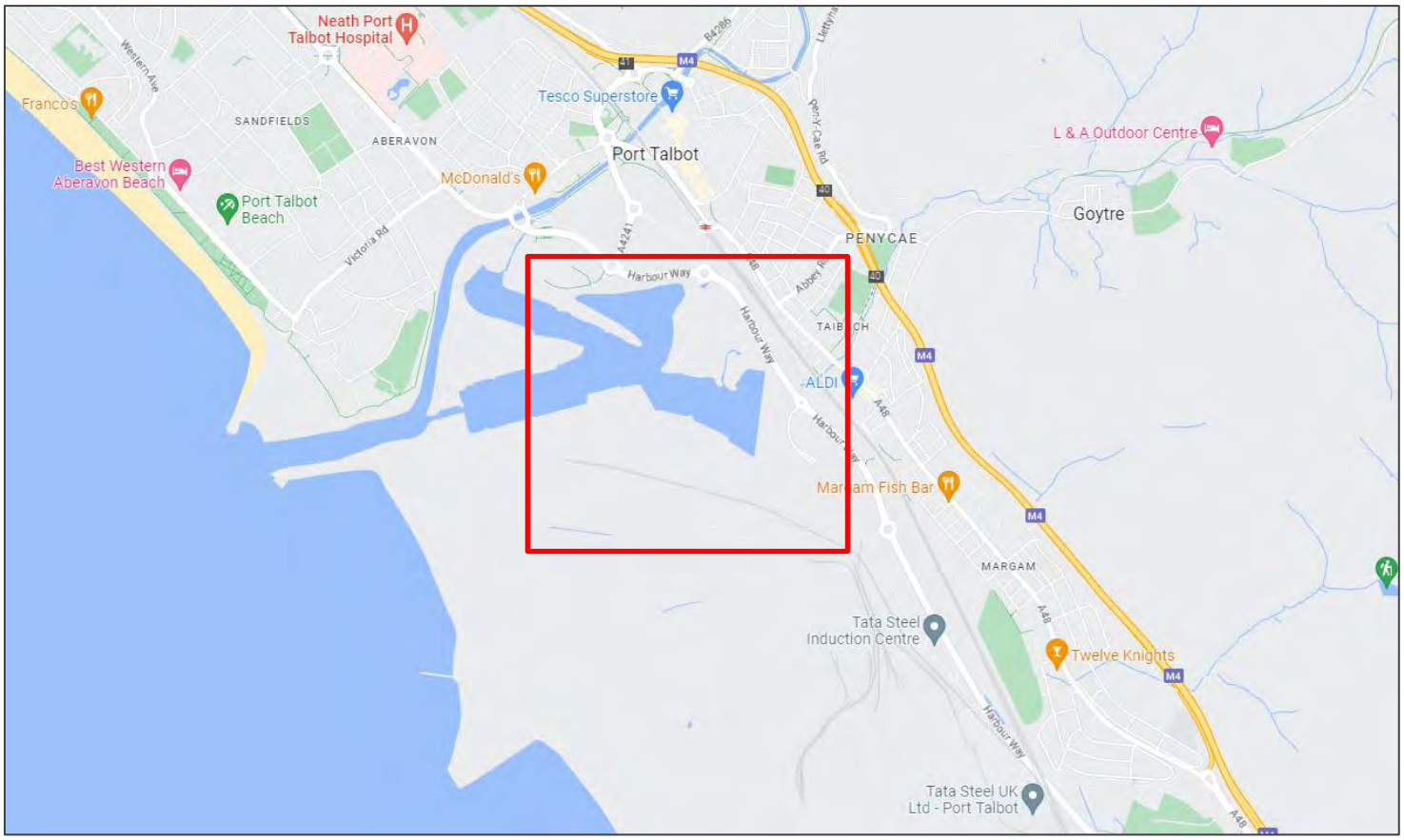
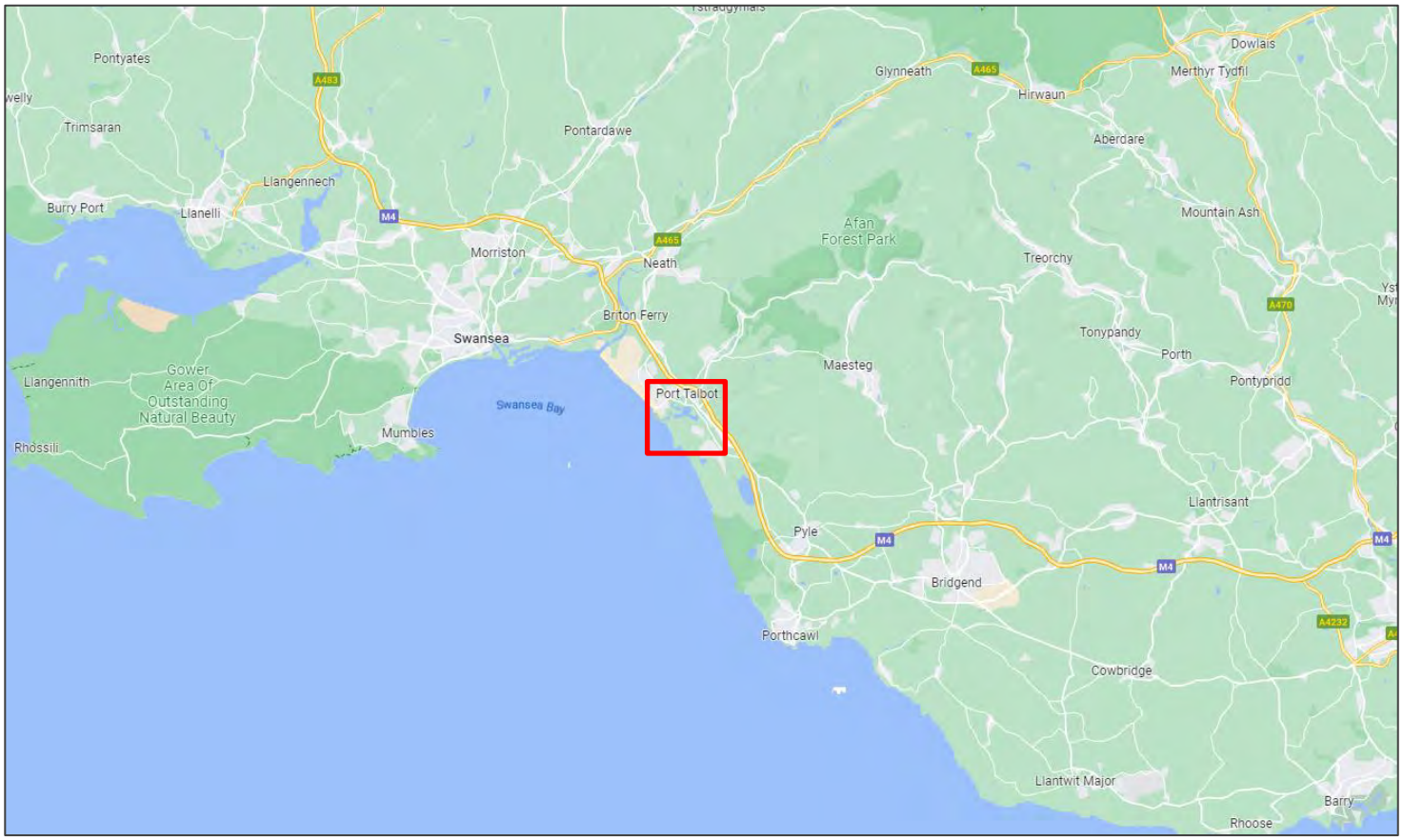
Title:	Site Location Maps	FIGURE: 1





N

Project	**Project Dragon, Port Talbot**
Client:	**TEC Ltd**
Report Ref:	**DRA-23-1532**
General Site Location	Info Source: Google (open-source)

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Title:	Recent Aerial Photograph	FIGURE: 2

N

Project	**Project Dragon, Port Talbot**
Client:	**TEC Ltd**
Report Ref:	**DRA-23-1532**
Approx. Site Boundary	Info Source: Google (open-source)

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Title:	Existing Site Plan	FIGURE: 3

N	Project	Project Dragon, Port Talbot
	Client:	TEC Ltd
	Report Ref:	DRA-23-1532
	Site Boundary	Info Source: TEC Ltd

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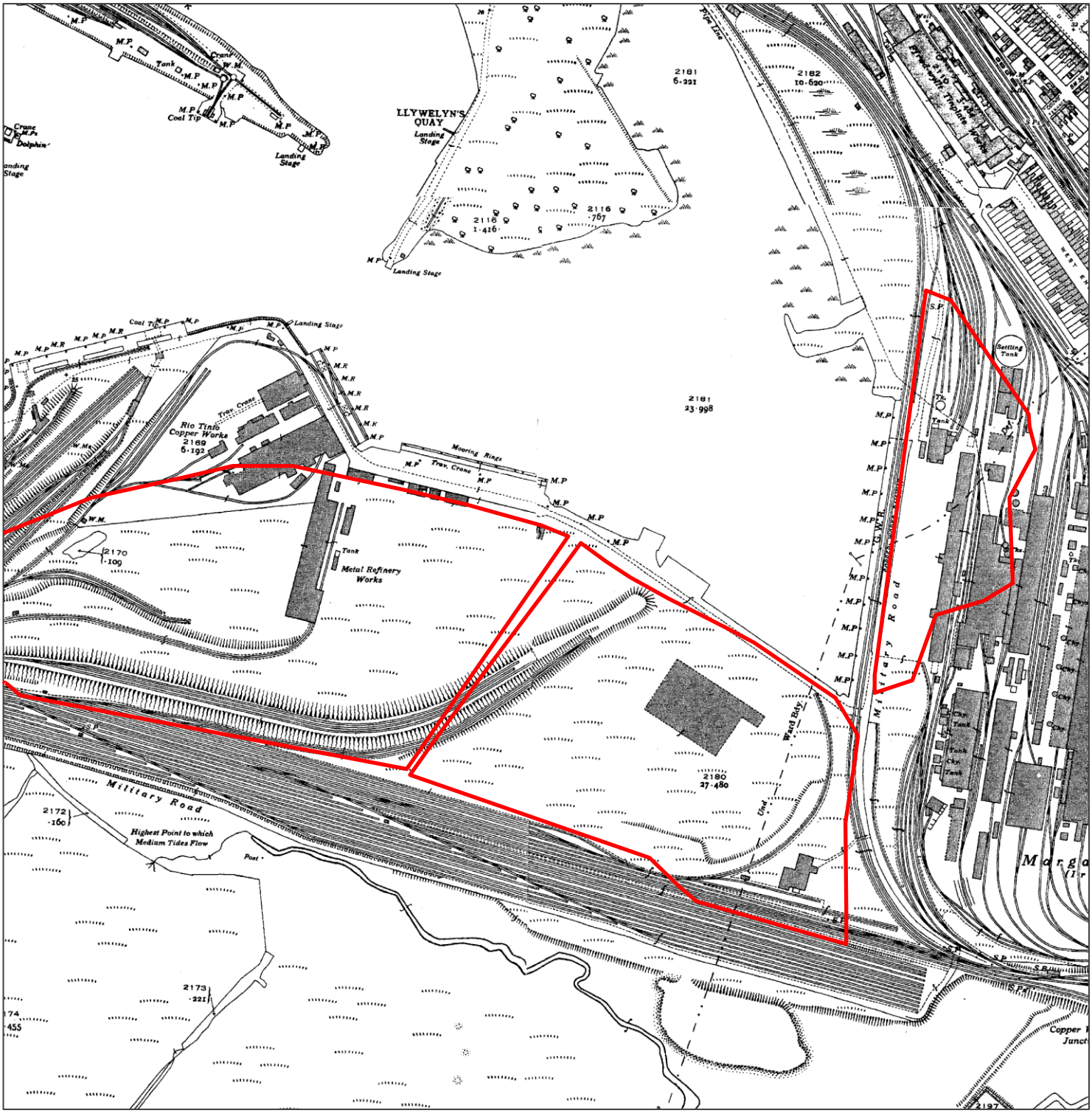
Title:	Historical OS Mapping – 1939-1940	FIGURE: 4.1



N	Project	Project Dragon, Port Talbot	
	Client:	TEC Ltd	
	Report Ref:	DRA-23-1532	
	Partial Site Boundary	Info Source:	Promap

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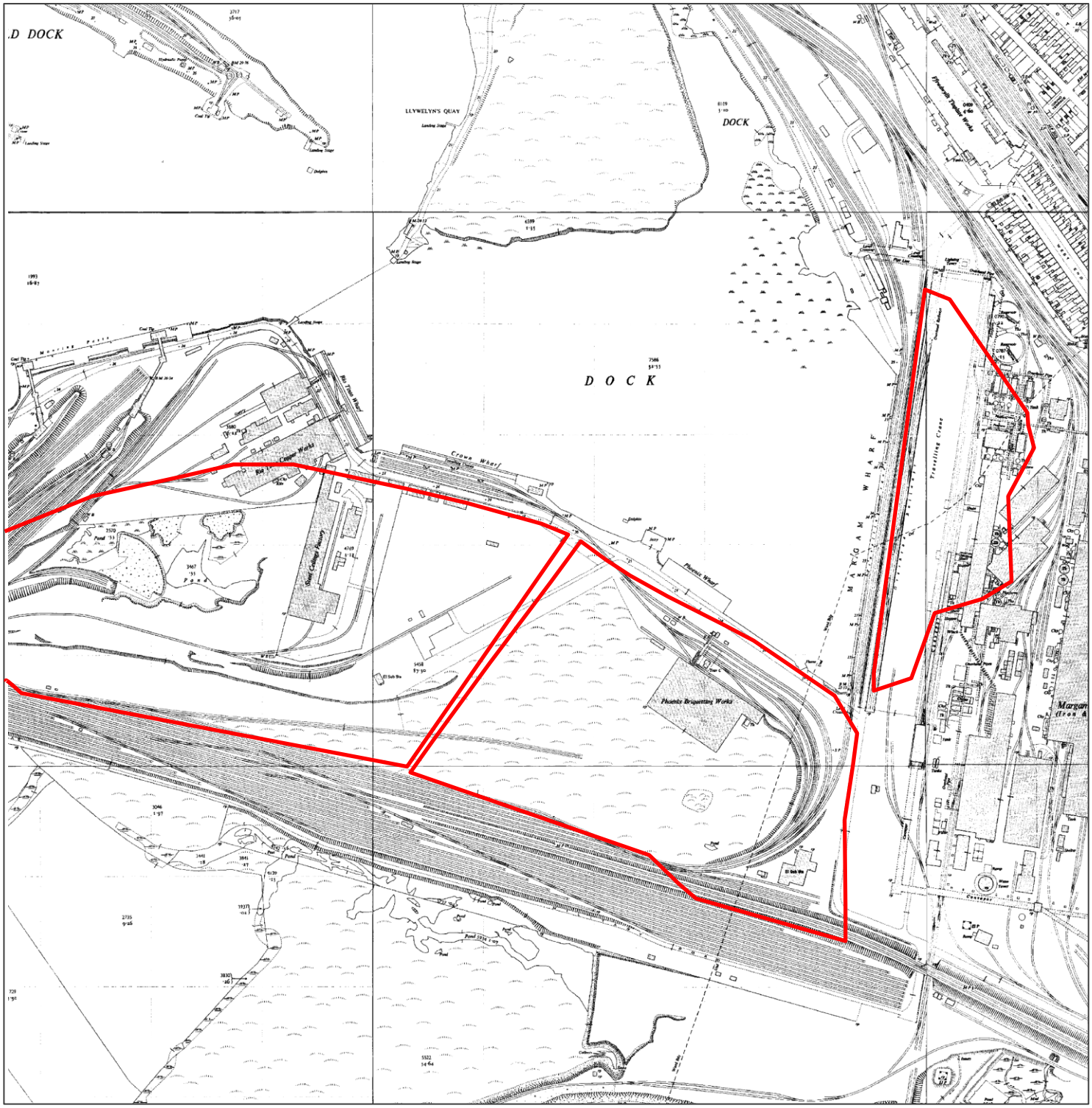
Title:	Historical OS Mapping – 1947-1949	FIGURE: 4.2



N	Project	Project Dragon, Port Talbot	
	Client:	TEC Ltd	
	Report Ref:	DRA-23-1532	
	Partial Site Boundary	Info Source:	Promap

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Title:	Historical Aerial Photography – 21st December 1940	FIGURE: 5.1

Project	Project Dragon, Port Talbot	
Client:	TEC Ltd	
Report Ref:	DRA-23-1532	
Approx. Site Boundary	Info Source: NCAP	

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Title:	Historical Aerial Photography – 21st December 1940	FIGURE: 5.2

Project	Project Dragon, Port Talbot	
Client:	TEC Ltd	
Report Ref:	DRA-23-1532	
Approx. Site Boundary	Info Source: NCAP	

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Title:	Historical Aerial Photography – 7th June 1946	FIGURE: 5.3

N

Project	**Project Dragon, Port Talbot**
Client:	**TEC Ltd**
Report Ref:	**DRA-23-1532**
Approx. Site Boundary	Info Source: Historic England

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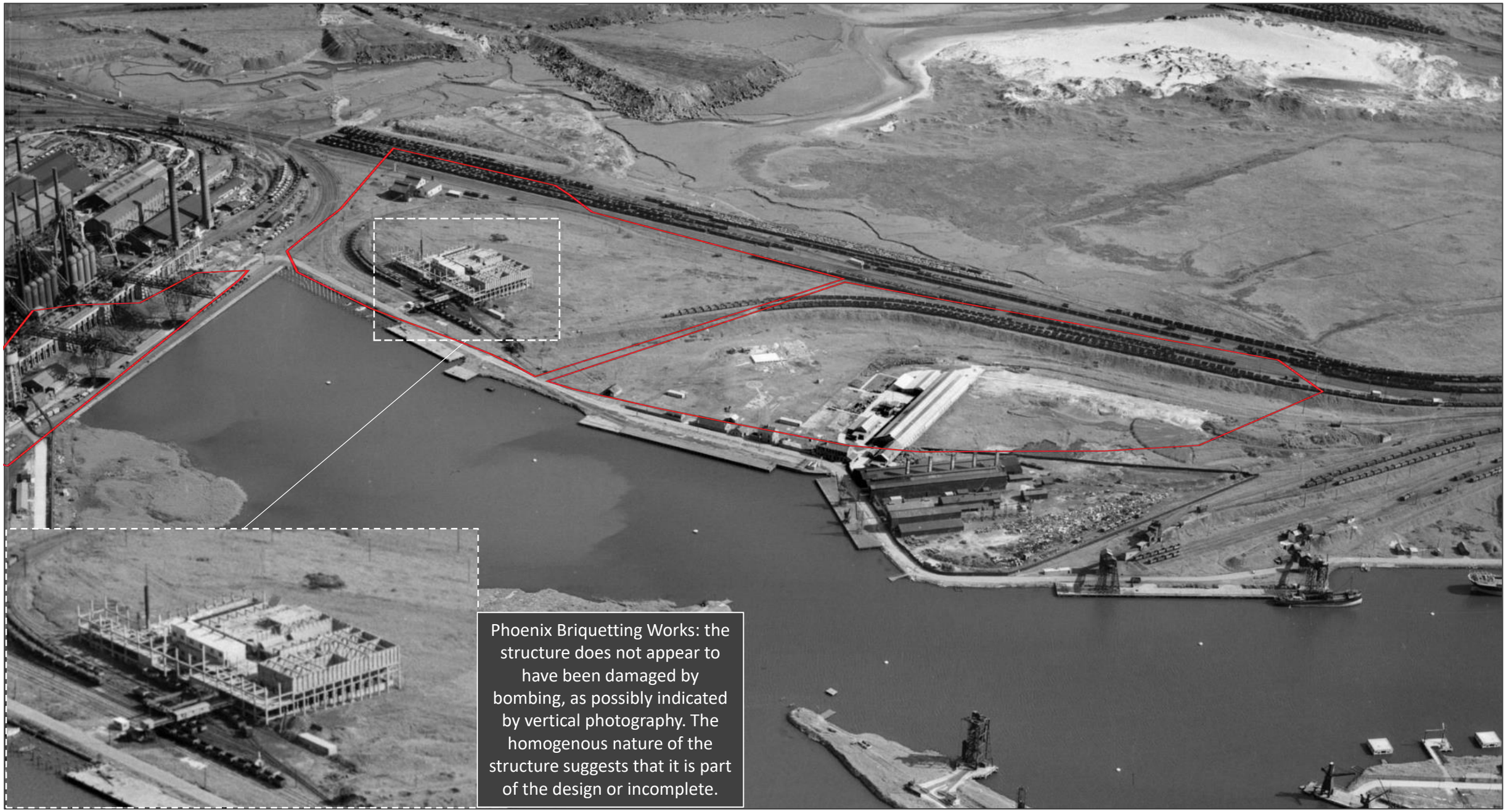
Title:	Historical Aerial Photography – 1947	FIGURE: 5.4



Phoenix Briquetting Works: the structure does not appear to have been damaged by bombing, as possibly indicated by vertical photography. The homogenous nature of the structure suggests that it is part of the design or incomplete.

N

Partial Site Boundary

Report Ref:	DRA-23-1532	Project	Project Dragon, Port Talbot
Info Source:	Britain from Above	Client:	TEC Ltd

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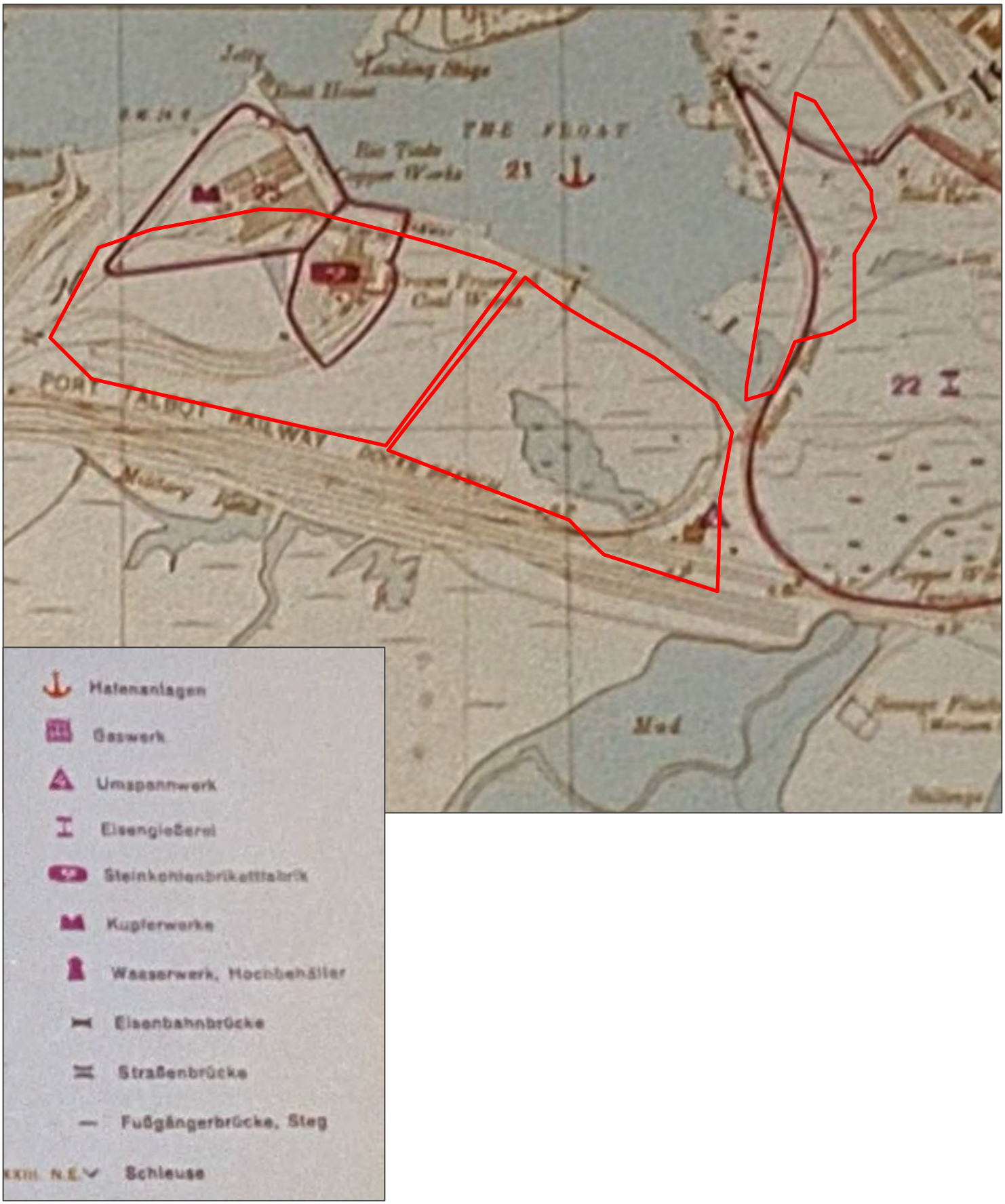
Title:	Luftwaffe Target Map – September 1940	FIGURE: 6



N	Project	Project Dragon, Port Talbot
	Client:	TEC Ltd
	Report Ref:	DRA-23-1532
	Approx. Site Boundary	Info Source: Historic England

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Title:	Risk Map – Recent Aerial Photograph	FIGURE: 7.1

Low Risk from German UXBs & HAA Shells

Low-Moderate Risk from German UXBs & HAA Shells

Moderate Risk from German UXBs & HAA Shells

N

Project	Project Dragon, Port Talbot
Client:	TEC Ltd
Report Ref:	DRA-23-1532
Approx. Site Boundary	Info Source: Google (open-source)

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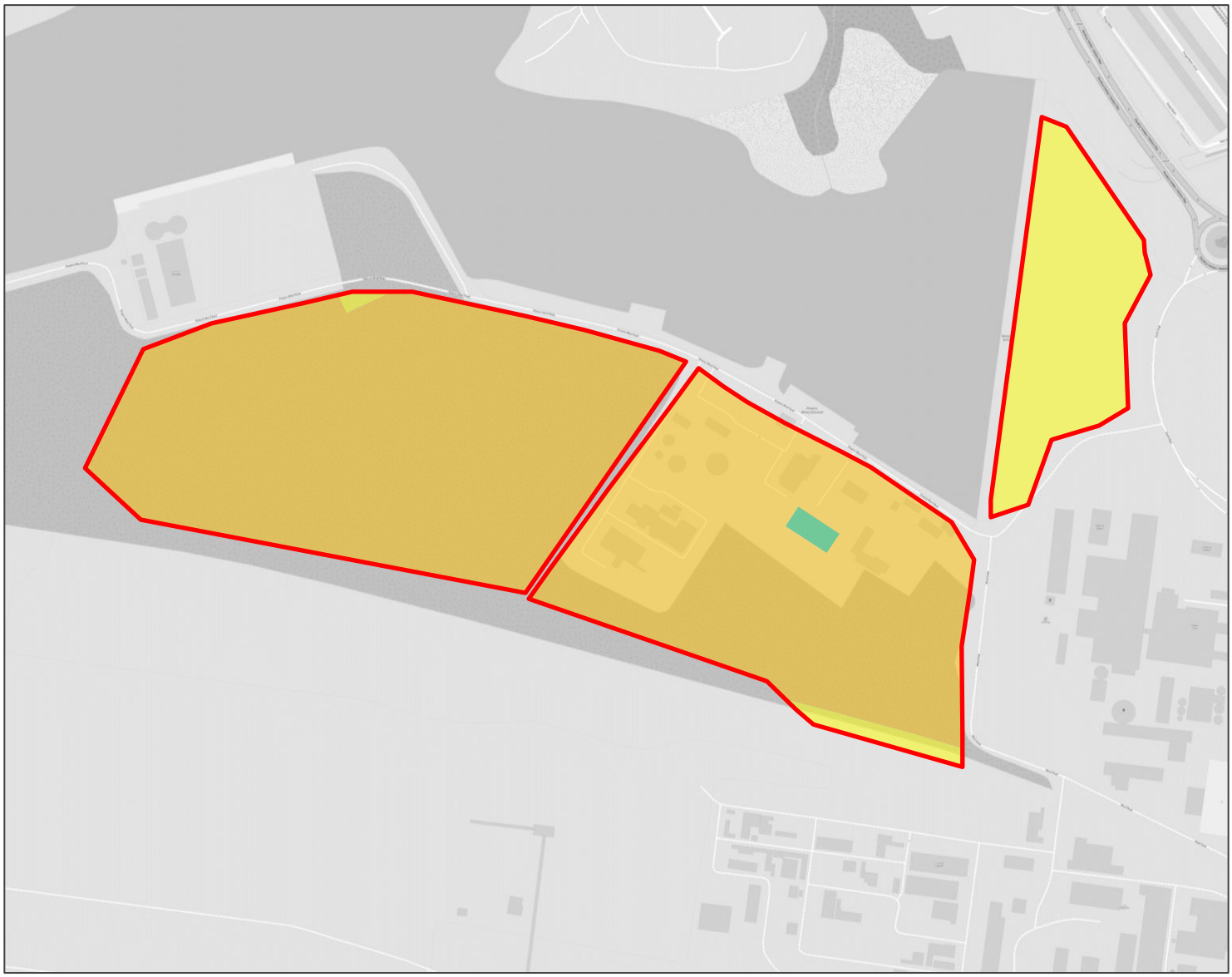
Title:	Risk Map – OpenStreetMap	FIGURE: 7.2



Low Risk from German UXBs & HAA Shells

Low-Moderate Risk from German UXBs & HAA Shells

Moderate Risk from German UXBs & HAA Shells

N

Project	**Project Dragon, Port Talbot**
Client:	**TEC Ltd**
Report Ref:	**DRA-23-1532**
Approx. Site Boundary	Info Source: OpenStreetMap

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Appendices: 1 - 5

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Recent German UXB Finds in the UK + Historical Analysis

- ***23rd May 2019*** - An SC250 (standard 250kg HE bomb) was found during shallow excavations at a building site in Kingston upon Thames, London. *Historical Analysis: The UXB landed in a small residential back garden belonging to an undamaged terraced house. It came to rest approximately 3 to 4m bgl.*
- ***15th May 2017*** - An SC250 (standard 250kg HE bomb) was found during shallow excavations at a building site in Aston, Birmingham. *Historical Analysis: The UXB landed in a small back garden belonging to a terraced house, part of a row. It J-Curved under a neighbouring garden and came to rest at just 1.4m bgl. NB: These houses had not sustained bomb damage.*
- ***2nd March 2017*** - A 250kg HE bomb was found during deep excavations at a building site in Brondesbury Park, London. *Historical Analysis: UXB landed in a large residential back garden. A single storey building was built on top of the UXB post-WWII.*
- ***19th January 2017*** - An SD50 (semi-armour piercing 50kg HE bomb) was dredged from the Thames during barge dredging works near Westminster Bridge, London.
- ***12th May 2016*** - A 500kg HE bomb was found buried just 1m below the playground of the former Royal High Junior School in Bath. *Historical Analysis: The UXB landed in a plot of neglected, unmaintained vegetation in between the school gym and main school building.*
- ***23rd September 2015*** - A 1,000kg HE bomb was encountered by a mechanical excavator on a building site in Paradise Street, Coventry. *Historical Analysis: the UXB landed in a large residential back garden occupied by dense vegetation. A two storey building was built on top of the UXB post-WWII.*
- ***10th August 2015*** - A 250kg HE bomb was found immediately beneath a basement floor during refurbishment works in Temple Street, Bethnal Green (London). *Historical Analysis: The UXB struck a house that had been damaged beyond repair during a previous air raid. The existing house was then built on top of UXB post-WWII.*
- ***21st May 2015*** - An SC50 (general purpose 50kg HE bomb) was found during deep excavations at a construction site in Wembley, London. *Historical Analysis: UXB landed in a large residential back garden.*
- ***23rd March 2015*** - A 250kg HE bomb was found during deep excavations at a building site in Grange Walk, Bermondsey (London). *Historical Analysis: inconclusive - reported UXB position is likely inaccurate.*

NB: Domestic UXO finds in the UK are too numerous to list. Between 2006 and 2009, over 15,000 items of British / Allied UXO (excluding small arms ammunition) were found on UK construction sites (CIRIA).

Initiation of WWII Allied Bombs

- ***6th January 2014*** - Mechanical excavator stuck a WWII bomb in Euskirchen (Germany) causing it to explode, killing the operator and injuring 13 more, two critically. The explosion was so large it damaged buildings 400m away.
- ***1st March 2013*** - During piling at a construction site in Ludwigshafen (Germany) a small buried WWII bomb exploded, injuring one worker.
- ***2nd June 2010*** - A British 500kg bomb detonated whilst being defused, killing three EOD engineers in Goettingen, Germany. The bomb was found as builders dug the foundations for a new sports hall. Several houses had their fronts blown off by the blast.
- ***19th September 2008*** - Seventeen people were injured and buildings were damaged when an excavator apparently drove over and set off a 250kg American bomb at a construction site in Hattingen, Germany.
- ***23rd October 2006*** - A construction worker breaking up tarmac at the side of a highway near the south-western German town of Aschaffenburg was killed when his machine struck and detonated a WWII bomb. In addition, the blast injured several motorists who were driving past.
- ***2006*** - A piling rig and dump truck were destroyed when a piling rig struck an Allied bomb on a construction site in Austria.
- ***2003*** - In the Austrian city of Salzburg, two people were killed while attempting to defuse a 250kg Allied bomb.
- ***1994*** - At a central Berlin construction site a piling rig struck a large WWII Allied bomb. 3 were killed and 14 more were injured. Dozens of cars in a 250m radius were wrecked, the top 10 floors of neighbouring office building collapsed and human remains were found 100m away.
- ***1990*** - In Wetzlar (Germany) two EOD engineers were blown up as they removed the detonator of an allied WWII UXB.

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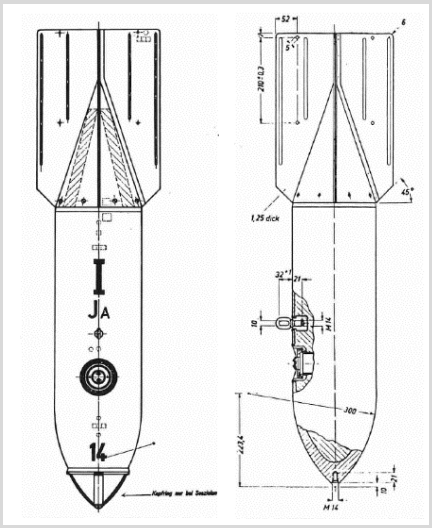
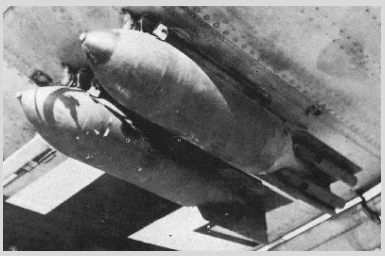
SC 50

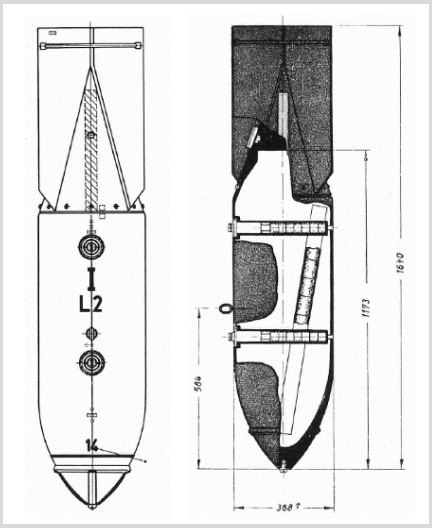
Bomb Weight:	40-54kg (110-119lb)
Explosive Weight:	25kg (55lb)
Filling:	TNT, Amatol or Trialen
Charge/Weight Ratio:	46%
Fuse Type:	Electrical impact fuse or mechanical delayed action fuse
Body Dimensions:	1,100mm length x 200mm diameter
Appearance:	Bomb body and tail painted grey/green with a yellow stripe on the tail unit. Steel construction.
Variants:	8 x variants. Additional fittings: Kopfring nose for limited penetration and Stabbo nose for dive-bombing.





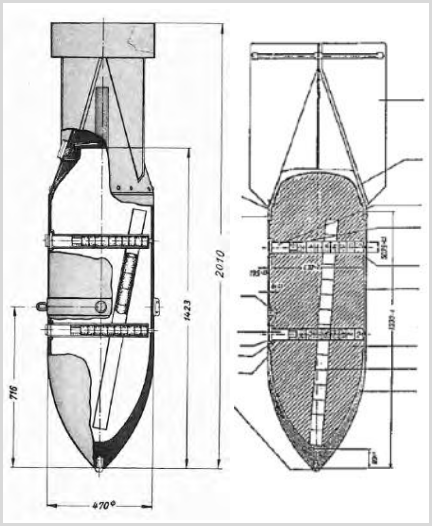
SC 250

Bomb Weight:	245-256kg (540-564lb)
Explosive Weight:	125-130kg (276-287lb)
Filling:	TNT, Amatol and Trialen mix
Charge/Weight Ratio:	44%
Fuse Type:	1 or 2 electrical impact fuse(s) or mechanical delayed action fuse(s)
Body Dimensions:	1,173mm length x 368mm diameter
Appearance:	Bomb body and tail painted grey/green with a yellow stripe on the tail unit. Steel construction.
Variants:	8 x variants. Kopfring nose for limited penetration. Stabbo nose for dive-bombing.



SC 500

Bomb Weight:	480-520kg (1,058-1,146lb)
Explosive Weight:	220kg (485lb)
Filling:	TNT, Amatol and Trialen mix
Charge/Weight Ratio:	44%
Fuse Type:	2 electrical impact fuses or mechanical delayed action fuses
Body Dimensions:	1,423mm length x 470mm diameter
Appearance:	Bomb body and tail painted grey/green or buff with a yellow stripe on the tail unit. Steel construction.
Variants:	3 x variants. Kopfring nose for limited penetration.



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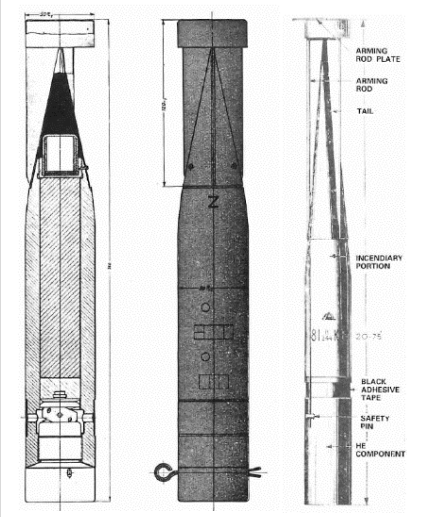
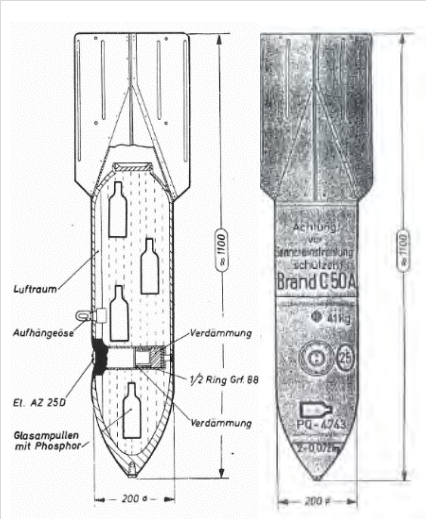
B-1E Sub-Munition

Bomb Weight:	1-1.3kg (2.2-2.87lb)
Incendiary Weight:	680g (1.4lb)
Filling:	Thermite
Fuse Type:	Simple impact fuse
Body Dimensions:	247mm length x 50mm diameter
Appearance:	Grey body and dark green painted tail unit. Magnesium alloy case.
Operation:	Small percussion charge ignites Thermite (>1,000°C burn).
Variants:	Most common variant: B 2EZ (2kg) included a small HE charge
Remarks:	Drop containers varied in size. The smallest cluster bomb held 36 x B-1Es and the largest 620 x B-1Es.



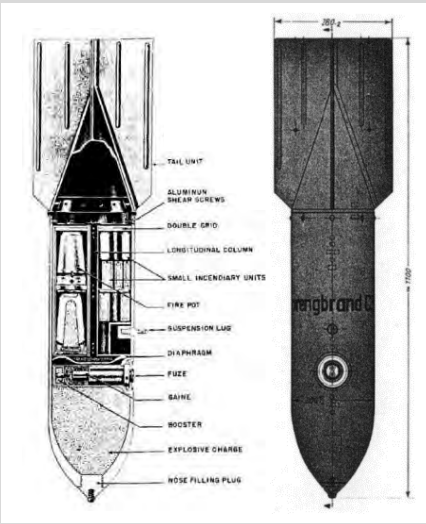
Brand C50

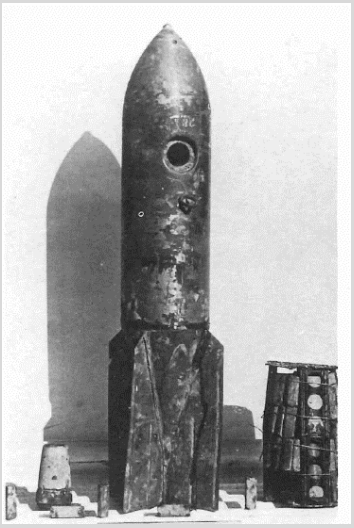
Bomb Weight:	41kg (90.4lb)
Incendiary Weight:	13kg (30lb)
Filling:	Main fill (86% Benzine, 10% Rubber) plus 4% Phosphorus in glass bottles
Fuse Type:	1 x electrical impact fuse
Bomb Dimensions:	762mm length x 203mm diameter
Appearance:	bomb body and tail painted grey or green with the rear of the bomb painted red and a red band around the centre of the body.
Variants:	C 50 B: 77% White Phos fill C 250 A: 87.7% Petroleum, 11.7% Polystyrene, 0.5% White Phos (185kg version)



Spreng-Brand C50 - *Fire Pot*

Bomb Weight:	34kg (75lb)
Explosive Weight:	9kg (20lb)
Filling:	TNT burster charge, 6 x Thermite containers (fire pots) and 67 x small triangular incendiary elements.
Fuse Type:	1 x electrical impact fuses or aerial burst fuse
Bomb Dimensions:	711mm length x 203mm diameter
Appearance:	Bomb body and tail painted grey/green or pale blue with red base plug and red or green incendiary markings. Steel construction.
Operation:	A charge blows off the base plate, firing a plume of incendiary mixture 100 yds. Approx 1 second later the HE charge detonates.





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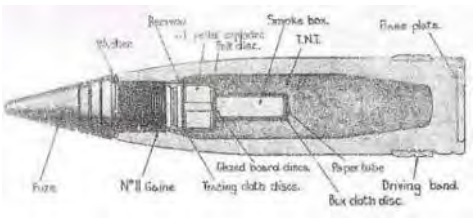
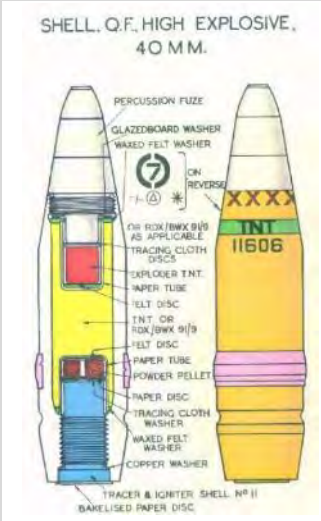
HAA Battery - 3.7" QF Shell

Shell Weight:	12.7kg
Shell Dimensions:	94mm x 438mm
Fill Weight:	1.1kg
Fill Type:	TNT
Fuse Type:	Mechanical Time Delay fuse
Appearance:	Grey body, copper driving bands, brass neck
Rate of Fire:	10 - 20 rpm
Ceiling:	9,000 - 18,000m
Variants:	HE or shrapnel shells. Note, the 4.5" gun was also used in an HAA role throughout the UK.



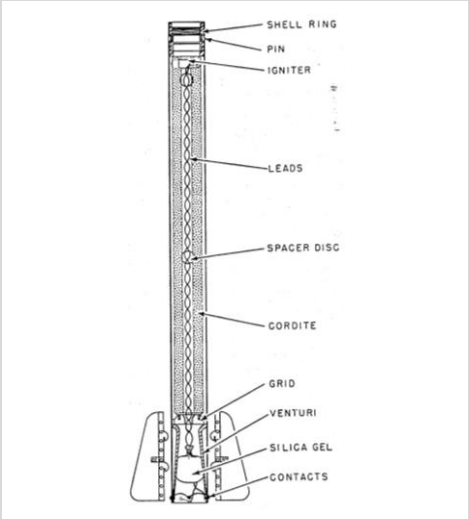
LAA Battery - 40mm Bofors Shell

Shell Weight:	0.84kg
Shell Dimensions:	40mm x 180mm
Fill Weight:	70g
Fill Type:	TNT
Fuse Type:	Impact fuse
Appearance:	Grey body, copper driving bands, brass neck
Rate of Fire:	120 rpm
Ceiling:	7,000m
Variants:	HE or AP shells. Both with rear tracer compartment



Z Battery - 3" U.P Rocket

Rocket Weight:	24.5kg
Warhead Weight:	1.94kg
Filling:	TNT warhead. Black Powder solid fuel rocket motor.
Fuse Type:	Mechanical Time Delay fuse
Rocket Dimensions:	1,930mm x 76mm
Ceiling:	6,770m
Operation:	Fired from single, tandem and (later) 36 x rail launchers (Z Batteries). Limited use throughout the UK.



Project	**Project Dragon, Port Talbot**
Client:	**TEC Ltd**
Report Ref:	**DRA-23-1532**
Info Source:	*W, Ramsey.1988 / various news sources*

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AA	*Anti-Aircraft (defences)*
AFS	*Auxiliary Fire Service*
AP	*Anti-Personnel*
ARP	*Air Raid Precautions*
ASW	*Anti-Submarine Warfare*
BDU	*Bomb Disposal Unit (historic term for EOD)*
Bgl	*Below Ground Level*
EOC	*Explosive Ordnance Clearance*
EOD	*Explosive Ordnance Disposal*
FP	*Fire Pot (German bomb)*
GI	*Ground Investigation*
HAA	*Heavy Anti-Air (gun battery)*
Ha	*Hectare (10,000m2)*
HE	*High Explosive*
IB	*Incendiary Bomb*
Kg	*Kilogram*
LAA	*Light Anti Air (gun battery)*
LCC	*London County Council*
LRRB	*Long Range Rocket Bomb (V2)*
LSA	*Land Service Ammunition*
Luftwaffe	*German Air Force*
OB	*Oil Bomb (German bomb)*
PM	*Parachute Mine (German bomb)*
RAF	*Royal Air Force*
RFC	*Royal Flying Corps*
RN	*Royal Navy (British)*
RNAS	*Royal Naval Air Service*
ROF	*Royal Ordnance Factory*
SAA	*Small Arms Ammunition*
SD2	*2kg AP bomb (German bomb)*
SI	*Site Investigation*
U/C	*Unclassified (German) bomb*
UP	*Unrotating Projectile (British 3" AA rocket)*
USAAF	*United States Army Air Force*
UX	*Unexploded*
UXB	*Unexploded Bomb*
UXO	*Unexploded Ordnance*
V1	*German Flying (pilotless) bomb - "Doodlebug"*
V2	*German LRRB - "Big Ben"*
WAAF	*Women's Auxiliary Air Force*
WWI	*World War One*
WWII	*World War Two*

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- ***Bates. H. E***, Flying Bombs Over England, Frogletts Publications Ltd, 1994.
- ***Bulloch. G***, Steeds J E, Green K, Sainsbury M G, Brockwell J S & Slade N J, Land Contamination: Technical Guidance on Special Sites: MoD Land, Environment Agency, 2001.
- ***Castle. I,*** London 1914-17: The Zeppelin Menace, Osprey Publishing Ltd, 2008.
- ***Castle. I,*** London 1917-18: The Bomber Blitz, Osprey Publishing Ltd, 2010.
- ***CIRIA***, C681: Unexploded Ordnance (UXO), A Guide for the Construction Industry, 2009.
- ***Clarke. N. J***, Luftwaffe Target Reconnaissance, German Aerial Photography 1939-1942, 1996.
- ***Clarke. N. J***, Adolf's British Holiday Snaps: Luftwaffe Aerial Reconnaissance Photographs of England, Scotland and Wales, 2012.
- ***Cocroft. W. D***, Dangerous Energy, Historic England, 2000.
- ***Dobinson. C. S,*** AA Command: Britain's Anti-Aircraft Defences of the Second World War, Methuen Publishing Ltd, 2001.
- ***Dobinson. C. S***, Fields of Deception - Britain's Bombing Decoys of World War II, Methuen Publishing Ltd, 2013.
- ***Fleischer. W***, German Air-Dropped Weapons to 1945, Midland Publishing. 2004.
- ***Jappy. M. J,*** Danger UXB: The Remarkable Story of the Disposal of Unexploded Bombs during the Second World War. Channel 4 Books, 2001.
- ***Morris. J***, German Air Raids on Britain: 1914-1918, Nonsuch Publishing, 2007.
- ***Price. A***, Blitz on Britain 1939-45, Sutton Publishing Ltd, 2000.
- ***Ramsey. W,*** The Blitz Then and Now: Vol 1, Battle of Britain Prints International Limited, 1987.
- ***Ramsey. W,*** The Blitz Then and Now: Vol 2, Battle of Britain Prints International Limited, 1988.
- ***Ramsey. W,*** The Blitz Then and Now: Vol 3, Battle of Britain Prints International Limited, 1990.
- ***Whiting. C***, Britain Under Fire: The Bombing of Britain's Cities 1940-1945, Pen & Sword Books Ltd, 1999.

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Appendix C

Exploratory Hole Logs

Borehole Log

Borehole No. **CHST101A**

Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 02/05/2023-05/05/2023
Location: Port Talbot	Contractor: Marshall Drilling Limited	Co-ords: E276414.63 N188561.60
Project No. 2111006.005	Drilling Equipment: Comacchio 305	Level: 8.48m AOD
Hole Type: RO	Logged By: Drillers	Scale: 1:160

Well	Water Strikes	Depth (m)	Type	Results	Coring TCR	Coring SCR	Coring RQD	Coring If (mm)	Depth (m)	Level (m)	Legend	Stratum Description
												SAND (WIND BLOWN SAND) (Drillers Description)
									6.50	1.98		ALLUVIUM (TIDAL FLAT DEPOSITS) (Drillers Description)
									14.00	-5.52		COBBLES (ALLUVIAL FAN DEPOSITS) (Drillers Description)
									25.00	-16.52		MUDSTONE (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (Drillers Description)
									31.00	-22.52		End of Borehole at 31.000m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
29.00	160																
31.00	160																

Remarks:

AGS

Borehole Log

Borehole No.
CHST101B
Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 08/05/2023-11/05/2023
Location: Port Talbot	Contractor: Marshall Drilling Limited	Co-ords: E276414.63 N188561.60
Project No. 2111006.005	Drilling Equipment: Comacchio 305	Level: 8.42m AOD
Hole Type: RO	Logged By: Drillers	Scale: 1:160

Well	Water Strikes	Depth (m)	Type	Results	Coring TCR	Coring SCR	Coring RQD	Coring If (mm)	Depth (m)	Level (m)	Legend	Stratum Description
												SAND (WIND BLOWN SAND) (Drillers Description)
									6.00	2.42		ALLUVIUM (TIDAL FLAT DEPOSITS) (Drillers Description)
									14.00	-5.58		COBBLES (ALLUVIAL FAN DEPOSITS) (Drillers Description)
									22.00	-13.58		MUDSTONE (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (Drillers Description)
									29.00	-20.58		End of Borehole at 29.000m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
29.00	160																

Remarks:

AGS

Borehole Log

Borehole No.
CHST101C
Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 15/05/2023-17/05/2023
Location: Port Talbot	Contractor: Marshall Drilling Limited	Co-ords: E276414.63 N188561.60
Project No. 2111006.005	Drilling Equipment: Comacchio 305	Level: 8.21m AOD
Hole Type: RO	Logged By: Drillers	Scale: 1:160

Well	Water Strikes	Depth (m)	Type	Results	Coring TCR	Coring SCR	Coring RQD	Coring If (mm)	Depth (m)	Level (m)	Legend	Stratum Description
												SAND (WIND BLOWN SAND) (Drillers Description)
									6.00	2.21		ALLUVIUM (TIDAL FLAT DEPOSITS) (Drillers Description)
									13.50	-5.29		COBBLES (ALLUVIAL FAN DEPOSITS) (Drillers Description)
									26.00	-17.79		MUDSTONE (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (Drillers Description)
									29.50	-21.29		End of Borehole at 29.500m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
29.50	160																

Remarks:

Borehole Log

Borehole No.
CHST102A
Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 28/03/2023-17/04/2023
Location: Port Talbot	Contractor: Marshall Drilling Limited	Co-ords: E276517.78 N188535.85
Project No. 2111006.005	Drilling Equipment: Comacchio 305	Level: 7.97m AOD
Hole Type: RO	Logged By: Drillers	Scale: 1:160

Well	Water Strikes	Depth (m)	Type	Results	Coring TCR	Coring SCR	Coring RQD	Coring If (mm)	Depth (m)	Level (m)	Legend	Stratum Description
									0.10	7.87		MADE GROUND. (Drillers Description)
												SAND (WIND BLOWN SAND) (Drillers Description)
									5.50	2.47		Alluvium and soft clay (TIDAL FLAT DEPOSITS) (Drillers Description)
									13.00	-5.03		Gravels/boulders (ALLUVIAL FAN DEPOSITS) (Drillers Description)
									20.00	-12.03		End of Borehole at 20.000m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
20.00	160																

Remarks:
Terminated at depth due to casing being stuck at 18m.

Borehole Log

Borehole No. **CHST102B**

Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 20/04/2023-28/04/2023
Location: Port Talbot	Contractor: Marshall Drilling Limited	Co-ords: E276517.78 N188535.85
Project No. 2111006.005	Drilling Equipment: Comacchio 305	Level: 7.97m AOD
Hole Type: RO	Logged By: RK/Drillers	Scale: 1:160

Well	Water Strikes	Depth (m)	Type	Results	Coring TCR	Coring SCR	Coring RQD	Coring If (mm)	Depth (m)	Level (m)	Legend	Stratum Description
									0.40	7.57		MADE GROUND. (Drillers Description)
		1.60 - 2.40	B						0.60	7.37		MADE GROUND: Dark brown to dark grey slightly sandy gravelly silt with occasional rootlets up to 4mm. Gravel of coke, clinker and brick.
												SAND (WIND BLOWN SAND) (Drillers Description)
									5.50	2.47		Light brown slightly silty fine to medium grained SAND. (WIND BLOWN SAND)
									6.00	1.97		ALLUVIUM/CLAY (TIDAL FLAT DEPOSITS) (Drillers Description)
												Clay and alluvium (TIDAL FLAT DEPOSITS) (Drillers Description)
									10.00	-2.03		Cobbles. (Drillers Description)
									12.50	-4.53		COBBLES and SAND (ALLUVIAL FAN DEPOSITS) (Drillers Description)
									22.00	-14.03		?Mudstone (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (Drillers Description)
									23.50	-15.53		MUDSTONE (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (Drillers Description)
									26.00	-18.03		End of Borehole at 26.000m
									29.00	-21.03		

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
25.50	160																
26.00	160																

Remarks:

Borehole Log

Borehole No. **CHST102C**

Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 02/05/2023-05/05/2023
Location: Port Talbot	Contractor: Marshall Drilling Limited	Co-ords: E276517.00 N188535.00
Project No. 2111006.005	Drilling Equipment: Comacchio 305	Level: 7.95m AOD
Hole Type: RO	Logged By: Drillers	Scale: 1:160

Well	Water Strikes	Depth (m)	Type	Results	Coring TCR	Coring SCR	Coring RQD	Coring If (mm)	Depth (m)	Level (m)	Legend	Stratum Description
									0.60	7.35		MADE GROUND: Dark brown to dark grey slightly sandy gravelly silt with occasional rootlets up to 4mm. Gravel of coke, clinker and brick.
												Light brown slightly silty fine to medium grained SAND. (WIND BLOWN SAND)
									5.50	2.45		ALLUVIUM/CLAY (TIDAL FLAT DEPOSITS) (Drillers Description)
									12.50	-4.55		COBBLES and SAND (ALLUVIAL FAN DEPOSITS) (Drillers Description)
									23.50	-15.55		MUDSTONE (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (Drillers Description)
									29.00	-21.05		End of Borehole at 29.000m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
25.50	160																

Remarks:

AGS

Borehole Log

Borehole No.
CHST102D
Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 15/05/2023-17/05/2023
Location: Port Talbot	Contractor: Marshall Drilling Limited	Co-ords: E276512.46 N188536.23
Project No. 2111006.005	Drilling Equipment: Comacchio 305	Level: 7.93m AOD
Hole Type: RO	Logged By: Drillers	Scale: 1:160

Well	Water Strikes	Depth (m)	Type	Results	Coring TCR	Coring SCR	Coring RQD	Coring If (mm)	Depth (m)	Level (m)	Legend	Stratum Description
									0.40	7.53		MADE GROUND (Drillers Description)
												SAND (WIND BLOWN SAND) (Drillers Description)
									6.00	1.93		ALLUVIUM (TIDAL FLAT DEPOSITS) (Drillers Description)
									10.00	-2.07		COBBLES (ALLUVIAL FAN DEPOSITS) (Drillers Description)
									26.00	-18.07		MUDSTONE (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (Drillers Description)
									29.50	-21.57		End of Borehole at 29.500m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
29.50	160																

Remarks:

Borehole Log

Borehole No. **BH101**

Sheet 1 of 3

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 27/03/2023-31/03/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276273.14 N188600.26
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 8.59m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.50 - 1.00	D					MADE GROUND: Brown to dark brown slightly clayey gravelly very silty sand with low cobble content and occasional roots up to 20mm. Gravel of slag, metal wire, wood fragments and brick. Cobbles of brick, concrete and tarmacadam.
		0.50 - 1.00	ES					
	▽	0.60 - 0.90	ES					
		1.00 - 1.45	B					
		1.00	SPT	N=4 (3,0/1,1,1,1)				
		1.45 - 2.00	B		1.40	7.18		
		1.50 - 2.00	ES					MADE GROUND: Brown slightly sandy slightly gravelly silty clay. Gravel of slag.
		2.00	SPT	N=4 (0,1/1,1,1,1)				
	▽	2.50 - 3.00	B		2.50	6.08		
		2.50 - 3.00	B					Soft, very low strength slightly sandy silty CLAY with occasional fibrous peat. Sand is fine grained. (TIDAL FLAT DEPOSITS)
		2.50 - 3.00	ES					
		3.00 - 3.45	D					
		3.00 - 3.45	D					
		3.00	SPT	N=4 (1,1/1,1,1,1)				
		4.00	D					
		4.00 - 4.45	D					
		4.00 - 4.45	U					
		5.00	D					
		5.00	HV	17 kPa				
	▽	6.00	D		6.00	2.58		
		6.00	SPT	N=4 (1,1/1,1,1,1)				Loose brown silty fine grained SAND. (WIND BLOWN SAND)
		6.50 - 7.00	B					
		7.00 - 7.45	D		7.00	1.58		
		7.00	SPT	N=17 (3,3/4,5,4,4)				Soft blueish grey to brownish grey sandy silty CLAY with occasional pseudofibrous peat and bands of fine to medium grained sand. (TIDAL FLAT DEPOSITS)
		8.00	D					
		8.00 - 8.45	D					
		8.00	SPT	N=4 (1,1/1,1,1,1)				
		9.00	U					
		10.00 - 10.45	D					
		10.00	SPT	N=8 (2,2/2,2,2,2)				
		11.00	D					
		11.00 - 11.45	D					
		11.00	SPT	N=4 (2,1/1,1,1,1)				
		12.00	D					

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
25.00	200	25.00	200	15.00	15.30	00:30				
				16.50	16.80	00:30				
				18.00	18.40	01:00				
				19.00	19.50	01:00				
				21.00	21.40	01:00				

Remarks:

Groundwater strike at 1.0m and 6.0m. Groundwater resting at 0.95m after 20minutes.

Borehole Log

Borehole No. **BH101**

Sheet 2 of 3

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 27/03/2023-31/03/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276273.14 N188600.26
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 8.59m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		12.00	SPT	N=8 (2,2/2,2,2,2)				Soft blueish grey to brownish grey sandy silty CLAY with occasional pseudofibrous peat and bands of fine to medium grained sand. (TIDAL FLAT DEPOSITS)
		13.00	D					
		13.00	SPT	N=8 (2,2/2,2,2,2)				
		14.00	D		14.00	-5.42		
		14.00	SPT	N=27 (4,4/6,7,7,7)				Stiff brown to dark brown fibrous to amorphous PEAT. (TIDAL FLAT DEPOSITS)
		15.00	D		15.00	-6.42		
		15.00 - 15.50	B					Dense brownish grey to brown gravelly SAND. Sand is fine to coarse grained. Gravel of fine to coarse subangular to rounded sandstone. (ALLUVIAL FAN DEPOSITS)
		15.00	SPT	N=43 (5,10/10,11,12,10)				
		16.00 - 16.50	B					
		16.50 - 16.90	D					
		16.50	SPT	50 (8,14/50 for 15mm)				
		17.50 - 18.00	B					
		18.00 - 18.45	D					
		18.00	SPT	50 (6,14/50 for 8mm)				
		19.00 - 19.50	B					
		19.50 - 19.90	D					
		19.50	SPT	N=39 (6,7/10,10,10,9)				
		20.50 - 21.00	B					
		21.00 - 21.45	D		21.00	-12.42		
		21.00	SPT	0 (50 for 15mm/0 for 0mm)				Dense to very dense brownish grey to brown sandy GRAVEL. Sand is fine to coarse grained. Gravel of fine to coarse subangular to brounded sandstone. (ALLUVIAL FAN DEPOSITS)
		22.00 - 22.50	B					
		22.50 - 22.90	D					
		23.50 - 24.00	B					
		24.00 - 24.45	D					

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
25.00	200	25.00	200	15.00	15.30	00:30				
				16.50	16.80	00:30				
				18.00	18.40	01:00				
				19.00	19.50	01:00				
				21.00	21.40	01:00				

Remarks:

Groundwater strike at 1.0m and 6.0m. Groundwater resting at 0.95m after 20minutes.

Borehole Log

Borehole No. **BH101** Sheet 3 of 3

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 27/03/2023-31/03/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276273.14 N188600.26
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 8.59m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		24.00	SPT	N=42 (5,7/7,10,11,14)				Dense to very dense brownish grey to brown sandy GRAVEL. Sand is fine to coarse grained. Gravel of fine to coarse subangular to brounded sandstone. (ALLUVIAL FAN DEPOSITS)
					25.00	-16.42		End of Borehole at 25.00m

25 26 27 28 29 30 31 32 33 34 35

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
25.00	200	25.00	200	15.00	15.30	00:30				
				16.50	16.80	00:30				
				18.00	18.40	01:00				
				19.00	19.50	01:00				
				21.00	21.40	01:00				

Remarks:
Groundwater strike at 1.0m and 6.0m. Groundwater resting at 0.95m after 20minutes.

Borehole Log

Borehole No. **BH102**

Sheet 1 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 31/03/2023-05/04/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276300.45 N188609.79
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 9.19m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.20 - 0.40	ES					MADE GROUND: Brown slightly gravelly silty sand. Gravel of slag, wood fragments and clinker.
		0.50 - 1.00	B					
	▼	1.00 - 1.45	D		1.00	8.19		MADE GROUND: Brown to light brown slightly gravelly silty sand. Gravel of slag.
		1.00	SPT	N=10 (3,2/2,3,2,3)				
		2.00	D					
		2.00 - 2.45	D					
		2.00	SPT	N=2 (0,0/0,1,0,1)				
		2.50 - 3.00	B		2.50	6.69		Soft light grey silty CLAY. (TIDAL FLAT DEPOSITS)
		3.00 - 3.45	U					
		3.00 - 3.50	B					
		4.00	D					
		4.00 - 4.45	D					
		4.00	SPT	N=4 (0,1/1,1,1,1)				
		4.50 - 5.00	B		4.50	4.69		Very loose to loose slightly clayey silty SAND with occasional bands of pseudofibrous. Sand is fine to medium grained. (WIND BLOWN SAND)
		5.00 - 5.45	D					
		5.00	SPT	N=2 (0,1/0,1,0,1)				
		6.00 - 6.50	B					
		6.50	SPT	N=6 (0,1/0,1,2,3)				
		7.50 - 8.00	B					
		8.00 - 8.45	D					
		8.00	SPT	N=2 (0,1/0,0,1,1)				
		9.50	D		9.50	-0.31		Soft to firm grey silty CLAY. (TIDAL FLAT DEPOSITS)
		9.50 - 9.95	D					
		9.50	SPT	N=4 (1,1/1,1,1,1)				
		11.00	D					
		11.00 - 11.45	D					
		11.00	SPT	N=8 (1,1/1,2,2,3)				

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
20.50	200	20.00	200	17.50	17.85	01:00				

Remarks:
Groundwater strike at 1.5m. Groundwater resting at 1.0m after 20minutes.

Borehole Log

Borehole No. **BH102**

Sheet 2 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 31/03/2023-05/04/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276300.45 N188609.79
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 9.19m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		12.50	D					Soft to firm grey silty CLAY. (TIDAL FLAT DEPOSITS)
		12.50 - 12.90	B					
		12.50 - 12.95	U					
		14.00	D					
		14.00 - 14.45	D					
		14.00	SPT	N=5 (1,3/2,1,1,1)				
		14.50 - 15.00	B					
					14.80	-5.61		Soft brown to dark brown slightly clayey fibrous to amorphous PEAT. (TIDAL FLAT DEPOSITS)
		15.50 - 15.90	D		15.50	-6.31		Very dense brown slightly gravelly SAND. Sand is fine to coarse grained. Gravel of fine to coarse subangular to subrounded sandstone. (ALLUVIAL FAN DEPOSITS)
		15.50	SPT	50 (10,10/50 for 90mm)				
		16.00 - 17.00	B					
		17.00 - 17.50	D		17.00	-7.81		Dense brownish grey to brown slightly sandy GRAVEL. Sand is fine to coarse grained. Gravel of fine to coarse subangular to rounded sandstone. (ALLUVIAL FAN DEPOSITS)
		17.00	SPT	0 (50 for 75mm/0 for 0mm)				
		18.00 - 18.50	B					
		18.50 - 18.90	D					
		18.50	SPT	55 (10,10/55 for 215mm)				
		19.50 - 20.00	B					
		20.00 - 20.20	D					
		20.00 - 24.50	B					
		20.00	SPT	25 (35 for 135mm/25 for 20mm)	20.50	-11.31		End of Borehole at 20.50m

13 14 15 16 17 18 19 20 21 22 23

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
20.50	200	20.00	200	17.50	17.85	01:00				

Remarks:
Groundwater strike at 1.5m. Groundwater resting at 1.0m after 20minutes.

AGS

Borehole Log

Borehole No. **BH103**

Sheet 1 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 18/04/2023-24/04/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276317.54 N188670.97
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 8.43m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.50 - 1.00	B					MADE GROUND: Dark grey mottled black slightly clayey silty very gravelly sand with occasional rootlets and roots up to 5mm. Gravel of slag.
		0.50 - 1.00	ES					
	▼	1.00 - 1.45	D					
		1.00	SPT	N=21 (3,7/5,5,5,6)				
		1.50 - 2.00	B		1.50	6.93		
	▽	2.00 - 2.45	D		2.00	6.43		MADE GROUND: Dark grey mottled grey slightly clayey silty very sandy gravel with rare fine rootlets. Gravel of slag, lime, plaster.
		2.00	SPT	N=17 (4,4/4,5,4,4)				MADE GROUND: Dark grey and black slightly clayey sandy gravel. Gravel of slag.
		2.50 - 3.00	B					
		2.50 - 3.00	ES					
		3.00	SPT	N=5 (2,1/1,2,1,1)	3.00	5.43		
		3.50 - 4.00	B					Soft, low strength brownish grey and grey mottled slightly sandy slightly gravelly silty CLAY with rare decayed rootlets and weak organic odour. Sand is fine grained. Gravel of fine subangular sandstone. (TIDAL FLAT DEPOSITS)
		3.90	PP	0.7 kg/cm2	4.00	4.43		
		3.90	HV	31 kPa				
		4.00	D					Firm, medium strength greyish brown and brown slightly sandy silty CLAY. Sand is fine grained. (TIDAL FLAT DEPOSITS)
		4.50	D					
		4.50	PP	1.0 kg/cm2				
		4.50	HV	43 kPa				
		4.60 - 5.00	B					
		5.00	D					
		5.00	SPT	N=4 (1,1/1,1,1,1)				
		5.50	D					
		6.50 - 6.95	U					
		6.90	D		6.80	1.63		Very soft to soft brownish grey slightly sandy silty CLAY. Sand is fine grained. (TIDAL FLAT DEPOSITS)
		7.00	PP	1.4 kg/cm2				
		7.00	HV	75 kPa				
		7.50 - 8.00	B		7.40	1.03		Very soft dark brownish grey slightly sandy slightly silty organic CLAY with frequent pockets of pseudofibrous peat and strong organic odour. Sand is fine grained. (TIDAL FLAT DEPOSITS)
		7.80	PP	0.5 kg/cm2				
		7.80	HV	21 kPa				
		8.00	D					
		8.00	SPT	N=4 (2,2/1,1,1,1)				
		8.80	PP	0.4 kg/cm2				
		8.80	HV	22 kPa				
		9.00 - 9.50	B					
		9.50 - 9.95	U					
		9.95	D					
		10.60 - 11.00	B					
		11.00	D					
		11.00	SPT	N=8 (1,2/2,2,2,2)				
		12.00 - 12.50	B					

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
22.00	200	22.00	200	14.10	14.50	01:00				
				15.50	16.50	01:00				
				16.60	17.00	01:00				
				17.00	17.40	00:45				
				21.50	22.00	01:00				

Remarks:
Groundwater strike at 2.0m. Groundwater resting at 1.0m after 20minutes.

Borehole Log

Borehole No. **BH103**

Sheet 2 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 18/04/2023-24/04/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276317.54 N188670.97
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 8.43m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		12.50	D					Very soft dark brownish grey slightly sandy slightly silty organic CLAY with frequent pockets of pseudofibrous peat and strong organic odour. Sand is fine grained. (TIDAL FLAT DEPOSITS)
		12.50	SPT	N=7 (1,1/1,2,2,2)	12.80	-4.37		
		13.80 - 14.00	B					Very dense greyish brown sandy GRAVEL. Sand is medium to coarse grained. Gravel of fine to coarse subangular to rounded sandstone. (ALLUVIAL FAN DEPOSITS)
		14.00	SPT	50 (25 for 25mm/50 for 20mm)				
		15.00	D					
		15.00 - 15.50	B					
		15.50	D					
		15.50	SPT	50 (25 for 80mm/50 for 30mm)				
		16.60 - 17.00	B					
		17.00	D					
		17.00	SPT	0 (50 for 50mm/0 for 0mm)				
		17.50	D					
		18.00 - 18.50	B					
		18.50	SPT	50 (25 for 140mm/50 for 60mm)				
		19.50 - 20.00	B					
		20.00	D					
		20.00	SPT	0 (50 for 70mm/0 for 0mm)				
		21.00 - 21.50	B					
		21.50	D					
		21.50	SPT	0 (50 for 25mm/0 for 0mm)				
		22.00	D		22.00	-13.57		End of Borehole at 22.00m
		22.00	SPT	50 (11,19/50 for 150mm)				

13 14 15 16 17 18 19 20 21 22 23

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
22.00	200	22.00	200	14.10	14.50	01:00				
				15.50	16.50	01:00				
				16.60	17.00	01:00				
				17.00	17.40	00:45				
				21.50	22.00	01:00				

Remarks:
Groundwater strike at 2.0m. Groundwater resting at 1.0m after 20minutes.

Borehole Log

Borehole No. **BH104**

Sheet 1 of 3

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 05/04/2023-12/04/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276327.41 N188593.70
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 8.73m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.00 - 0.35	D					MADE GROUND: Dark brown slightly clayey silty gravelly sand. Gravel of brick, sandstone, wood fragments, clinker and coke.
		0.00 - 0.35	ES		0.35	8.38		
		0.35 - 1.00	B					Brown slightly gravelly fine to coarse grained SAND. Gravel of fine to coarse subangular sandstone. (WIND BLOWN SAND)
		0.35 - 1.00	ES					
		1.00 - 1.45	D					
		1.00	SPT	N=8 (2,2/2,2,2,2)				
		1.50 - 2.00	B		1.50	7.23		Firm brown slightly gravelly slightly sandy silty CLAY. Gravel of fine to medium subangular sandstone. (TIDAL FLAT DEPOSITS)
		1.50 - 2.00	ES					
		2.00 - 2.40	B					
		2.00 - 2.45	ES					
		2.50 - 3.00	B		2.40	6.33		Very loose brownish grey slightly gravelly fine to medium grained SAND. Gravel of fine to medium subangular to subrounded sandstone. (WIND BLOWN SAND)
		2.50 - 3.00	ES					
		3.00	D					
		3.00	SPT	N=4 (1,1/1,1,1,1)				
		3.80 - 4.00	B					
		4.00 - 4.45	D		4.00	4.73		Very loose greyish brown slightly gravelly fine to medium grained SAND with occasional pocket of clayey amorphous peat. Gravel of fine to medium subangular to subrounded sandstone. (WIND BLOWN SAND)
		4.00 - 4.45	U					
		4.00	SPT	N=2 (0,0/1,0,0,1)				
		4.50 - 5.00	B					
		5.00 - 5.45	D					
		5.00	SPT	N=2 (0,0/1,0,0,1)				
		6.00 - 6.50	B					
		6.50 - 6.95	D		6.50	2.23		Loose brownish grey slightly clayey silty fine to medium grained SAND with occasional pockets of silty organic clay and thin pockets of fibrous peat. (WIND BLOWN SAND)
		6.50	SPT	N=7 (1,1/1,2,2,2)	6.80	1.93		Very soft to firm, very low strength brown mottled yellowish brown slightly sandy silty organic CLAY with occasional to frequent pockets of fibrous to pseudofibrous peat and rare shell fragments Sand is fine grained. (TIDAL FLAT DEPOSITS)
		7.50 - 800.00	B					
		8.00 - 8.45	D					
		8.00	SPT	N=1 (0,0/0,0,0,1)				
		9.00 - 9.50	B					
		9.50 - 9.95	D					
		9.50 - 9.95	U					
		9.50	SPT	N=13 (5,6/5,3,2,3)				
		10.50 - 11.00	B					
		11.00 - 11.45	D					
		11.00	SPT	N=14 (4,3/3,4,4,3)				
		12.00 - 12.50	B		12.00	-3.27		

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
25.00	200	24.50	200	18.65	19.05	01:00				
				19.05	19.50	01:00				
				21.60	22.10	01:00				
				23.00	23.60	00:30				

Remarks:

Groundwater strike at 2.0m. Groundwater resting at 1.5m after 20minutes. Borehole deepened with rotary drilling (see BH104 follow on).

Borehole Log

Borehole No. **BH104**

Sheet 2 of 3

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 05/04/2023-12/04/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276327.41 N188593.70
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 8.73m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		12.50 - 12.95	D					Soft to firm brown to dark brown slightly clayey fibrous to amorphous PEAT. (TIDAL FLAT DEPOSITS)
		13.50 - 14.00	B					
		14.00	D					
		14.00	SPT	N=21 (1,2/3,5,6,7)				
		15.00 - 15.50	B					
		15.50 - 15.95	D					
		15.50	SPT	N=52 (3,3/3,7,12,30)				
		16.50 - 17.00	B		16.50	-7.77		
		17.00	SPT	N=50 (5,7/7,11,14,18)				Dense to very dense greyish brown sandy GRAVEL with low cobble content. Sand is medium to coarse grained. Gravel of fine to coarse subangular to rounded sandstone. Cobbles of medium strong to strong brownish grey sandstone. (ALLUVIAL FAN DEPOSITS)
		18.00 - 18.50	B					
		18.50	SPT	50 (6,6/50 for 15mm)				
		19.50 - 20.00	B					
		20.00	SPT	N=36 (5,6/8,8,10,10)				
		21.00 - 21.50	B					
		21.50	SPT	25 (35 for 85mm/25 for 5mm)				
		22.50 - 23.00	B					
		23.60 - 24.00	B					

13 14 15 16 17 18 19 20 21 22 23

Hole Diameter

Depth Base (m)	Diameter (mm)
25.00	200

Casing Diameter

Depth Base (m)	Diameter (mm)
24.50	200

Chiselling

Depth Top (m)	Depth Base (m)	Duration (hh:mm)
18.65	19.05	01:00
19.05	19.50	01:00
21.60	22.10	01:00
23.00	23.60	00:30

Inclination & Orientation

Depth Top (m)	Depth Base (m)	Inclination	Orientation

Remarks:

Groundwater strike at 2.0m. Groundwater resting at 1.5m after 20minutes. Borehole deepened with rotary drilling (see BH104 follow on).

Borehole Log

Borehole No. **BH104**

Sheet 3 of 3

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 05/04/2023-12/04/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276327.41 N188593.70
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 8.73m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		24.00	SPT	N=54 (4,5/8,12,16,18)	25.00	-16.27		Dense to very dense greyish brown sandy GRAVEL with low cobble content. Sand is medium to coarse grained. Gravel of fine to coarse subangular to rounded sandstone. Cobbles of medium strong to strong brownish grey sandstone. (ALLUVIAL FAN DEPOSITS) End of Borehole at 25.00m

25 26 27 28 29 30 31 32 33 34 35

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
25.00	200	24.50	200	18.65	19.05	01:00				
				19.05	19.50	01:00				
				21.60	22.10	01:00				
				23.00	23.60	00:30				

Remarks:

Groundwater strike at 2.0m. Groundwater resting at 1.5m after 20minutes. Borehole deepened with rotary drilling (see BH104 follow on).

Borehole Log

Borehole No. **BH105**

Sheet 1 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 28/03/2023-03/04/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276375.21 N188639.30
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 8.44m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.00 - 0.30	D					
		0.10 - 0.30	ES		0.30	8.14		MADE GROUND: Dark brown, black and greyish brown slightly clayey silty very sandy gravel with frequent root up to 25mm. Gravel of brick, wood fragments, clinker and coke.
	▼	0.60 - 3.00	B		0.60	7.84		MADE GROUND: Grey slighlty clayey sandy gravel. Gravel of brick and concrete.
		0.60 - 3.00	ES					
		1.00	D					
	▽	1.00 - 1.45	D					MADE GROUND: Grey to black sandy gravel. Gravel of brick, concrete, slag, wood fragmants and porcelain fragments.
	▼	1.00	SPT	N=15 (1,2/4,4,4,3)				
		2.00	D					
		2.00 - 2.45	D					
		2.00	SPT	N=15 (5,4/3,3,4,5)				
		3.00 - 3.45	D		3.00	5.44		Soft to locally firm, very low strength grey silty CLAY. (TIDAL FLAT DEPOSITS)
		3.00 - 7.00	B					
		3.00	SPT	N=3 (1,0/0,1,1,1)				
		4.00	D					
		4.00 - 4.45	U					
		4.40 - 4.60	D					
		5.00	D					
		5.00	HV	22 kPa				
		6.00 - 6.45	D					
		6.00	SPT	N=14 (2,3/4,3,3,4)				
		7.00 - 10.00	B		7.00	1.44		Firm, very low strength brownish grey slightly sandy silty CLAY. (TIDAL FLAT DEPOSITS)
		7.00 - 7.40	D					
		7.40 - 7.60	U					
		8.00	D					
		8.00 - 8.45	D					
		8.00	SPT	N=5 (1,0/1,1,1,2)				
		9.00	D					
		9.00	D		9.10	-0.66		Very soft to soft grey silty organic CLAY with occasional pockets of amorphous peat. (TIDAL FLAT DEPOSITS)
		9.00	HV	5 kPa				
		10.00 - 10.40	U		9.80	-1.36		Soft brown to dark brown slightly clayey fibrous to amorphous PEAT. (TIDAL FLAT DEPOSITS)
		10.00 - 12.00	B					
		10.40 - 10.60	D					
		11.00	D					
		11.50 - 11.95	D					
		11.50	SPT	N=10 (1,1/2,2,2,4)				
		12.00	D					

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
23.00	200	23.00	200	0.30	0.60	01:00				
				14.70	15.00	01:00				
				15.80	16.30	01:30				
				17.00	17.80	01:30				
				18.50	18.90	02:00				

Remarks:

Groundwater strike at 1.3m and 13.5m. Groundwater resting at 0.7m after 20minutes.

Borehole Log

Borehole No. **BH105** Sheet 2 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 28/03/2023-03/04/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276375.21 N188639.30
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 8.44m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		13.00	D		13.20	-4.76		Soft brown to dark brown slightly clayey fibrous to amorphous PEAT. (TIDAL FLAT DEPOSITS)
		13.50 - 17.00	B					Very dense greyish brown slightly clayey silty very sandy GRAVEL with low cobble content. Sand is fine to coarse grained. Gravel of fine to coarse subangular to rounded sandstone. Cobbles of medium strong to strong brownish grey sandstone. (ALLUVIAL FAN DEPOSITS)
		13.50 - 19.95	D					
		13.50	SPT	N=50 (4,8/50 for 276mm)				
		14.00	D					
		14.50	D					
		15.00	D					
		15.00 - 15.45	D					
		15.00	SPT	52 (8,11/52 for 208mm)				
		16.00	D					
		16.50 - 16.95	D					
		16.50	SPT	53 (11,13/53 for 166mm)				
		17.00	D					
		17.00 - 23.00	B					
		18.00	D					
		18.00 - 18.45	D					
		18.00	SPT	50 (5,10/50 for 189mm)				
		19.00	D					
		19.50 - 19.95	D					
		19.50	SPT	50 (25 for 85mm/50 for 150mm)				
		20.00	D					
		21.00	D					
		21.50 - 21.95	D					
		21.50	SPT	36 (4,8/9,12,15,)				
		22.00	D					
		23.00	D		23.00	-14.56		End of Borehole at 23.00m
		23.00 - 23.95	D					
		23.00	SPT	50 (25 for 10mm/50 for 30mm)				

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
23.00	200	23.00	200	0.30	0.60	01:00				
				14.70	15.00	01:00				
				15.80	16.30	01:30				
				17.00	17.80	01:30				
				18.50	18.90	02:00				

Remarks:
Groundwater strike at 1.3m and 13.5m. Groundwater resting at 0.7m after 20minutes.

Borehole Log

Borehole No. **BH106**

Sheet 1 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 20/03/2023-27/03/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276465.14 N188764.96
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 7.13m AOD
Hole Type: CP	Logged By: MT	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.30 - 1.00	B					Greyish brown and brown mottled very gravelly SILT. Gravel of brick and concrete. (MADE GROUND)
		1.00	D		1.00	6.13		Very soft greyish brown very sandy CLAY. (TIDAL FLAT DEPOSITS)
		1.00 - 2.00	B					
		1.00 - 2.00	ES					
		1.00	SPT	N=2 (1 for 75mm/2 for 150mm)				
		2.00	D		2.00	5.13		Very soft greyish brown slightly gravelly clayey very silty SAND. sand is fine to medium grained. Gravel of fine to medium subangular sandstone (TIDAL FLAT DEPOSITS)
		2.00 - 4.00	B					
		2.00 - 4.00	ES					
		2.00	SPT	N=5 (1 for 75mm/5 for 225mm)				
		3.00	D					
		4.00	B		4.00	3.13		Very soft dark grey organic CLAY. (TIDAL FLAT DEPOSITS)
		4.00	D					
		4.00 - 4.40	D					
		4.40 - 4.60	D					
		5.00	D					
		5.00	HV	4 kPa	5.10	2.03		Soft, very low strength greyish brown slightly sandy CLAY. (TIDAL FLAT DEPOSITS)
		5.60 - 6.50	U		5.60	1.53		Very soft, very low strength slightly sandy slightly peaty organic silty CLAY. Sand is fine to medium grained (TIDAL FLAT DEPOSITS)
		6.00	D					
		6.20	D					
		7.00	D		7.00	0.13		Soft, very low strength plastic dark grey slightly sandy silty clayey fibrous PEAT with weak organic odour. (TIDAL FLAT DEPOSITS)
		7.40	SPT	N=9 (3,1/2,2,2,3)				
		8.00	D					
		8.40	HV	8 kPa				
		9.00	D					
		9.40 - 10.00	B					
		9.44 - 9.80	D					
		9.80 - 10.00	D					
		10.00	B		10.00	-2.87		Very dense (locally medium dense at 18.3mbgl) brownish grey gravelly SAND with medium cobble content. Gravels of fine to coarse angular to rounded sandstone. Cobbles of subangular to subrounded sandstone. (ALLUVIAL FAN DEPOSITS)
		10.00	D					
		10.00	SPT	N=50 (3,9/50 for 236mm)				
		11.00	D					
		11.50	SPT	N=50 (6,9/50 for 225mm)				
		12.00	D					

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
20.95	200	20.00	200	0.10	0.40	01:00				
				11.90	12.30	01:00				
				13.50	13.90	01:00				
				14.00	16.50	04:00				
				18.30	18.60	01:00				

Remarks:

Resting groundwater at groundlevel. Groundwater strike at 10.0m. Groundwater resting at groundlevel after 20minutes.

Borehole Log

Borehole No. **BH106**

Sheet 2 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 20/03/2023-27/03/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276465.14 N188764.96
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 7.13m AOD
Hole Type: CP	Logged By: MT	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		13.00	D					Very dense (locally medium dense at 18.3mbgl) brownish grey gravelly SAND with medium cobble content. Gravels of fine to coarse angular to rounded sandstone. Cobbles of subangular to subrounded sandstone. (ALLUVIAL FAN DEPOSITS)
		13.00	SPT	N=60 (6,11/60 for 165mm)				
		14.00	D					
		14.60	SPT	N=50 (8,12/50 for 266mm)				
		15.00	D					
		16.00	D					
		16.00	SPT	N=50 (25 for 96mm/50 for 161mm)				
		17.00	D					
		17.50	SPT	N=50 (14,11/50 for 225mm)				
		18.30	D					
		18.30 - 18.60	B					
		18.30	SPT	N=26 (3,7/6,4,7,9)				
		19.00	D					
		19.30	SPT	N=50 (25 for 75mm/50 for 10mm)				
		20.00	D					
		20.30	SPT	N=50 (25 for 75mm/50 for 95mm)				
		20.50	SPT	N=50 (25 for 31mm/50 for 0mm)	21.00	-13.87		End of Borehole at 21.00m

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
20.95	200	20.00	200	0.10	0.40	01:00				
				11.90	12.30	01:00				
				13.50	13.90	01:00				
				14.00	16.50	04:00				
				18.30	18.60	01:00				

Remarks:

Resting groundwater at groundlevel. Groundwater strike at 10.0m. Groundwater resting at groundlevel after 20minutes.

AGS

Borehole Log

Borehole No. **BH107**

Sheet 1 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 15/05/2023-18/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276382.99 N188602.53
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 8.61m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.40 - 0.60	ES					MADE GROUND: Dark grey and black slightly clayey silty very gravelly sand with rare rootlets and low cobble content. Gravel of concrete, metal, brick, tarmacadam and slag. Cobbles of brick and slag.
		0.50 - 1.00	B					
		1.00	D					
		1.00	SPT	N=6 (3,2/1,1,2,2)	1.30	7.31		
		1.50 - 2.00	B					Loose brown and grey silty SAND. Sand is fine to medium grained. (WIND BLOWN SAND)
		1.80 - 2.00	ES					
		2.00	D					
		2.00	SPT	N=8 (1,1/1,2,2,3)				
		2.50 - 3.00	B		2.50	6.11		Soft, low strength brown and grey mottled sandy silty CLAY. Sand is fine to medium grained. (TIDAL FLAT DEPOSITS)
		3.00	D					
		3.00	SPT	N=4 (1,1/1,1,1,1)				
		3.50 - 4.00	B		3.50	5.11		Soft to firm, low strength brown very sandy silty CLAY. Sand is fine to coarse grained. (TIDAL FLAT DEPOSITS)
		3.80	PP	0.4 kg/cm2				
		3.80	HV	26 kPa				
		4.00	D					
		4.00	SPT	N=6 (1,1/1,1,2,2)	4.50	4.11		
		4.50 - 5.00	B					Soft to firm, low to medium strength slightly gravelly silty CLAY. Gravel of fine to coarse subangular to subrounded sandstone. (TIDAL FLAT DEPOSITS)
		4.80	PP	0.5 kg/cm2				
		4.80	HV	42 kPa	5.00	3.61		
		5.00	D					Soft to locally firm greyish brown slightly gravelly very sandy silty CLAY with very weak organic odour. Sand is fine to coarse grained. Gravel of fine to medium subangular to subrounded sandstone. (TIDAL FLAT DEPOSITS)
		5.00	SPT	N=5 (1,1/1,1,1,2)				
		6.00 - 6.50	B					
		6.50	D					
		6.50	SPT	N=9 (2,1/2,2,2,3)				
		7.50 - 8.00	B		7.50	1.11		Soft to locally firm slightly sandy silty organic CLAY with occasional to frequent pockets of pseudofibrous peat and weak organic odour. (TIDAL FLAT DEPOSITS)
		8.00	D					
		8.00	SPT	N=4 (1,1/1,1,1,1)				
		9.00	B					
		9.50	D					
		9.50	SPT	N=4 (1,1/1,1,1,1)				
		10.50 - 11.00	B					
		11.00	D		11.00	-2.39		Soft, spongy brown mottled grey very clayey amorphous to fibrous PEAT with weak organic odour. (TIDAL FLAT DEPOSITS)
		11.00	SPT	N=13 (1,3/3,3,3,4)				
		12.00 - 12.50	B					

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
22.00	200	22.00	200	18.50	19.00	01:00				
				19.00	19.50	01:00				
				19.50	20.00	01:00				
				22.00	22.00	00:30				

Remarks:
Groundwater strike at 0.8m. Groundwater resting at 0.5m after 20minutes.

Borehole Log

Borehole No. **BH107**

Sheet 2 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 15/05/2023-18/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276382.99 N188602.53
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 8.61m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		12.50	D					Soft, spongy brown mottled grey very clayey amorphous to fibrous PEAT with weak organic odour. (TIDAL FLAT DEPOSITS)
		12.50	SPT	N=15 (1,1/3,3,4,5)				
		13.50 - 14.00	B					
		13.50	SPT	N=24 (1,1/2,5,7,10)				
		14.00	D					
		14.30 - 14.60	B		14.30	-5.69		
		15.50	SPT	25 (36 for 90mm/25 for 5mm)				Very dense to dense grey slightly sandy GRAVEL with low cobble content. Sand is fine to coarse grained. Gravel of fine to coarse subangular to rounded sandstone. Cobbles of medium strong to strong grey sandstone and extremely strong brownish grey quartzitic sandstone. (ALLUVIAL FAN DEPOSITS)
		16.50 - 17.00	B					
		17.00	SPT	50 (10,10/50 for 50mm)				
		18.00 - 18.50	B					
		18.50	SPT	0 (50 for 50mm/0 for 0mm)				
		19.50 - 20.00	B					
		20.00	SPT	0 (50 for 70mm/0 for 0mm)				
		21.00 - 21.50	B					
		21.50	SPT	N=47 (7,10/11,11,12,13)				
		22.00	SPT	0 (50 for 70mm/0 for 0mm)	22.00	-13.39		End of Borehole at 22.00m

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
22.00	200	22.00	200	18.50	19.00	01:00				
				19.00	19.50	01:00				
				19.50	20.00	01:00				
				22.00	22.00	00:30				

Remarks:
Groundwater strike at 0.8m. Groundwater resting at 0.5m after 20minutes.

Borehole Log

Borehole No. **BH108**

Sheet 1 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 10/05/2023-15/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276434.19 N188702.27
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 7.30m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.00 - 0.50	B					MADE GROUND: Dark brown slightly sandy silty gravelly clay with rare rootlets and roots up to 8mm. Gravel of brick, concrete, tile, sandstone and clinker.
					0.60	6.70		
		1.00 - 2.00	B					MADE GROUND: Black gravelly sandy silt. Gravel of clinker, slag and brick.
		1.00	SPT	N=3 (1,0/0,1,1,1)				
		2.00	D					
		2.00	SPT	N=2 (1,1/1,0,1,0)				
					2.50	4.80		
		3.00 - 3.50	B					MADE GROUND: Brownish grey slightly gravelly slightly sandy silty organic CLAY with rare metal fragments.
		3.00	SPT	N=8 (1,2/2,2,2,2)				
		4.00 - 5.00	B					
		4.00	SPT	N=5 (1,1/1,1,0,3)				
		5.00	D		5.00	2.30		
		5.00 - 6.00	B					Very soft to soft brownish grey mottled yellowish brown slightly silty organic CLAY with rare pockets of pseudofibrous peat. (TIDAL FLAT DEPOSITS)
		5.00	SPT	N=0 (0,0/0,0,0,0)				
		6.00	SPT	N=0 (0,0/0,0,0,0)	6.00	1.30		Soft, spongy brown to brownish grey clayey amorphous to fibrous PEAT with weak organic odour. (TIDAL FLAT DEPOSITS)
		7.50	SPT	N=0 (0,0/0,0,0,0)				
		8.00 - 9.00	B		8.00	-0.70		Very soft greyish brown mottled yellowish brown slightly gravelly sandy silty CLAY. Sand is fine to coarse grained. Gravel of fine to coarse subangular to subrounded sandstone. (TIDAL FLAT DEPOSITS)
		9.00	D					
		9.00	SPT	N=0 (0,0/0,0,0,0)				
		10.00	D					
		10.00 - 10.40	B					
		10.50	D					
		10.50	SPT	N=4 (1,1/1,1,1,1)				
		11.80 - 12.00	B					
		12.00	SPT	N=20 (3,5/5,4,5,6)	12.00	-4.70		

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
21.30	200	21.30	200	18.60 20.60	18.90 21.00	00:30 00:30				

Remarks:

Groundwater strike at 0.8m. Groundwater resting at 0.4m after 20minutes.

Borehole Log

Borehole No. **BH108**

Sheet 2 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 10/05/2023-15/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276434.19 N188702.27
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 7.30m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Medium dense brown sandy GRAVEL. Sand is fine to coarse grained. Gravel of fine to coarse subangular to subrounded sandstone. (ALLUVIAL FAN DEPOSITS)
		13.00 - 13.50	B		13.00	-5.70		
		13.50	SPT	N=50 (10,9/10,12,16,12)				Medium dense to very dense brown slightly sandy GRAVEL with low cobble content. Sand is fine to coarse grained. Gravel of fine to coarse subangular to rounded sandstone. Cobbles of medium strong to strong grey sandstone. (ALLUVIAL FAN DEPOSITS)
		15.00	D					
		15.00 - 15.50	B					
		15.00	SPT	N=50 (11,13/13,13,17,7)				
		16.50	SPT	N=44 (3,11/12,10,11,11)				
		18.00	SPT	N=39 (8,9/9,11,10,9)				
		19.00	D					
		19.50	SPT	N=24 (2,2/2,6,7,9)				
		20.80 - 21.00	B					
		21.00	SPT	50 (20,5/50 for 102mm)				
					21.30	-14.00		End of Borehole at 21.30m

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
21.30	200	21.30	200	18.60 20.60	18.90 21.00	00:30 00:30				

Remarks:
Groundwater strike at 0.8m. Groundwater resting at 0.4m after 20minutes.

Borehole Log

Borehole No. **BH109**

Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 19/05/2023-22/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276451.94 N188540.60
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 7.77m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.50 - 1.00	B					MADE GROUND: Brown and brownish grey slightly gravelly silty sand. Gravel of wood fragments, coke and brick.
		0.60 - 0.80	ES		0.80	6.97		
		1.00	D					Medium dense yellowish brown and light brown slightly silty fine to medium grained SAND. (WIND BLOWN SAND)
		1.00	SPT	N=7 (2,2/2,2,2,1)				
		1.50 - 2.00	B					
		1.80 - 2.00	ES					
		2.00	D					
		2.00	SPT	N=11 (2,2/2,3,3,3)				
		2.50 - 3.00	B					
		3.00	SPT	N=4 (1,1/1,1,1,1)				
		3.50 - 4.00	B					
		4.00	SPT	N=41 (6,7/9,9,11,12)				
		4.50	D					
		5.00	SPT	N=35 (5,5/7,8,10,10)				
		5.50 - 6.00	B		5.50	2.27		Loose yellowish brown and light brown fine to medium grained SAND with rare pockets of pseudofibrous peat. (WIND BLOWN SAND)
		6.50	SPT	N=8 (1,1/1,2,2,3)	6.50	1.27		End of Borehole at 6.50m

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
6.50	200	6.50	200							

Remarks:

Groundwater strike at 0.8m. Groundwater resting at 0.5m after 20minutes. Terminated at depth due to unstable working area caused by blowing sands.

Borehole Log

Borehole No. **BH110**

Sheet 1 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 04/05/2023-09/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276476.01 N188599.95
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 7.91m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.50 - 1.00	B					MADE GROUND: Dark grey slightly sandy gravelly silty clay with rare rootlets and roots up to 4mm. Gravel of slag, wood fragments and brick.
		0.60 - 0.80	ES		0.80	7.11		
		1.00	D					MADE GROUND: Brownish grey slightly gravelly very silty sand with occasional pockets of yellowish brown mottled grey silty clay. Gravel of slag.
		1.00	SPT	N=4 (1,1/1,1,1,1)				
		1.50 - 2.00	B					
		2.00	D		2.00	5.91		Soft, low strength brownish grey slightly gravelly sandy silty CLAY with occasional thin pockets of pseudofibrous to fibrous peat. Sand is fine to coarse grained. Gravel of fine to coarse subangular sandstone. (TIDAL FLAT DEPOSITS)
		2.00	SPT	N=4 (1,1/1,1,1,1)				
		2.50 - 3.00	B					
		2.60 - 2.90	ES					
		2.60	PP	0.6 kg/cm2	3.00	4.91		
		2.60	HV	32 kPa				
		3.00	D					Firm to locally stiff, medium strength greenish brown mottled yellowish brown and grey slightly gravelly silty CLAY. Gravel of fine subangular sandstone. (TIDAL FLAT DEPOSITS)
		3.00	SPT	N=4 (1,1/1,1,1,1)				
		3.50 - 4.00	B					
		3.60	PP	0.6 kg/cm2				
		3.60	HV	35 kPa				
		4.00	D					
		4.00	SPT	N=10 (1,1/2,2,3,3)	4.50	3.41		
		4.50 - 5.00	B					Firm to locally stiff, high strength greenish brown mottled yellowish brown and grey silty CLAY with rare gravel of fine to coarse subangular to subrounded sandstone. (TIDAL FLAT DEPOSITS)
		4.60	PP	1.3 kg/cm2				
		4.60	HV	72 kPa				
		5.00	D					
		5.00	SPT	N=10 (1,1/2,2,3,3)				
		6.00 - 6.50	B		6.00	1.91		Soft, low strength brownish grey slightly sandy silty CLAY with weak organic odour. Gravel of fine to coarse subangular to subrounded sandstone. (TIDAL FLAT DEPOSITS)
		6.20	PP	1.8 kg/cm2				
		6.20	HV	85 kPa				
		6.50	D					
		6.50	SPT	N=9 (1,1/2,2,2,3)				
		7.50 - 8.00	B		7.50	0.41		Soft to firm greyish brown and brown slightly clayey amorphous to fibrous PEAT with weak organic odour. (TIDAL FLAT DEPOSITS)
		8.00	D					
		9.00 - 9.50	B					
		9.00	PP	0.6 kg/cm2				
		9.00	HV	32 kPa				
		9.50	D					
		9.50	SPT	N=7 (1,1/1,1,2,3)				
		10.50 - 11.00	B					
		11.00	D		11.00	-3.09		Very soft to soft brownish grey mottled greyish brown silty organic CLAY. (TIDAL FLAT DEPOSITS)
		11.00	SPT	N=8 (2,2/2,2,2,2)				
		12.00 - 12.50	B					

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
19.00	200	19.00	200							

Remarks:
Groundwater strike at 4.0m. Groundwater resting at 3.1m after 20minutes.

Borehole Log

Borehole No. **BH110** Sheet 2 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 04/05/2023-09/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276476.01 N188599.95
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 7.91m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		12.50	D					Very soft to soft brownish grey mottled greyish brown silty organic CLAY. (TIDAL FLAT DEPOSITS)
		12.50	SPT	N=11 (1,1/1,2,3,5)	12.90	-4.99		
		13.50 - 14.00	B					Very dense brownish grey slightly clayey sandy GRAVEL. Sand is fine to coarse grained. Gravel of fine to coarse subangular to subrounded sandstone. (ALLUVIAL FAN DEPOSITS)
		14.00	D					
		14.00	SPT	50 (26 for 85mm/50 for 10mm)				
		15.00 - 15.50	B					
		15.50	D		15.50	-7.59		
		15.50	SPT	0 (50 for 75mm/0 for 0mm)				Very dense brownish grey slightly clayey slightly silty sandy GRAVEL with low cobble content. Sand is fine to coarse grained. Gravel of fine to coarse subrounded to rounded sandstone. Cobbles of medium strong to strong yellowish brown and grey sandstone. (ALLUVIAL FAN DEPOSITS)
		16.50 - 17.00	B					
		17.00	D					
		17.00	SPT	25 (35 for 125mm/25 for 10mm)				
		18.00 - 18.50	B					
		18.50	D					
		18.50 - 19.00	B					
		18.50	SPT	50 (25 for 125mm/50 for 40mm)	19.00	-11.09		End of Borehole at 19.00m
		19.00	D					
		19.00	SPT	25 (50 for 90mm/25 for 10mm)				

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
19.00	200	19.00	200							

Remarks:
Groundwater strike at 4.0m. Groundwater resting at 3.1m after 20minutes.

Borehole Log

Borehole No. **BH111** Sheet 1 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 10/05/2023-15/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276510.34 N188679.57
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 7.45m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.00	B					MADE GROUND: Black to dark grey slightly gravelly silt with rare rootlets. Gravel of clinker, slag, brick and wood fragments.
		0.50	B		0.45	7.00		MADE GROUND: Black to brownish grey slightly silty sandy gravel with low cobble content. Gravel of slag, brick, concrete, and sandstone. Cobbles of concrete and slag.
		1.00	SPT	N=7 (4,3/2,3,1,1)				
		1.50	B					
		2.00	SPT	N=12 (2,2/2,3,3,4)	2.00	5.45		Firm, medium strength grey mottled yellowish brown slightly sandy slightly gravelly silty CLAY with rare decayed rootlets. Sand is fine to medium grained. Gravel of fine to medium subangular to subrounded sandstone. (TIDAL FLAT DEPOSITS)
		2.50	B		2.50	4.95		
		2.80	PP	1.4 kg/cm2				
		2.80	HV	70 kPa				
		3.00	D					Very soft to locally firm, very low strength dark grey mottled greyish brown slightly sandy slightly silty organic CLAY. Sand if fine to medium grained. (TIDAL FLAT DEPOSITS)
		3.00	SPT	N=6 (1,1/1,1,2,2)				
		3.50	B					
		3.80	PP	1.2 kg/cm2				
		3.80	HV	58 kPa				
		4.00	D					
		4.00	SPT	N=4 (1,1/1,1,1,1)				
		4.50	B					
		5.00	D					
		5.00	SPT	N=4 (1,1/1,1,1,1)				
		6.00 - 6.50	B					
		6.50	D					
		6.50	SPT	N=4 (1,1/1,1,1,1)				
		7.50 - 8.00	B		7.50	-0.05		Very soft dark grey slightly silty organic CLAY with occasional pockets of amorphous to pseudofibrous peat and with a strong organic odour. (TIDAL FLAT DEPOSITS)
		8.00	D					
		8.00	SPT	N=4 (1,1/1,1,1,1)				
		9.00 - 9.50	B					
		9.50	D					
		9.50	SPT	N=11 (1,1/2,3,3,3)				
		10.50 - 11.00	B					
		11.00	D		10.80	-3.35		Dense brown brown to greyish brown slightly sandy GRAVEL. Sand is medium to coarse grained. Gravel of fine to coarse subangular to subrounded sandstone. (ALLUVIAL FAN DEPOSITS)
		11.00	SPT	N=32 (4,5/7,7,8,10)				
		11.20 - 12.00	B					

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
18.00	200	18.00	200							

Remarks:
Groundwater strike at 0.8m. Groundwater resting at 0.3m after 20minutes.

Borehole Log

Borehole No. **BH111** Sheet 2 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 10/05/2023-15/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276510.34 N188679.57
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 7.45m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		12.50	D		12.50	-5.05		Dense brown brown to greyish brown slightly sandy GRAVEL. Sand is medium to coarse grained. Gravel of fine to coarse subangular to subrounded sandstone. (ALLUVIAL FAN DEPOSITS)
		12.50	SPT	0 (50 for 45mm/0 for 0mm)				
		13.50 - 14.00	B					Very dense brown sandy GRAVEL with low cobble content. Sand is medium to coarse grained. Gravel of fine to coarse subangular to rounded sandstone. Cobbles of medium strong to strong grey sandstone. (ALLUVIAL FAN DEPOSITS)
		14.00	D					
		14.00	SPT	50 (25 for 85mm/50 for 15mm)				
		15.00 - 15.50	B					
		15.50	D					
		15.50	SPT	0 (50 for 30mm/0 for 0mm)				
		16.50 - 17.60	B					
		17.00	D					
		17.00	SPT	0 (50 for 75mm/0 for 0mm)				
		17.60 - 18.00	B					
		18.00	D		18.00	-10.55		End of Borehole at 18.00m
		18.00	SPT	0 (50 for 75mm/0 for 0mm)				

13 14 15 16 17 18 19 20 21 22 23

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
18.00	200	18.00	200							

Remarks:
Groundwater strike at 0.8m. Groundwater resting at 0.3m after 20minutes.

AGS

Borehole Log

Borehole No. **BH112**

Sheet 1 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 04/05/2023-09/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276499.21 N188719.98
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 7.15m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.00 - 1.00	B					MADE GROUND: Black to dark brown slightly sandy gravelly silty clay with occasional rootlets and roots up to 7mm. Gravel of clinker, coke, wood fragments, slag and porcelain fragments.
		0.20 - 0.60	ES					
		1.00	D					
		1.00 - 3.00	B					
		1.00	SPT	N=0 (1,0/0,0,0,0)	1.40	5.75		
		1.50 - 2.00	ES					MADE GROUND: Brownish grey gravelly sandy silt. Gravel of slag, brick and coke.
		2.00	D					
		2.00	SPT	N=1 (1,0/0,1,0,0)				
					2.80	4.35		Soft to locally firm brownish grey mottled brown and grey slightly sandy silty CLAY. Sand is fine to medium grained. (TIDAL FLAT DEPOSITS)
		3.00	D					
		3.00 - 4.00	B					
		3.00	SPT	N=7 (1,1/1,2,2,2)				
		4.00	D		4.00	3.15		Soft, very low strength brownish grey mottled brown and grey slightly sandy silty CLAY with occasional pockets of amorphous to fibrous peat. Sand is fine to medium grained. (TIDAL FLAT DEPOSITS)
		4.00 - 8.40	B					
		4.00	HV	19 kPa				
		5.00	D					
		5.00 - 5.45	U					
		6.00	D					
		6.00	SPT	N=6 (1,1/1,1,2,2)				
		7.00	D					
		7.00	HV	14 kPa				
		8.00	D					
		8.00 - 8.40	U					
		8.40 - 11.20	B					
		9.00	D					
		9.00	SPT	N=9 (1,2/2,2,2,3)				
		10.00	D					
		10.00	SPT	N=17 (1,3/3,5,4,5)				
		11.20	D		11.20	-4.05		Very dense brownish grey silty SAND with moderately strong organic odour. Sand is fine to medium grained. (ALLUVIAL FAN DEPOSITS)
		11.20 - 18.20	B					
		11.20	SPT	56 (25 for 110mm/56 for 225mm)				

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
22.00	200	22.00	200	13.20	13.60	01:00				

Remarks:

Groundwater strike at 1.3m and 11.5m. Groundwater resting at 0.3m after 20minutes. Yellowish brown sheen observed within standing groundwater. Borehole collapsed to 7.4m. Borehole installed to 7.4m to serve as additional monitoring location.

Borehole Log

Borehole No. **BH112** Sheet 2 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 04/05/2023-09/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276499.21 N188719.98
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 7.15m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		12.20	D		12.50	-5.35		Very dense brownish grey silty SAND with moderately strong organic odour. Sand is fine to medium grained. (ALLUVIAL FAN DEPOSITS)
		12.70	SPT	50 (6,9/50 for 150mm)				Dense to locally very dense brownish grey sandy GRAVEL with low cobble content. Sand is fine to coarse grained. Gravel of fine to coarse subangular to rounded sandstone. Cobbles of of medium strong to strong grey sandstone. (ALLUVIAL FAN DEPOSITS)
		13.20	D					
		14.20	D					
		14.20	SPT	N=48 (24 for 110mm/11,9,14,14)				
		15.20	D					
		15.70	SPT	50 (4,9/50 for 191mm)				
		16.20	D					
		17.20	D					
		17.20	SPT	40 (11,13/40 for 225mm)				
		18.20	B					
		18.20	SPT	N=19 (3,4/4,5,4,6)				
		19.20	D					
		19.40 - 19.80	B					
		19.40	SPT	N=30 (6,6/8,7,7,8)				
		20.40	SPT	N=36 (6,7/7,10,9,10)				
		21.80 - 22.00	B		22.00	-14.85		End of Borehole at 22.00m

13 14 15 16 17 18 19 20 21 22 23

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
22.00	200	22.00	200	13.20	13.60	01:00				

Remarks:
Groundwater strike at 1.3m and 11.5m. Groundwater resting at 0.3m after 20minutes. Yellowish brown sheen observed within standing groundwater. Borehole collapsed to 7.4m. Borehole installed to 7.4m to serve as additional monitoring location.

AGS

Borehole Log

Borehole No. **BH113**

Sheet 1 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 25/04/2023-27/04/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276520.09 N188607.42
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 8.08m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	▼	0.50 - 1.00	B					MADE GROUND: Dark brown to black slightly sandy gravelly silt with occasional rootlets. Gravel of concrete, metal fragments, clinker and coke.
		0.60 - 0.80	ES					
		1.00	D		1.00	7.08		
		1.00	SPT	N=9 (3,3/2,1,3,3)				MADE GROUND: Dark brown to greyish brown and brown slightly clayey slightly gravelly silty sand. Gravel of coke and clinker.
		1.50 - 2.00	B					
		1.60 - 1.80	ES					
		2.00	D					
		2.00	SPT	N=4 (3,1/0,0,1,3)				
		2.50 - 3.00	B		2.50	5.58		MADE GROUND: Greyish brown, brownish grey and blueish grey slightly sandy gravelly silty clay with occasional pockets of amorphous peat. Gravel of slag, sandstone, porcelain and terracotta fragments.
		3.00	D					
		3.00	SPT	N=4 (3,1/1,1,1,1)				
					3.40	4.68		Very loose to loose brownish grey slightly clayey silty sandy GRAVEL with low cobble content and rare pockets of pseudofibrous to amorphous peat. Sand is fine to coarse grained. Gravel of fine to coarse subangular to subrounded sandstone. Cobbles of medium strong to strong grey sandstone. (TIDAL FLAT DEPOSITS)
		3.70 - 4.00	B					
		4.00	D		4.00	4.08		
		4.00	SPT	N=2 (2,1/1,0,0,1)				
		4.50 - 5.00	B					
		5.00	D					
		5.00	SPT	N=2 (1,0/0,0,1,1)				Soft to locally firm, low strength brownish grey silty CLAY with frequent decayed rootlets. (TIDAL FLAT DEPOSITS)
		5.50 - 6.00	B		5.50	2.58		Brown spongy slightly sandy silty clayey pseudofibrous to amorphous PEAT with strong organic odour. Sand is fine grained. (TIDAL FLAT DEPOSITS)
		6.50	D					
		6.50	SPT	N=4 (1,1/1,1,1,1)				
		7.50 - 8.00	B					
		8.00	D					
		8.00	SPT	N=4 (1,1/1,1,1,1)				
		8.50 - 9.00	B					
		9.50 - 10.00	B					
		9.50 - 9.95	U					
		10.50 - 11.00	B					
		11.00	D					
		11.00	SPT	N=4 (1,1/1,1,1,1)				
		11.50 - 12.00	B		11.40	-3.32		Loose to medium dense grey to brownish grey slightly clayey very silty SAND with rare pseudofibrous peat. Sand is fine grained. (ALLUVIAL FAN DEPOSITS)

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
17.50	200	17.00	200	14.00	14.50	01:00				
				14.50	15.00	01:00				
				15.00	15.50	01:00				
				16.50	17.00	01:00				

Remarks:

Groundwater strike at 0 .5m. Groundwater resting at 0.5m after 20minutes. Borehole deepened with rotary drilling (see BH113 follow on).

Borehole Log

Borehole No. **BH113** Sheet 2 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 25/04/2023-27/04/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276520.09 N188607.42
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 8.08m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		12.50 12.50	D SPT	N=23 (1,1/3,6,7,7)				Loose to medium dense grey to brownish grey slightly clayey very silty SAND with rare pseudofibrous peat. Sand is fine grained. (ALLUVIAL FAN DEPOSITS)
		13.50 - 14.00	B		13.50	-5.42		
		14.00 14.00	D SPT	25 (45 for 85mm/25 for 5mm)				Very dense greyish brown sandy GRAVEL with low cobble content. Sand is fine to coarse grained. Gravel of fine to coarse subangular to rounded sandstone. (ALLUVIAL FAN DEPOSITS)
		15.00 - 15.50	B					
		15.50 15.50	D SPT	50 (10,18/50 for 15mm)				
		16.50 - 17.00	B					
		17.00 17.00	D SPT	0 (50 for 75mm/0 for 0mm)				
		17.50 17.50	D SPT	0 (50 for 75mm/0 for 0mm)	17.50	-9.42		End of Borehole at 17.50m

13 14 15 16 17 18 19 20 21 22 23

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
17.50	200	17.00	200	14.00	14.50	01:00				
				14.50	15.00	01:00				
				15.00	15.50	01:00				
				16.50	17.00	01:00				

Remarks:
Groundwater strike at 0 .5m. Groundwater resting at 0.5m after 20minutes. Borehole deepened with rotary drilling (see BH113 follow on).

Borehole Log

Borehole No. **BH114**

Sheet 1 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 27/04/2023-03/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276543.27 N188706.83
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 7.84m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.00 - 1.20	B					MADE GROUND: Brownish grey to dark grey slightly clayey gravelly silt with rare rootlets and roots up to 3mm. Gravel of slag, brick, wood and sandstone.
		0.80 - 1.40	ES					
		1.20	D		1.20	6.64		
		1.20	SPT	N=3 (1 for 75mm/3 for 225mm)				MADE GROUND: (Very soft) Black slightly sandy silty clay. Sand is fine grained.
		2.20	D					
		2.20 - 2.80	B					
		2.20	SPT	N=4 (1 for 75mm/1,1,1,1)	2.80	5.04		
		2.40 - 2.60	ES					MADE GROUND: Dark grey to black slightly silty slightly sandy gravel with low to medium cobble content. Gravel and cobbles of concrete, brick and slag.
		2.80 - 4.00	B					
		2.80	SPT	0 (25 for 0mm/0 for 0mm)	3.60	4.24		
		4.00 - 5.00	B		4.00	3.84		MADE GROUND: (Very soft) Brownish grey gravelly very silty clay. Gravel of siltstone and brick.
		4.00	SPT	N=4 (2,3/1,1,1,1)				Very soft, extremely low strength dark grey and brown mottled greyish brown silty CLAY with very weak organic odour. (TIDAL FLAT DEPOSITS)
		5.00	D					
		5.00 - 6.90	B					
		5.00	SPT	N=6 (7,4/2,1,2,1)				
		6.00 - 8.50	B					
		6.00	SPT	N=6 (1,1/1,1,2,2)				
		7.00	D					
		7.00 - 8.50	B					
		7.00	HV	8 kPa				
		8.00	D					
		8.00 - 8.40	U					
		8.50 - 9.50	B		8.50	-0.66		Very soft, extremely low strength plastic brown mottled greyish brown clayey amorphous to pseudofibrous PEAT with weak organic odour. (TIDAL FLAT DEPOSITS)
		8.50	SPT	N=9 (6,3/2,2,3,2)				
		9.50	D		9.50	-1.66		Soft, extremely low strength grey and greyish brown mottled sandy silty CLAY with rare cemented sandstone.(TIDAL FLAT DEPOSITS)
		9.50 - 10.00	B					Very dense brownish grey very gravelly SAND recovered as sandy gravel. Sand is fine to coarse grained. Gravel of fine to coarse subangular to subrounded sandstone. (ALLUVIAL FAN DEPOSITS)
		9.50 - 9.95	U					
		10.00 - 10.50	B					
		10.00	SPT	N=6 (1,1/1,1,1,3)				
		10.50	D		10.50	-2.66		Dense strong grey to dark grey cobbles of quartzitic sandstone with rare veins of quartz. (ALLUVIAL FAN DEPOSITS)
		10.50 - 11.00	B					
		10.50	SPT	50 (3,8/50 for 225mm)	11.00	-3.16		
		11.00	D					Very dense greyish brown sandy GRAVEL. Sand is fine to coarse grained. Gravel of fine to coarse subangular to rounded sandstone. (ALLUVIAL FAN DEPOSITS)
		11.10 - 11.50	B		11.50	-3.66		
		11.10	SPT	0 (25 for 20mm/0 for 0mm)				
		11.50 - 15.00	B					

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
22.20	200	22.20	200	2.80	3.20	01:00				
				3.20	3.60	01:30				
				11.00	11.40	01:00				
				15.00	15.50	01:00				
				15.50	16.00	01:00				

Remarks:

Groundwater strike at 1.5m and 11.2m. Groundwater resting at 0.8m after 20minutes.

Borehole Log

Borehole No. **BH114**

Sheet 2 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 27/04/2023-03/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276543.27 N188706.83
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 7.84m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		11.50	SPT	N=44 (21,4/16,10,9,9)				Very dense greyish brown sandy GRAVEL. Sand is fine to coarse grained. Gravel of fine to coarse subangular to rounded sandstone. (ALLUVIAL FAN DEPOSITS)
		12.00	D					
		13.00	D					
		13.00	SPT	50 (13,12/50 for 179mm)				
		14.00	D					
		14.50	SPT	50 (6,16/50 for 150mm)				
					15.00	-7.16		Dense to very dense greyish brown silty sandy GRAVEL with low cobble content. Sand is fine to coarse grained. Gravel of fine to coarse subangular to rounded sandstone. Cobbles of very strong orangish brown and grey sandstone. (ALLUVIAL FAN DEPOSITS)
		16.00	SPT	50 (25 for 120mm/50 for 225mm)				
		17.00	D					
		17.00	SPT	50 (7,11/50 for 200mm)				
		18.00 - 19.60	B					
		18.50	SPT	N=28 (4,1/3,3,7,15)				
		19.00	D					
		19.50 - 22.20	B		19.50	-11.66		Very dense greyish brown slightly silty sandy GRAVEL with low cobble content. Sand is fine to coarse grained. Gravel of fine to coarse subangular to subrounded sandstone. Cobbles of strong grey to greenish grey sandstone. (ALLUVIAL FAN DEPOSITS)
		19.50	SPT	N=32 (9,3/7,7,8,10)				
		20.00	D					
		20.50	SPT	N=50 (8,13/10,16,16,8)				
		22.00	D					
		22.00	SPT	50 (25 for 75mm/50 for 21mm)	22.20	-14.36		End of Borehole at 22.20m

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
22.20	200	22.20	200	2.80	3.20	01:00				
				3.20	3.60	01:30				
				11.00	11.40	01:00				
				15.00	15.50	01:00				
				15.50	16.00	01:00				

Remarks:

Groundwater strike at 1.5m and 11.2m. Groundwater resting at 0.8m after 20minutes.

Borehole Log

Borehole No. **BH115**

Sheet 1 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 25/04/2023-27/04/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276616.36 N188674.81
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 7.48m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.00 - 1.00	B					MADE GROUND: Dark grey slightly sandy gravelly silt with low cobble content. Gravel of tarmacadam, wood fragments, coke and brick. Cobbles of brick.
		1.00	D		1.00	6.48		MADE GROUND: Black very silty gravel. Gravel of siltstone and slag.
		1.00	D					
		1.00 - 2.00	B					
		1.00	SPT	N=9 (1,2/2,2,3,2)				
		2.00	D					
		2.00	D					
		2.00 - 5.00	B					
		2.00	SPT	N=5 (1,0/1,1,1,2)				
		2.20 - 2.50	ES					
		3.00	D					
		3.00	D					
		3.00	SPT	N=8 (1,1/1,2,2,3)				
		4.00	D					
		4.00	D					
		4.00	SPT	N=1 (1,0/0,0,1,0)				
		5.00	D		4.90	2.58		Soft, very low strength dark grey mottled grey slightly gravelly silty organic CLAY with occasional decayed rootlets. Gravel of fine to coarse subangular siltstone. (TIDAL FLAT DEPOSITS)
		5.00 - 6.00	B					
		5.00	HV	12 kPa				
		6.00	D		6.00	1.48		Very soft to soft, very low strength greyish brown mottled dark grey silty organic CLAY. (TIDAL FLAT DEPOSITS)
		6.00 - 6.40	U					
		6.40	D					
		7.00	D					
		7.00	SPT	N=3 (1,0/0,1,1,1)				
		7.00	PP	0.4 kg/cm2				
		7.00	HV	19 kPa				
		8.00	D					
		8.00	HV	8 kPa				
		9.00	D		9.00	-1.52		Loose greyish brown silty sandy GRAVEL. Sand is fine to coarse grained. Gravel of fine to coarse subangular to subrounded sandstone with low cobble content. (TIDAL FLAT DEPOSITS)
		9.00 - 10.20	B					
		9.00 - 9.40	U					
		9.60	D					
		10.00	D					
		10.20 - 11.20	B					
		10.50	D					Soft, spongy greyish brown to dark brown pseudofibrous to amorphous PEAT with weak organic odour. (TIDAL FLAT DEPOSITS)
		10.50	SPT	N=6 (1,1/1,1,2,2)	10.90	-3.42		Medium dense to dense brownish grey slightly silty sandy GRAVEL with low cobble content. Sand is fine to coarse grained. Gravel of fine to coarse subangular to subrounded sandstone. Cobbles of medium strong to strong grey sandstone. (ALLUVIAL FAN DEPOSITS)
		11.00 - 11.60	B					
		11.10	D					
		11.20	D					
		11.20 - 17.20	B		11.60	-4.12		
		11.20	SPT	N=12 (2,1/2,3,4,3)				
		11.60	D					

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
20.40	200	20.20	200	18.60	19.10	01:00				
				19.40	19.80	01:00				
				20.20	20.40	01:00				

Remarks:
Groundwater strike at 1.3m and 9.7m. Groundwater resting at 0.5m after 20minutes.

Borehole Log

Borehole No. **BH115**

Sheet 2 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 25/04/2023-27/04/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276616.36 N188674.81
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 7.48m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		11.60	SPT	N=21 (2,3/3,5,7,6)				Medium dense to dense brownish grey slightly silty sandy GRAVEL with low cobble content. Sand is fine to coarse grained. Gravel of fine to coarse subangular to subrounded sandstone. Cobbles of medium strong to strong grey sandstone. (ALLUVIAL FAN DEPOSITS)
		12.10	D					
		12.10 - 17.20	B					
		13.00	D					
		13.60 - 14.05	B					
		13.60	SPT	N=31 (7,6/8,6,8,9)				
		14.00	D					
		15.00	D					
		15.10	D					
		15.10	SPT	N=40 (6,8/14,9,8,9)				
		16.00	D					
		16.50	D					
		16.50	SPT	N=49 (10,11/49 for 225mm)				
		17.00	D					
		17.20	D		17.20	-9.72		
		17.20 - 18.20	B					Dense yellowish brown sandy GRAVEL with low cobble content. Sand is medium to coarse grained. Gravel of fine to coarse subangular to subrounded sandstone. (ALLUVIAL FAN DEPOSITS)
		17.20	SPT	N=38 (3,5/6,8,11,13)				
		18.00	D					
		18.20	D		18.20	-10.72		
		18.20 - 19.20	B					Dense brown slightly clayey silty sandy GRAVEL with low cobble content. Sand is fine to coarse grained. Gravel of fine to coarse subangular to rounded sandstone. (ALLUVIAL FAN DEPOSITS)
		18.20	SPT	N=42 (8,7/10,11,11,10)				
					19.20	-11.72		Firm to stiff, medium to high strength brown mottled greyish brown gravelly silty CLAY. Gravel of extremely weak fine to medium angular mudstone. (TIDAL FLAT DEPOSITS)
		20.20	D		20.20	-12.72		
		20.20	SPT	50 (10,15/50 for 106mm)	20.40	-12.92		Very dense greyish brown slightly silty sandy GRAVEL with low cobble content. Sand is fine to coarse grained. Gravel of fine to coarse subangular to rounded sandstone. Cobbles of strong grey to greenish grey sandstone. (ALLUVIAL FAN DEPOSITS)
		21.10	SPT	N=36 (3,6/7,10,9,10)				
								End of Borehole at 20.40m

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
20.40	200	20.20	200	18.60	19.10	01:00				
				19.40	19.80	01:00				
				20.20	20.40	01:00				

Remarks:
Groundwater strike at 1.3m and 9.7m. Groundwater resting at 0.5m after 20minutes.

Borehole Log

Borehole No. **BH116**

Sheet 1 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 13/04/2023-18/04/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276279.62 N188672.66
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 8.72m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.50	ES					MADE GROUND: Black to dark grey slightly clayey silty very gravelly sand with rare rootlets. Gravel of wood, slag and brick.
		0.50 - 1.00	B					
		1.00 - 1.45	D		1.00	7.72		
		1.00	SPT	N=10 (1,1/2,3,3,2)				MADE GROUND: Black silty gravel. Gravel of slag and coke.
		1.50 - 2.00	B					
		2.00 - 2.45	D					
		2.00	SPT	N=4 (1,1/1,1,1,1)				
		2.50 - 3.00	B					
		3.00	D					
		3.00	SPT	N=2 (0,1/0,1,0,1)				
		3.50 - 3.90	B					
		3.90 - 4.00	D		3.90	4.82		
		4.00 - 4.45	D					Soft greyish brown slightly sandy silty CLAY with occasional decayed rootlets. Sand is fine grained. (TIDAL FLAT DEPOSITS)
		4.00	SPT	N=5 (2,1/1,1,1,2)				
		4.50 - 5.00	B		4.50	4.22		
		4.80	PP	0.5 kg/cm2				Very soft to soft and locally firm, low strength greyish brown mottled greenish grey slightly sandy silty CLAY with rare pockets of amorphous peat and faint organic odour. Sand is fine to medium grained. (TIDAL FLAT DEPOSITS)
		4.80	HV	25 kPa				
		5.00 - 5.45	D					
		5.00	SPT	N=4 (1,1/1,1,1,1)				
		6.00 - 6.50	B					
		6.00	PP	0.6 kg/cm2				
		6.00	HV	34 kPa				
		6.50 - 6.95	U					
		7.50 - 8.00	B					
		8.00 - 8.95	D					
		8.00	SPT	N=8 (2,2/2,2,2,2)				
		9.10	D		9.10	-0.38		
		9.10 - 9.50	B					Soft to firm dark grey to blueish grey silty very sandy organic CLAY with occasional pockets of pseudofibrous peat, shell fragments, rare decayed rootlets and strong organic odour. Sand is fine to medium grained. (TIDAL FLAT DEPOSITS)
		9.50 - 9.95	D		9.50	-0.78		
		9.50	SPT	N=12 (1,2/3,3,3,3)				
		10.50 - 10.95	B					Soft dark grey slightly sandy silty CLAY with occasional fibrous to pseudofibrous and faint organic odour. Sand is fine to medium grained. (TIDAL FLAT DEPOSITS)
		11.00 - 11.45	D		10.90	-2.18		
		11.00	SPT	N=4 (1,1/1,1,1,1)				Very soft dark grey to greyish brown slightly sandy silty organic CLAY with amorphous peat and strong organic odour. Sand is fine grained. (TIDAL FLAT DEPOSITS)
		12.00 - 12.50	B					

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
19.50	200	19.50	200	15.50	16.00	01:00				
				17.00	17.50	01:00				
				17.50	18.00	01:00				
				19.50	19.70	01:00				
				19.70	19.90	01:00				

Remarks:

Groundwater strike at 1.0m. Groundwater resting at 0.5m after 20minutes. Borehole deepened with rotary drilling (see BH116 follow on).

Borehole Log

Borehole No. **BH116**

Sheet 2 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 13/04/2023-18/04/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276279.62 N188672.66
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 8.72m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		12.50 - 12.95	D		12.60	-3.88		Very soft dark grey to greyish brown slightly sandy silty organic CLAY with amorphous peat and strong organic odour. Sand is fine grained. (TIDAL FLAT DEPOSITS)
		12.50	SPT	N=30 (1,2/2,5,9,14)				Dense to very dense greyish brown slightly silty slightly clayey sandy GRAVEL with low cobble content. Sand is fine to coarse grained. Gravel of strong to very strong fine to coarse subangular to rounded sandstone. Cobbles of strong to very strong grey sandstone. (ALLUVIAL FAN DEPOSITS)
		13.50 - 14.00	B					
		15.00 - 15.50	B					
		15.50	SPT	25 (35 for 85mm/25 for 5mm)				
		16.50 - 17.00	B					
		17.00	SPT	25 (50 for 85mm/25 for 5mm)				
		18.50 - 19.00	B					
		19.00	SPT	N=29 (5,5/5,7,7,10)				
		19.60	SPT	0 (50 for 0mm/0 for 0mm)	19.50	-10.78		End of Borehole at 19.50m
		19.70	SPT	0 (50 for 0mm/0 for 0mm)				

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
19.50	200	19.50	200	15.50	16.00	01:00				
				17.00	17.50	01:00				
				17.50	18.00	01:00				
				19.50	19.70	01:00				
				19.70	19.90	01:00				

Remarks:

Groundwater strike at 1.0m. Groundwater resting at 0.5m after 20minutes. Borehole deepened with rotary drilling (see BH116 follow on).

Borehole Log

Borehole No. **BH117**

Sheet 1 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 13/04/2023-18/04/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276369.73 N188710.52
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 8.35m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.00 - 2.45	B					MADE GROUND: Dark brown slightly gravelly sandy silt with rare rootlets and roots upto 8mm. Gravel of wood, slag, coke and rebar.
		0.20 - 0.60	ES					
		1.00	SPT	N=20 (17,7/10,5,3,2)	0.90	7.45		MADE GROUND: Grey cobbles of concrete.
					1.10	7.25		MADE GROUND: (Soft) Dark brown mottled brown slightly gravelly slightly sandy clayey silt with low cobble content. Gravel and cobbles of slag.
		2.00	B					
		2.00	SPT	N=32 (11,9/7,7,8,10)				
		3.00 - 4.00	D					
		3.00	SPT	N=8 (2,4/2,2,3,1)				
					3.70	4.65		MADE GROUND: Dark grey slightly sandy gravel with low cobble content. Gravel of clinker, slag, coke and metal fragments. Cobbles of slag.
		4.00 - 4.10	B		4.00	4.35		
		4.00 - 4.45	D					
		4.00	SPT	N=9 (1,2/2,2,3,2)				
		5.00	D					Very soft to soft, medium becoming very low strength greenish grey mottled brown slightly sandy slightly peaty silty CLAY. Sand is fine to medium grained. (TIDAL FLAT DEPOSITS)
		6.00 - 6.40	U					
		6.40	D					
		6.40 - 6.60	D					
		7.00	D					
		7.00	SPT	N=5 (1,1/1,1,1,2)				
		8.00	D					
		8.00	HV	5 kPa				
		9.00 - 9.40	D					
		9.40 - 9.60	D					
		10.00 - 10.45	D		10.00	-1.65		Very soft to soft, low strength brown slightly sandy clayey plastic amorphous PEAT with moderately strong organic odour. Sand is fine to medium grained. (TIDAL FLAT DEPOSITS)
		10.00	SPT	N=11 (2,2/4,3,2,2)				
		11.50 - 11.90	U					
					12.00	-3.65		

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
22.00	200	22.20	200	2.10	2.40	01:00				
				18.50	19.00	01:00				
				19.80	20.30	01:00				
				22.00	22.30	01:00				
				22.30	22.30	01:00				

Remarks:

Groundwater strike at 1.2m and 12.1m. Groundwater resting at 0.3m after 20minutes. Borehole deepened with rotary drilling (see BH117 follow on).

Borehole Log

Borehole No. **BH117** Sheet 2 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 13/04/2023-18/04/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276369.73 N188710.52
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 8.35m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		12.10	D					Dense to very dense brownish grey to grey slightly silty gravelly SAND with low cobble content. Sand is fine to coarse grained. Gravel of fine to coarse subangular to rounded sandstone. Cobbles of medium strong to strong grey sandstone. (ALLUVIAL FAN DEPOSITS)
		12.10 - 15.00	B					
		12.10	SPT	N=39 (4,6/9,9,11,10)				
		13.50 - 14.00	D					
		13.60	SPT	N=36 (3,7/36 for 150mm)				
		14.50 - 14.95	D					
		14.50	SPT	50 (12,13/50 for 116mm)				
		15.00 - 19.00	B		15.00	-6.65		Very dense brown fine to coarse grained SAND.
		15.50	D					
		16.00	SPT	50 (16,9/50 for 177mm)				
		16.50	D					
		17.50	D					
		17.50	SPT	50 (25 for 106mm/50 for 225mm)				
		18.80	D					
		19.00			19.00	-10.65		Dense to very dense brown to greyish brown sandy GRAVEL. Sand is fine to coarse grained. Gravel of fine to medium subangular to subrounded sandstone and rare quartz. (ALLUVIAL FAN DEPOSITS)
		19.00 - 19.50	B					
		19.00	SPT	N=32 (6,8/7,8,8,9)				
		19.50	SPT	50 (25 for 117mm/50 for 106mm)				
		19.80	D					
		20.50	D					
		21.00	SPT	50 (25 for 75mm/50 for 75mm)				
		21.50	D					
		22.00	SPT	50 (25 for 75mm/50 for 30mm)	22.20	-13.85		End of Borehole at 22.20m

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
22.00	200	22.20	200	2.10	2.40	01:00				
				18.50	19.00	01:00				
				19.80	20.30	01:00				
				22.00	22.30	01:00				
				22.30	22.30	01:00				

Remarks:
Groundwater strike at 1.2m and 12.1m. Groundwater resting at 0.3m after 20minutes. Borehole deepened with rotary drilling (see BH117 follow on).

Borehole Log

Borehole No. **BH118**

Sheet 1 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 04/04/2023-12/04/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276559.81 N188686.20
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 8.38m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.00 - 1.00	D					MADE GROUND: Brownish grey slightly gravelly sandy silt. Gravel of wood fragements, plastic, metal wire, brick, concrete and rubber.
		0.30 - 0.60	ES					
	▼	1.00	D		1.00	7.38		MADE GROUND: Dark grey slighlty gravelly silty sand. Gravel of clinker, metal fragments, wood and brick.
	▼	1.00 - 3.00	B		1.30	7.08		MADE GROUND: Brownish grey slightly gravelly silty sand. Gravel of sandstone and rare brick.
	▽	1.00	SPT	N=34 (1,4/8,8,9,9)				
		1.10 - 1.50	ES					
		2.00	D					
		2.00	SPT	N=1 (1,0/0,0,0,1)				
		3.00	D		3.00	5.38		Soft to firm, grey silty CLAY. (TIDAL FLAT DEPOSITS)
		3.00	SPT	N=12 (1,1/2,3,3,4)				
		4.00	D					
		4.00	SPT	N=7 (1,1/1,2,2,2)				
		4.30 - 5.00	B					
		5.00	D		4.70	3.68		Soft to firm, low to very low strength grey mottled black silty CLAY with occasional pockets of amorphous peat. (TIDAL FLAT DEPOSITS)
		5.00	SPT	N=4 (1,1/1,1,1,1)				
		7.00	U					
		7.40	D					
		8.00	D					
		8.00	SPT	N=7 (2,2/1,2,2,2)				
		9.00	D					
		9.00	HV	2 kPa				
		10.00	D					
		10.00 - 10.45	U					
		10.50	D		10.50	-2.12		Very soft, very low strength brown mottled dark brown slightly clayey plastic amorphous PEAT with moderately strong organic odour. (TIDAL FLAT DEPOSITS)
		10.50	SPT	N=8 (1,0/1,1,2,4)				
		11.50	D		11.50	-3.12		Very soft grey mottled brownish grey silty organic CLAY. (TIDAL FLAT DEPOSITS)
		11.50	SPT	N=1 (1,0/0,0,1,0)				
		12.00	HV	3 kPa				

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
20.50	200	20.00	200	1.00	3.00	01:00				
				17.50	18.00	01:00				
				19.60	20.00	01:00				
				20.00	20.50	01:30				

Remarks:
Groundwater strike at 1.5m and 20.5m. Groundwater resting at 0.9m after 20minutes.

Borehole Log

Borehole No. **BH118**

Sheet 2 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 04/04/2023-12/04/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276559.81 N188686.20
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 8.38m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		13.50	SPT	N=3 (1,0/1,0,1,1)				Very soft grey mottled brownish grey silty organic CLAY. (TIDAL FLAT DEPOSITS)
					14.20	-5.82		
		14.50	D					Dense to very dense brown to greyish brown sandy GRAVEL. Sand is fine to coarse grained. Gravel of fine to medium subangular to subrounded sandstone and rare quartz. (ALLUVIAL FAN DEPOSITS)
		14.50	SPT	N=31 (3,6/8,8,7,8)				
		16.50	D					
		17.00 - 18.50	B					
		17.00	SPT	50 (25 for 114mm/50 for 116mm)				
		17.50	D					
		18.50	D					
		18.50	SPT	50 (25 for 106mm/50 for 150mm)				
		18.60 - 20.00	B					
					20.50	-12.12		End of Borehole at 20.50m

13 14 15 16 17 18 19 20 21 22 23

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
20.50	200	20.00	200	1.00	3.00	01:00				
				17.50	18.00	01:00				
				19.60	20.00	01:00				
				20.00	20.50	01:30				

Remarks:
Groundwater strike at 1.5m and 20.5m. Groundwater resting at 0.9m after 20minutes.

Borehole Log

Borehole No. **BH119**

Sheet 1 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 19/04/2023-24/04/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276559.81 N188686.20
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 8.25m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.00 - 1.00	B					MADE GROUND: Dark grey and grey sandy gravelly silt. Gravel of slag, wood and rubber.
		0.10 - 1.00	ES					
		1.00	D		1.00	7.25		MADE GROUND: Dark brown grey slightly gravelly slightly sandy slightly clayey silt. Gravel of slag.
		1.00	SPT	N=16 (1,4/3,2,2,9)				
		2.00	D		2.00	6.25		MADE GROUND: Dark brown and black mottled slightly gravelly sandy silt with rare rootlets. Gravel of slag.
		2.00 - 4.00	B					
		2.00	SPT	N=3 (1,0/0,1,1,1)				
		3.00	D					
		3.00	SPT	N=4 (1,1/1,1,1,1)				
		4.00	D					
		4.00 - 6.00	B					
		4.00	SPT	N=16 (1,2/2,3,5,6)				
		5.00	D					
		5.00 - 5.20	ES					
		5.00	SPT	N=19 (2,3/3,6,5,5)				
		6.00	D		6.00	2.25		MADE GROUND: Black and dark grey slightly gravelly clayey sand with occasional fine rootlets and moderately strong organic odour. Gravel of slag.
		6.00 - 9.00	B					
		6.00	HV	13 kPa				
		7.00	D		6.90	1.35		Soft, very low strength brownish grey mottled black slightly sandy peaty silty CLAY with occasional pockets of amorphous to fibrous peat. Sand is fine to medium grained. (TIDAL FLAT DEPOSITS)
		7.00 - 7.40	U					
		7.40	D					
		8.00	D					
		8.00	SPT	N=9 (1,2/2,2,2,3)				
		9.00 - 11.50	B		9.00	-0.75		Stiff, medium grained greyish brown slightly sandy silty CLAY with frequent pockets of brown fibrous peat. Sand is fine to medium grained. (TIDAL FLAT DEPOSITS)
		9.00	HV	4 kPa				
		10.00	D					
		10.00 - 10.45	U					
		11.00	D		11.00	-2.75		Soft greyish brown slightly sandy silty CLAY. Sand is fine to medium grained. (TIDAL FLAT DEPOSITS)
		11.00 - 12.80	B					
		11.50	SPT	N=19 (2,3/5,4,5,5)				
		12.00	D					

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
20.00	200	20.00	200	12.90	13.30	01:00				
				14.10	14.60	01:30				
				14.60	14.90	01:00				
				16.00	16.50	01:30				
				19.00	19.50	01:30				

Remarks:

Groundwater strike at 1.3m and 12.5m. Groundwater resting at 0.5m after 20minutes. Borehole deepened with rotary drilling (see BH119 follow on).

Borehole Log

Borehole No. **BH119**

Sheet 2 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 19/04/2023-24/04/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276559.81 N188686.20
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 8.25m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		12.10 - 20.00	B		12.10	-3.85		Soft greyish brown slightly sandy silty CLAY. Sand is fine to medium grained. (TIDAL FLAT DEPOSITS)
		12.10	SPT	50 (8,12/50 for 181mm)				Very dense greyish brown silty sandy GRAVEL. Sand is fine to coarse grained. Gravel of fine to coarse subangular to rounded sandstone. Cobbles of medium strong to strong grey sandstone. (ALLUVIAL FAN DEPOSITS)
		13.00	D					
		13.50	SPT	50 (4,6/50 for 116mm)				
		14.00	D					
		15.00	SPT	38 (14,5/38 for 225mm)				
		16.00	SPT	50 (25 for 75mm/50 for 165mm)				
		17.50	SPT	50 (25 for 123mm/50 for 195mm)				
		19.50	SPT	50 (25 for 100mm/50 for 114mm)				
					20.00	-11.75		End of Borehole at 20.00m

13 14 15 16 17 18 19 20 21 22 23

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
20.00	200	20.00	200	12.90	13.30	01:00				
				14.10	14.60	01:30				
				14.60	14.90	01:00				
				16.00	16.50	01:30				
				19.00	19.50	01:30				

Remarks:

Groundwater strike at 1.3m and 12.5m. Groundwater resting at 0.5m after 20minutes. Borehole deepened with rotary drilling (see BH119 follow on).

Borehole Log

Borehole No. **BH120**

Sheet 1 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 27/04/2023-03/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276554.17 N188602.94
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 8.38m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.50 - 1.00	B					MADE GROUND: Dark brown slightly sandy slightly gravelly silt with rare rootlets and roots up to 2mm to 5mm. Gravel of slag, wood and brick.
		0.60 - 0.80	ES					
		1.00	D		1.00	7.38		MADE GROUND: Brown slightly gravelly very silty sand.
		1.00	SPT	N=7 (0,0/1,1,2,3)				
	▼	1.50 - 2.00	B					
		2.00	D		2.00	6.38		MADE GROUND: Very soft, very low strength dark grey and grey mottled slightly gravelly sandy silty organic CLAY with occasional thin pockets of sand. Sand is fine to medium grained. Gravel of fine to medium subangular sandstone.
		2.00	SPT	N=3 (0,1/0,1,1,1)				
		2.40 - 2.90	ES					
		2.50 - 3.00	B					
		2.80	PP	0.4 kg/cm2				
	▽	2.80	HV	14 kPa	3.00	5.38		
		3.00	D					MADE GROUND: Very soft dark grey mottled brown slightly gravelly sandy silty organic CLAY with low cobble content. Gravel and cobbles of strong to very strong subangular to subrounded dark grey to greenish grey igneous lithology of gabronorite with anorthite and pyroxene inclusions and rare thin streamers and well rounded nodules of mineralised copper.
		3.00	SPT	N=4 (1,1/1,1,1,1)				
		3.50 - 4.00	B					
		4.00	D					
		4.00	SPT	N=4 (1,1/1,1,1,1)				
		4.50 - 5.00	B					
		5.00	D		5.00	3.38		Very soft greyish brown mottled brown slightly gravelly sandy silty CLAY with rare pockets of amorphous peat. Sand is fine to medium grained. Gravel of fine to coarse subangular sandstone. (TIDAL FLAT DEPOSITS)
		5.00	SPT	N=6 (1,1/1,1,2,2)				
		5.50 - 6.00	B					
					6.00	2.38		Very soft, very low strength dark grey and greyish brown mottled silty organic CLAY. (TIDAL FLAT DEPOSITS)
		6.50	D					
		6.50	SPT	N=4 (1,1/1,1,1,1)				
		7.50 - 8.00	B					
		7.80	PP	0.4 kg/cm2				
		7.80	HV	15 kPa	8.00	0.38		Very soft greyish brown mottled brown very silty organic CLAY. (TIDAL FLAT DEPOSITS)
		8.00	D					
		8.00	SPT	N=4 (1,1/1,1,1,1)				
		9.00 - 9.50	B					
		9.50	D		9.50	-1.12		Very soft, greyish brown mottled brownish grey silty CLAY with rare decayed rootlets. (TIDAL FLAT DEPOSITS)
		9.50 - 10.00	B					
		9.50	SPT	N=4 (1,1/1,1,1,1)	10.00	-1.62		Very soft, plastic to spongy greyish brown and brown clayey amorphous to pseudofibrous slightly gravelly silty clayey PEAT with faint organic odour. gravel of fine to coarse subrounded to rounded sandstone. (TIDAL FLAT DEPOSITS)
		10.50 - 11.00	B					
		11.00	D					
		11.00	SPT	N=11 (2,2/2,3,3,3)				
		12.00 - 12.50	B					

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
21.50	200	21.50	200	15.50	16.00	01:00				
				16.00	16.50	01:00				
				16.50	17.00	01:00				
				17.00	17.50	01:00				

Remarks:
Groundwater strike at 3.0m. Groundwater resting at 1.5m after 20minutes.

Borehole Log

Borehole No. **BH120** Sheet 2 of 2

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 27/04/2023-03/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276554.17 N188602.94
Project No. 2111006.005	Drilling Equipment: Dando 2000	Level: 8.38m AOD
Hole Type: CP	Logged By: RK	Scale: 1:60

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		12.50	D		12.50	-4.12		Very soft, plastic to spongy greyish brown and brown clayey amorphous to pseudofibrous slightly gravelly silty clayey PEAT with faint organic odour. gravel of fine to coarse subrounded to rounded sandstone. (TIDAL FLAT DEPOSITS)
		12.50	SPT	50 (9,16/50 for 92mm)				
		13.20 - 14.00	B					Very dense brownish grey slightly clayey slightly silty sandy GRAVEL with low cobble content. Sand is fine to coarse grained. Gravel of fine to coarse subangular to rounded sandstone. Cobbles of very strong grey sandstone. (ALLUVIAL FAN DEPOSITS)
		14.00	D					
		14.00	SPT	N=50 (4 for 88mm/50 for 240mm)				
		15.00 - 15.50	B					
		15.00	SPT	0 (50 for 75mm/0 for 0mm)				
		15.50	D					
		16.50 - 17.00	B					
		17.00	D		17.00	-8.62		Very dense greenish brown very sandy GRAVEL with low cobble content. Sand is fine to coarse grained. Gravel of fine to coarse subangular to rounded sandstone. Cobbles of strong grey sandstone. (ALLUVIAL FAN DEPOSITS)
		17.00	SPT	50 (10,10/50 for 15mm)				
		17.50 - 18.00	B					
		18.50	SPT	50 (8,7/50 for 20mm)				
		20.00	SPT	50 (25 for 80mm/50 for 20mm)				
					21.50	-13.12		End of Borehole at 21.50m

Hole Diameter		Casing Diameter		Chiselling			Inclination & Orientation			
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Depth Top (m)	Depth Base (m)	Inclination	Orientation
21.50	200	21.50	200	15.50	16.00	01:00				
				16.00	16.50	01:00				
				16.50	17.00	01:00				
				17.00	17.50	01:00				

Remarks:
Groundwater strike at 3.0m. Groundwater resting at 1.5m after 20minutes.

Borehole Log

Borehole No. **BH104 follow on**
Sheet 1 of 3

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 27/04/2023-02/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276327.41 N188593.70
Project No. 2111006.005	Drilling Equipment: Klem KR802	Level: 8.73m AOD
Hole Type: RC	Logged By: RK	Scale: 1:105

Well	Water Strikes	Depth (m)	Type	Results	Coring TCR	Coring SCR	Coring RQD	Coring If (mm)	Depth (m)	Level (m)	Legend	Stratum Description
									0.35	8.38		See log BH104
									2.40	6.33		
									4.00	4.73		
									6.50	2.23		
									6.80	1.93		
									12.00	-3.27		
									16.50	-7.77		Dense to very dense greyish brown sandy GRAVEL with low cobble content. Sand is medium to coarse grained. Gravel of fine to coarse subangular to rounded sandstone. Cobbles of medium strong to strong brownish grey sandstone. (ALLUVIAL FAN DEPOSITS) (Logged through cable percussive drilling - see BH104)
									20.00	-11.27		Clayey GRAVEL. (ALLUVIAL FAN DEPOSITS) (Drillers logs)

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
25.00	200																
62.00	100																

Remarks:
Rotary follow on over cable percussive hole BH103. See BH103.

Borehole Log

Borehole No. **BH104 follow on**
Sheet 2 of 3

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 27/04/2023-02/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276327.41 N188593.70
Project No. 2111006.005	Drilling Equipment: Klem KR802	Level: 8.73m AOD
Hole Type: RC	Logged By: RK	Scale: 1:105

Well	Water Strikes	Depth (m)	Type	Results	Coring TCR	Coring SCR	Coring RQD	Coring If (mm)	Depth (m)	Level (m)	Legend	Stratum Description
												Clayey GRAVEL. (ALLUVIAL FAN DEPOSITS) (Drillers logs)
									25.00	-16.27		MUDSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION)(Drillers logs)
		32.65 - 32.79	C						32.00	-23.27		Weak dark grey highly fractured MUDSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION)
		33.06 - 33.19	C		100	81	26					
		32.50 - 34.00							34.00	-25.27		Weak to medium strong grey to dark grey to grey very thinly bedded to thinly bedded SILTSTONE with occasional very thinly bedded mudstone and occasional sub vertical fractures and occasional silt infill (2/4/20), dipping 14 to 19 degrees. (SOUTH WALES MIDDLE COAL MEASURES FORMATION)
		34.70 - 34.80	C		53	34	7					
		34.00 - 35.50			100	85	78					
		36.70 - 36.90	C						37.00	-28.27		MUDSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (Drillers logs)
		35.50 - 37.00										

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
25.00	200																
62.00	100																

Remarks:
Rotary follow on over cable percussive hole BH103. See BH103.

Borehole Log

Borehole No. **BH104 follow on**
Sheet 3 of 3

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 27/04/2023-02/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276327.41 N188593.70
Project No. 2111006.005	Drilling Equipment: Klem KR802	Level: 8.73m AOD
Hole Type: RC	Logged By: RK	Scale: 1:105

Well	Water Strikes	Depth (m)	Type	Results	Coring TCR	Coring SCR	Coring RQD	Coring If (mm)	Depth (m)	Level (m)	Legend	Stratum Description
									43.00	-34.27		MUDSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (Drillers logs)
												SANDSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (Drillers logs)
									47.00	-38.27		MUDSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (Drillers logs)
									54.20	-45.47		Dark grey MUDSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (Drillers logs)
									55.00	-46.27		Interbedded MUDSTONE and SANDSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (Drillers logs)
									62.00	-53.27		End of Borehole at 62.00m

43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
25.00	200																
62.00	100																

Remarks:
Rotary follow on over cable percussive hole BH103. See BH103.

AGS

Borehole Log

Borehole No. **BH113 follow on**
Sheet 1 of 3

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 15/05/2023-16/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276520.09 N188607.42
Project No. 2111006.005	Drilling Equipment: Klem KR802	Level: 8.08m AOD
Hole Type: RC	Logged By: RK	Scale: 1:105

Well	Water Strikes	Depth (m)	Type	Results	Coring TCR	Coring SCR	Coring RQD	Coring If (mm)	Depth (m)	Level (m)	Legend	Stratum Description
												See log BH113
									3.40	4.68		
									4.00	4.08		
									5.50	2.58		
									11.40	-3.32		
									13.50	-5.42		Very dense greyish brown sandy GRAVEL with low cobble content. Sand is fine to coarse grained. Gravel of fine to coarse subangular to rounded sandstone. (ALLUVIAL FAN DEPOSITS) (Logged through cable percussive drilling - see BH113)
									17.50	-9.42		Clayey GRAVEL. (ALLUVIAL FAN DEPOSITS) (Drillers logs)

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
17.50	200																
60.00	100																

Remarks:
Rotary follow on over cable percussive hole BH113. See BH113.

Borehole Log

Borehole No. **BH113 follow on**
Sheet 2 of 3

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 15/05/2023-16/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276520.09 N188607.42
Project No. 2111006.005	Drilling Equipment: Klem KR802	Level: 8.08m AOD
Hole Type: RC	Logged By: RK	Scale: 1:105

Well	Water Strikes	Depth (m)	Type	Results	Coring TCR	Coring SCR	Coring RQD	Coring If (mm)	Depth (m)	Level (m)	Legend	Stratum Description
												Clayey GRAVEL. (ALLUVIAL FAN DEPOSITS) (Drillers logs)
									25.70	-17.62		MUDSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (Drillers logs)
									27.00	-18.92		Interbedded MUDSTONE and SILTSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (Drillers logs)
									30.00	-21.92		Medium strong grey SANDSTONE with occasional horizontal laminae of siltstone and thin veins of quartz. (SOUTH WALES MIDDLE COAL MEASURES FORMATION)
		31.00 - 31.20	C		93	71	45					
		30.00 - 31.50			100	43	25		31.90	-23.82		Weak dark grey SILTSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION)
									31.90	-23.82		Weak black COAL. (SOUTH WALES MIDDLE COAL MEASURES FORMATION)
		31.50 - 33.00							32.15	-24.07		
		34.00 - 34.20	C		67	43	8		32.20	-24.12		
									32.30	-24.22		Weak black COAL. (SOUTH WALES MIDDLE COAL MEASURES FORMATION)
		33.00 - 34.50			100	63	10		33.60	-25.52		Weak to medium strong grey to dark grey interbedded SANDSTONE and SILTSTONE with rare fractures and infill of silty clay. (SOUTH WALES MIDDLE COAL MEASURES FORMATION)
		34.50 - 36.00			100	86	8					Weak dark grey SILTSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION)
		36.00 - 37.50	C		75	19	13		38.30	-30.22		Medium strong grey to dark grey thinly laminated SANDSTONE and SILTSTONE with rare vertical veins of quartz. (SOUTH WALES MIDDLE COAL MEASURES FORMATION)
		38.00 - 38.20										
		37.50 - 39.00			53	17	0					Very weak to weak and locally medium strong grey to dark grey thickly laminated to medium bedded interbedded SILTSTONE and MUDSTONE dipping 40 to 48 degrees. (SOUTH WALES MIDDLE COAL MEASURES FORMATION)
		40.00 - 40.15	C									
		39.00 - 40.50			63	13	12					
		41.50 - 41.70	C						42.00	-33.92		

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
17.50	200																
60.00	100																

Remarks:
Rotary follow on over cable percussive hole BH113. See BH113.

Borehole Log

Borehole No. **BH113 follow on**
Sheet 3 of 3

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 15/05/2023-16/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276520.09 N188607.42
Project No. 2111006.005	Drilling Equipment: Klem KR802	Level: 8.08m AOD
Hole Type: RC	Logged By: RK	Scale: 1:105

Well	Water Strikes	Depth (m)	Type	Results	Coring TCR	Coring SCR	Coring RQD	Coring If (mm)	Depth (m)	Level (m)	Legend	Stratum Description
		40.50 - 42.00										MUDSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (Drillers logs)
									44.90	-36.82		Interbedded MUDSTONE and SANDSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (Drillers logs)
									51.00	-42.92		SANDSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (Drillers logs)
									60.00	-51.92		End of Borehole at 60.00m

43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
17.50	200																
60.00	100																

Remarks:
Rotary follow on over cable percussive hole BH113. See BH113.

AGS

Borehole Log

Borehole No. **BH116 follow on**
Sheet 1 of 3

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 03/05/2023-05/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276279.62 N188672.66
Project No. 2111006.005	Drilling Equipment: Klem KR802	Level: 8.72m AOD
Hole Type: RC	Logged By: RK	Scale: 1:105

Well	Water Strikes	Depth (m)	Type	Results	Coring TCR	Coring SCR	Coring RQD	Coring If (mm)	Depth (m)	Level (m)	Legend	Stratum Description
												See log BH116
									3.90	4.82		
									9.10	-0.38		
									9.50	-0.78		
									10.90	-2.18		
									12.60	-3.88		Dense to very dense greyish brown slightly silty slightly clayey sandy GRAVEL with low cobble content. Sand is fine to coarse grained. Gravel of strong to very strong fine to coarse subangular to rounded sandstone. Cobbles of strong to very strong grey sandstone. (ALLUVIAL FAN DEPOSITS)(Logged through cable percussive drilling - see BH116)
									19.50	-10.78		Clayey GRAVEL. (ALLUVIAL FAN DEPOSITS) (Drillers logs)

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
19.50	200																
60.00	100																

Remarks:
Rotary follow on over cable percussive hole BH116. See BH116.

Borehole Log

Borehole No. **BH116 follow on**
Sheet 2 of 3

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 03/05/2023-05/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276279.62 N188672.66
Project No. 2111006.005	Drilling Equipment: Klem KR802	Level: 8.72m AOD
Hole Type: RC	Logged By: RK	Scale: 1:105

Well	Water Strikes	Depth (m)	Type	Results	Coring TCR	Coring SCR	Coring RQD	Coring If (mm)	Depth (m)	Level (m)	Legend	Stratum Description
												Clayey GRAVEL. (ALLUVIAL FAN DEPOSITS) (Drillers logs)
									29.00	-20.28		Stiff grey clayey fracured MUDSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (Drillers logs)
					90	14	0		30.00	-21.28		
		30.00 - 30.50							30.50	-21.78		Weak dark grey highly fractured MUDSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (poor recovery)
												Weak dark grey highly fractured MUDSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (Drillers logs)
									35.00	-26.28		Extremely weak to weak brownish grey to dark grey MUDSTONE extremely closely to very closely spaced with occasional fractures and occasional silt infill (0/4/30). (SOUTH WALES MIDDLE COAL MEASURES FORMATION)
					20	5	0					
		35.00 - 36.50			25	0	0					
		36.50 - 37.50							37.50	-28.78		Soft MUDSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (Drillers logs)
												Weak to medium strong very closely to closely spaced dark grey MUDSTONE with rare vertical veins quartz, with rare fractures and occasional silt infill (0/0/2), dipping 2 to 5 degrees. (SOUTH WALES MIDDLE COAL MEASURES FORMATION)
									40.00	-31.28		
					20	0	0					
		40.00 - 41.50										

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
19.50	200																
60.00	100																

Remarks:
Rotary follow on over cable percussive hole BH116. See BH116.

Borehole Log

Borehole No. **BH116 follow on**
Sheet 3 of 3

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 03/05/2023-05/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276279.62 N188672.66
Project No. 2111006.005	Drilling Equipment: Klem KR802	Level: 8.72m AOD
Hole Type: RC	Logged By: RK	Scale: 1:105

Well	Water Strikes	Depth (m)	Type	Results	Coring TCR	Coring SCR	Coring RQD	Coring If (mm)	Depth (m)	Level (m)	Legend	Stratum Description
		42.40 - 43.00	C		27	13	0					Weak to medium strong very closely to closely spaced dark grey MUDSTONE with rare vertical veins quartz, with rare fractures and occasional silt infill (0/0/2), dipping 2 to 5 degrees. (SOUTH WALES MIDDLE COAL MEASURES FORMATION)
		41.50 - 43.00										
		44.00 - 44.15	C		67	57	9		44.50	-35.78		
		44.70 - 44.90	C									SILTSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (Drillers logs)
		43.50 - 45.00										
									53.20	-44.48		Dark grey MUDSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (Drillers logs)
									53.90	-45.18		Interbedded SANDSTONE and SILTSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION)
									60.00	-51.28		End of Borehole at 60.00m

43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
19.50	200																
60.00	100																

Remarks:
Rotary follow on over cable percussive hole BH116. See BH116.

Borehole Log

Borehole No. **BH117 follow on**
Sheet 1 of 3

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 09/05/2023-10/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276397.70 N188602.45
Project No. 2111006.005	Drilling Equipment: Klem KR802	Level: 8.35m AOD
Hole Type: RC	Logged By: RK	Scale: 1:105

Well	Water Strikes	Depth (m)	Type	Results	Coring TCR	Coring SCR	Coring RQD	Coring If (mm)	Depth (m)	Level (m)	Legend	Stratum Description
												See log BH117
									4.00	4.35		
									10.00	-1.65		
									12.00	-3.65		
									15.00	-6.65		
									19.00	-10.65		Dense to very dense brown to greyish brown sandy GRAVEL. Sand is fine to coarse grained. Gravel of fine to medium subangular to subrounded sandstone and rare quartz. (ALLUVIAL FAN DEPOSITS) (Logged through cable percussive drilling - see BH117)

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
22.00	200																
55.00	100																

Remarks:
Rotary follow on over cable percussive hole BH117. See BH117.

Borehole Log

Borehole No. **BH117 follow on**
Sheet 2 of 3

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 09/05/2023-10/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276397.70 N188602.45
Project No. 2111006.005	Drilling Equipment: Klem KR802	Level: 8.35m AOD
Hole Type: RC	Logged By: RK	Scale: 1:105

Well	Water Strikes	Depth (m)	Type	Results	Coring TCR	Coring SCR	Coring RQD	Coring If (mm)	Depth (m)	Level (m)	Legend	Stratum Description
									22.20	-13.85		Dense to very dense brown to greyish brown sandy GRAVEL. Sand is fine to coarse grained. Gravel of fine to medium subangular to subrounded sandstone and rare quartz. (ALLUVIAL FAN DEPOSITS) (Logged through cable percussive drilling - see BH117)
									24.20	-15.85		Clayey GRAVEL. (ALLUVIAL FAN DEPOSITS) (Drillers logs)
												MUDSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (Drillers logs)
		27.30 - 27.56	C		100	58	44		27.00	-18.65		Strong to very strong and locally weak to medium strong grey thinly bedded to medium bedded SANDSTONE with very thinly laminated bands of siltstone with rare clean voids (1/1/4) and rare veins of quartzite. (SOUTH WALES MIDDLE COAL MEASURES FORMATION)
		27.60 - 27.85	C									
		27.00 - 28.50			27	57	0					
		28.50 - 30.00										
					62	55	18					
		36.00 - 37.50	C									
		37.50 - 37.80	C		100	51	73					
		38.30 - 38.70	C						39.00	-30.65		Weak dark grey MUDSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION)
		37.50 - 39.00	C		82	58	51		39.40	-31.05		Strong to very strong and locally medium strong grey very thinly bedded to thickly bedded SANDSTONE with very thinly laminated bands of siltstone with rare clean voids (1/1/5), dipping 23 to 30 degrees. (SOUTH WALES MIDDLE COAL MEASURES FORMATION)
		39.40 - 39.60	C									
		40.20 - 40.35			33	17	8					
		39.00 - 40.50							42.00	-33.65		

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
22.00	200																
55.00	100																

Remarks:
Rotary follow on over cable percussive hole BH117. See BH117.

Borehole Log

Borehole No. **BH117 follow on**
Sheet 3 of 3

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 09/05/2023-10/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276397.70 N188602.45
Project No. 2111006.005	Drilling Equipment: Klem KR802	Level: 8.35m AOD
Hole Type: RC	Logged By: RK	Scale: 1:105

Well	Water Strikes	Depth (m)	Type	Results	Coring TCR	Coring SCR	Coring RQD	Coring If (mm)	Depth (m)	Level (m)	Legend	Stratum Description
		40.50 - 42.00										MUDSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (Drillers logs)
									49.50	-41.15		Interbedded SANDSTONE and SILTSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (Drillers logs)
									55.00	-46.65		End of Borehole at 55.00m

43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
22.00	200																
55.00	100																

Remarks:
Rotary follow on over cable percussive hole BH117. See BH117.

Borehole Log

Borehole No. **BH119 follow on**
Sheet 1 of 3

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 11/05/2023-15/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276559.81 N188686.20
Project No. 2111006.005	Drilling Equipment: Klem KR802	Level: 8.25m AOD
Hole Type: RC	Logged By: RK	Scale: 1:106

Well	Water Strikes	Depth (m)	Type	Results	Coring TCR	Coring SCR	Coring RQD	Coring If (mm)	Depth (m)	Level (m)	Legend	Stratum Description
												See log BH119
									6.90	1.35		
									9.00	-0.75		
									12.10	-3.85		Very dense greyish brown silty sandy GRAVEL. Sand is fine to coarse grained. Gravel of fine to coarse subangular to rounded sandstone. Cobbles of medium strong to strong grey sandstone. (ALLUVIAL FAN DEPOSITS) (Logged through cable percussive drilling - see BH119)
									20.00	-11.75		Clayey GRAVEL. (ALLUVIAL FAN DEPOSITS) (Drillers logs)

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
20.00	200																
54.00	100																

Remarks:
Rotary follow on over cable percussive hole BH119. See BH119.

AGS

Borehole Log

Borehole No. **BH119 follow on**
Sheet 2 of 3

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 11/05/2023-15/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276559.81 N188686.20
Project No. 2111006.005	Drilling Equipment: Klem KR802	Level: 8.25m AOD
Hole Type: RC	Logged By: RK	Scale: 1:106

Well	Water Strikes	Depth (m)	Type	Results	Coring TCR	Coring SCR	Coring RQD	Coring If (mm)	Depth (m)	Level (m)	Legend	Stratum Description
									21.40	-13.15		Clayey GRAVEL. (ALLUVIAL FAN DEPOSITS) (Drillers logs)
												MUDSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (Drillers logs)
									24.00	-15.75		
		24.90 - 25.00	C		100	77	23					Weak to medium strong grey thinly laminated to thinly bedded SILTSTONE with thin fractures with occasional clay infill. (SOUTH WALES MIDDLE COAL MEASURES FORMATION)
		24.00 - 25.50			100	81	7					
		25.50 - 27.00			100	77	0					
		27.00 - 28.50			100	94	0					
		28.50 - 30.00			100	61	11					
		31.00 - 31.20	C						30.50	-22.25		
		30.00 - 31.50	C						30.60	-22.35		Very weak to weak black COAL. (SOUTH WALES MIDDLE COAL MEASURES FORMATION)
		32.00 - 32.15	C						31.20	-22.95		
		32.80 - 33.00			100	37	28		31.85	-23.60		Weak to medium strong and locally very weak dark grey MUDSTONE with rare to occasional very thin veins of pyrite between fractures. (SOUTH WALES MIDDLE COAL MEASURES FORMATION)
		31.50 - 33.00	C		100	70	0					
		33.00 - 33.50			100	81	40		34.00	-25.75		Weak dark grey dark grey to black MUDSTONE with occasional very thinly bedded bands of coal, and rare to occasional very thin veins of pyrite between fractures. (SOUTH WALES MIDDLE COAL MEASURES FORMATION)
		34.30 - 34.50							35.00	-26.75		
		33.50 - 35.00										Weak to locally medium strong grey interbedded SILTSTONE and MUDSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION)
												Weak to locally medium strong dark grey MUDSTONE with rare thin veins of pyrite. (SOUTH WALES MIDDLE COAL MEASURES FORMATION)
												Interbedded MUDSTONE and SILTSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (Drillers logs)

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
20.00	200																
54.00	100																

Remarks:
Rotary follow on over cable percussive hole BH119. See BH119.

Borehole Log

Borehole No. **BH119 follow on**
Sheet 3 of 3

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 11/05/2023-15/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276559.81 N188686.20
Project No. 2111006.005	Drilling Equipment: Klem KR802	Level: 8.25m AOD
Hole Type: RC	Logged By: RK	Scale: 1:106

Well	Water Strikes	Depth (m)	Type	Results	Coring TCR	Coring SCR	Coring RQD	Coring If (mm)	Depth (m)	Level (m)	Legend	Stratum Description
												Interbedded MUDSTONE and SILTSTONE. (SOUTH WALES MIDDLE COAL MEASURES FORMATION) (Drillers logs)
									54.00	-45.75		End of Borehole at 54.00m

43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
20.00	200																
54.00	100																

Remarks:
Rotary follow on over cable percussive hole BH119. See BH119.

Borehole Log

Borehole No. **DS101**

Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 26/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276210.61 N188733.26
Project No. 2111006.005	Drilling Equipment: Archway competitor	Level: 8.27m AOD
Hole Type: WS	Logged By: MT	Scale: 1:33

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.40 - 0.80	ES		0.30	7.97		Dark brown sandy SILT with occasional rootlets and a single brick cobble. (MADE GROUND)
	▼	1.00	SPT	N=8 (4 for 75mm/2,2,2,2)				Light yellowish brown slightly gravelly SAND. Gravel of slag. (MADE GROUND)
		1.40 - 1.80	ES		1.60	6.67		Black silty GRAVEL of slag. (MADE GROUND)
		2.00	SPT	N=0 (1 for 450mm/0 for 0mm)	1.85	6.42		Yellowish brown fine to medium SAND. (WIND BLOWN SAND)
		3.00	SPT	N=0 (2 for 450mm/0 for 0mm)	3.00	5.27		End of Borehole at 3.00m

1 2 3 4 5 6

Remarks:
Groundwater strike at 1.2mbgl.
Groundwater resting at 1.2mbgl after 10mins.
Terminated due to blowing sands.

AGS

Borehole Log

Borehole No.
DS102A
Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 25/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276361.36 N188757.44
Project No. 2111006.005	Drilling Equipment: Archway competitor	Level: 8.25m AOD
Hole Type: WS	Logged By: MT	Scale: 1:33

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.60	7.65		Dark brown and black mottled slightly sandy gravelly SILT with rare rootlets. Gravel of brick and wood. (MADE GROUND)
								End of Borehole at 0.60m

1
2
3
4
5
6

Remarks:
Refusal at 0.6mbgl on suspected brick cobble.

AGS

Borehole Log

Borehole No.
DS102B
Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 25/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276361.36 N188757.44
Project No. 2111006.005	Drilling Equipment: Archway competitor	Level: 8.25m AOD
Hole Type: WS	Logged By: MT	Scale: 1:33

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.70 - 1.00	ES		0.70	7.55		Dark brown and black mottled slightly sandy very gravelly SILT with low cobble content and rare rootlets. Gravel and cobbles of brick. (MADE GROUND)
		1.00	SPT	N=50 (1,2/50 for 265mm)	1.00	7.25		Black slightly sandy SILT with rare rootlets and rare pockets of ash. (MADE GROUND)
								End of Borehole at 1.00m

Remarks:
Refusal at 1.0mbgl on suspected brick cobble.

Borehole Log

Borehole No. **DS102C**

Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 25/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276361.36 N188757.44
Project No. 2111006.005	Drilling Equipment: Archway Competitor	Level: 8.25m AOD
Hole Type: WS	Logged By: MT	Scale: 1:33

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Dark brown and black mottled slightly sandy very gravelly SILT with low cobble content and rare rootlets. Gravel and cobbles of brick. (MADE GROUND)
					0.70	7.55		Black slightly sandy SILT with rare rootlets and pockets of ash. (MADE GROUND)
		1.00	SPT	N=50 (1,2/50 for 255mm)	1.00	7.25		End of Borehole at 1.00m

Remarks:
Refusal at 1.0mbgl on suspected brick cobble.

Borehole Log

Borehole No. **DS102D**

Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 25/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276361.36 N188757.44
Project No. 2111006.005	Drilling Equipment: Archway competitor	Level: 8.25m AOD
Hole Type: WS	Logged By: MT	Scale: 1:33

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.50	7.75		Dark brown and black mottled slightly sandy very gravelly SILT with low cobble content and rare rootlets. Gravel and cobbles of brick. (MADE GROUND)
								Black slightly sandy slightly gravelly SILT with rare pockets of ash. Gravel of slag. (MADE GROUND)
		1.00	SPT	N=50 (1 for 300mm/50 for 105mm)	1.00	7.25		End of Borehole at 1.00m

1 2 3 4 5 6

Remarks:
Refusal at 1.0mbgl on suspected brick cobble.

AGS

Borehole Log

Borehole No. **DS103**

Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 26/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276398.41 N188781.28
Project No. 2111006.005	Drilling Equipment: Archway competitor	Level: 7.71m AOD
Hole Type: WS	Logged By: MT	Scale: 1:33

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30 - 0.80	ES					Dark brown slightly sandy slightly gravelly SILT with rare rootlets. Gravel of brick and slag. (MADE GROUND)
	▼	1.00	SPT	N=17 (5,4/4,3,4,6)	1.00	6.71		
		1.40 - 1.60	ES					Brownish grey clayey fine to medium SAND with rare pockets of soft grey clay. (TIDAL FLAT DEPOSITS)
		2.00	SPT	N=7 (1,1/2,2,1,2)				
		3.00	SPT	N=1 (1 for 300mm/1 for 150mm)				
		4.00	SPT	N=1 (1 for 225mm/1 for 225mm)				
		5.00	SPT	N=0 (1 for 450mm/0 for 0mm)	5.00	2.71		End of Borehole at 5.00m

Remarks:
Groundwater strike at 1.2mbgl.
Groundwater resting at 1.0mbgl after 10 mins.

Borehole Log

Borehole No. **DS104**

Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 25/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276621.82 N188674.21
Project No. 2111006.005	Drilling Equipment: Archway competitor	Level: 7.51m AOD
Hole Type: WS	Logged By: MT	Scale: 1:33

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.20 - 0.60	ES					Dark brown mottled black slightly sandy slightly gravelly SILT with rare rootlets and a single cobble of slag. Gravel of brick and slag. (MADE GROUND)
		1.00	SPT	N=5 (3,2/1,1,2,1)				
					1.70	5.81		Black slightly sandy silty GRAVEL of slag. (MADE GROUND)
		2.00	SPT	N=4 (1,1/1,1,1,1)				
		2.40 - 2.80	ES					
		3.00	SPT	N=1 (1 for 300mm/1 for 150mm)				
		4.00	SPT	N=0 (1 for 450mm/0 for 0mm)				
		4.70 - 5.00	ES		4.70	2.81		Black gravelly SILT. Gravel of slag. (MADE GROUND)
		5.00	SPT	N=0 (1 for 450mm/0 for 0mm)				
					5.60	1.91		Soft dark greyish brown slightly sandy CLAY. (TIDAL FLAT DEPOSITS)
		6.00	SPT	N=2 (1,0/1,0,1,0)	6.00	1.51		End of Borehole at 6.00m

Remarks:

Groundwater strike at 1.7mbgl.
Groundwater resting at 1.2mbgl.

AGS

Borehole Log

Borehole No.
DS105A
Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 25/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276596.34 N188637.87
Project No. 2111006.005	Drilling Equipment: Archway competitor	Level: 8.28m AOD
Hole Type: WS	Logged By: MT	Scale: 1:33

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.80	7.48		Dark brown and black mottled slightly sandy slightly gravelly SILT. Gravel of brick, slag and plastic. (MADE GROUND)
								End of Borehole at 0.80m

1
2
3
4
5
6

Remarks:
Refusal at 0.8mbgl on suspected brick cobble.

AGS

Borehole Log

Borehole No. **DS105B**

Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 25/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276596.34 N188637.87
Project No. 2111006.005	Drilling Equipment: Archway competitor	Level: 8.28m AOD
Hole Type: WS	Logged By: MT	Scale: 1:33

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30 - 0.70	ES		0.40	7.88		Brown slightly sandy gravelly SILT with rare rootlets. Gravel of slag. (MADE GROUND)
		1.00	SPT	N=12 (6,5/4,3,2,3)				Dark brown and black mottled slightly sandy gravelly SILT. Gravel of brick, slag and plastic. (MADE GROUND)
		1.40 - 1.70	ES		1.40	6.88		Black, brown and brownish grey mottled slightly gravelly silty SAND with low cobble content. Gravel and cobbles of brick and slag. (MADE GROUND)
	▽	2.00	SPT	N=7 (7,4/2,2,1,2)				
					2.60	5.68		Black silty GRAVEL of slag. (MADE GROUND)
		3.00	SPT	N=3 (1 for 225mm/1,1,1,0)				
		4.00	SPT	N=4 (1,0/1,1,1,1)	4.00	4.28		End of Borehole at 4.00m

Remarks:

Groundwater strike at 2.0mbgl.
Groundwater resting at 2.1mbgl after 10 mins.
Hole collapse from 4.0m to 3.3mbgl.

Borehole Log

Borehole No. **DS106**

Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 25/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276537.96 N188669.21
Project No. 2111006.005	Drilling Equipment: Archway competitor	Level: 8.06m AOD
Hole Type: WS	Logged By: MT	Scale: 1:33

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.20 - 0.60	ES					Dark brown and black mottled slightly sandy slightly gravelly SILT with rare rootlets and pockets of ash. Gravel of brick, slag and wood. (MADE GROUND)
		1.00	SPT	N=23 (1,1/5,6,6,6)				
		1.40 - 1.80	ES					
	▼				1.80	6.26		
		2.00	SPT	N=4 (2,2/1,1,1,1)				Dark brown and black mottled slightly gravelly very sandy SILT. (MADE GROUND)
					2.80	5.26		
		3.00	SPT	N=1 (1 for 375mm/1 for 75mm)				Black slightly sandy silty GRAVEL of slag with a weak organic/ tar odour. (MADE GROUND)
		3.30 - 3.60	ES					
		4.00	SPT	N=1 (1,0/1,0,0,0)				
					4.80	3.26		Brownish grey fine to medium SAND. (TIDAL FLAT DEPOSITS)
		5.00	SPT	N=1 (1 for 300mm/1 for 150mm)	5.00	3.06		End of Borehole at 5.00m

Remarks:

Groundwater strike at 1.8mbgl.
Groundwater resting at 1.8mbgl after 10 mins.

Borehole Log

Borehole No. **DS107**

Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 25/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276490.12 N188588.89
Project No. 2111006.005	Drilling Equipment: Archway competitor	Level: 8.08m AOD
Hole Type: WS	Logged By: MT	Scale: 1:33

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.20 - 0.50	ES					Dark brown and black mottled slightly gravelly sandy SILT with rare rootlets, roots (2-5mm diameter) and pockets of ash. Gravel of slag. (MADE GROUND)
					0.50	7.58		Brown and yellowish brown mottled fine to medium SAND. (TIDAL FLAT DEPOSITS)
	▽	1.00	SPT	N=5 (1,2/1,2,1,1)				
		1.50 - 1.80	ES					
		2.00	SPT	N=1 (1 for 300mm/1 for 150mm)	2.00	6.08		Soft grey CLAY with occasional pockets of brown pesudo-fibrous PEAT. (TIDAL FLAT DEPOSITS)
		2.60	HV	13 kPa				
		3.00	SPT	N=0 (1 for 450mm/0 for 0mm)				
		3.60	HV	14 kPa				
		4.00	SPT	N=2 (1,0/1,0,1,0)				
		4.60	HV	11 kPa				
		5.00	SPT	N=4 (1,0/1,1,1,1)	5.00	3.08		End of Borehole at 5.00m

1 2 3 4 5 6

Remarks:

Groundwater strike at 1.2mbgl.
Groundwater resting at 1.1mbgl after 10 mins.
Reported HSV data is the average of 3 readings.

Borehole Log

Borehole No. **DS108**

Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 24/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276246.79 N188608.28
Project No. 2111006.005	Drilling Equipment: Archway competitor	Level: 8.81m AOD
Hole Type: WS	Logged By: MT	Scale: 1:33

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.10 - 0.30	ES					Greyish brown slightly gravelly sandy SILT with occasional rootlets. Gravel of brick, slag and wood. (MADE GROUND)
					0.35	8.46		Soft greyish brown mottled brown slightly sandy CLAY with rare rootlets and decayed rootlets. (TIDAL FLAT DEPOSITS)
		0.80	PP	1.0 kg/cm2				
		0.80	HV	43 kPa				
		1.00	SPT	N=1 (1,0/1,0,0,0)				
		1.60	PP	0.5 kg/cm2				
		1.60	HV	30 kPa				
		1.80 - 2.00	ES					
		2.00	SPT	N=1 (1 for 300mm/1 for 150mm)	1.95	6.86		Light brown fine to medium SAND. (TIDAL FLAT DEPOSITS)
					2.05	6.76		Soft grey CLAY. (TIDAL FLAT DEPOSITS)
		2.60	PP	1.0 kg/cm2	2.60	6.21		Firm grey slightly sandy CLAY. (TIDAL FLAT DEPOSITS)
		2.60	HV	50 kPa				
		2.90	PP	1.0 kg/cm2				
		2.90	HV	52 kPa				
		3.00	SPT	N=5 (1,0/1,1,1,2)				
		3.60	PP	1.0 kg/cm2				
		3.60	HV	35 kPa				
		3.63	HV	30 kPa				
		3.90	PP	1.0 kg/cm2				
		3.90	HV	48 kPa	4.00	4.81		Soft grey very sandy CLAY with occasional pockets of brown amorphous PEAT. (TIDAL FLAT DEPOSITS)
		4.00	SPT	N=6 (1,1/1,1,2,2)				
		5.00	SPT	N=5 (1,2/1,1,2,1)	4.90	3.91		Greyish brown fine to medium SAND. (TIDAL FLAT DEPOSITS)
					5.00	3.81		End of Borehole at 5.00m

Remarks:

Groundwater strike at 1.0mbgl.
Groundwater resting at 1.8mbgl after 10 mins.
Reported HSV data is the average of 3 readings.
Reported PP data is the average of 5 readings.

Borehole Log

Borehole No. **DS109**

Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 24/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276536.94 N188528.25
Project No. 2111006.005	Drilling Equipment: Archway competitor	Level: 7.96m AOD
Hole Type: WS	Logged By: MT	Scale: 1:33

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.20 - 0.40	ES					Dark brown slightly sandy slightly gravelly SILT with rare rootlets and occasional pockets of soft dark brown clay. Gravel of brick, glass and concrete. (MADE GROUND)
					0.60	7.36		Dark brown slightly sandy GRAVEL of brick, concrete and slag. (MADE GROUND)
					0.90	7.06		Light brown fine to medium SAND. (WIND BLOWN SAND)
		1.20	SPT	N=18 (2,2/3,4,5,6)				
		1.40 - 1.60	D					
		1.40 - 1.60	ES					
		2.00	SPT	N=0 (1 for 450mm/0 for 0mm)	2.00	5.96		End of Borehole at 2.00m

Remarks:

Groundwater strike at 1.2mbgl.
Groundwater resting at 0.65mbgl after 10 mins.
Terminated at 2.0mbgl due to blowing sands.

Borehole Log

Borehole No. **DS110**

Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 24/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276274.64 N188708.85
Project No. 2111006.005	Drilling Equipment: Archway competitor	Level: 8.01m AOD
Hole Type: WS	Logged By: MT	Scale: 1:33

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.20 - 0.60	ES					Dark brown and black mottled slightly sandy gravelly SILT with rare rootlets. Gravel of brick, slag and wood. (MADE GROUND)
		1.00	SPT	N=14 (2,2/3,3,2,6)				
	▼	1.60 - 2.00	ES		1.60	6.41		Black slightly sandy very gravelly SILT. Gravel of slag. (MADE GROUND)
		2.00	SPT	N=9 (2,3/3,3,2,1)				
					2.60	5.41		Black and dark reddish brown mottled slightly sandy GRAVEL of slag and brick. (MADE GROUND)
		3.00	SPT	N=2 (2 for 225mm/2 for 225mm)				
					3.80	4.21		Soft dark grey and black mottled organic CLAY with frequent decayed rootlets. (TIDAL FLAT DEPOSITS)
		4.00	SPT	N=1 (1 for 300mm/1 for 150mm)	4.00	4.01		Very soft to soft grey sandy CLAY. (TIDAL FLAT DEPOSITS)
		4.80	PP	0.5 kg/cm2				
		4.80	HV	18 kPa				
		5.00	SPT	N=3 (1,0/1,0,1,1)	5.00	3.01		End of Borehole at 5.00m

Remarks:

Groundwater strike at 1.6mbgl.
Groundwater resting at 1.3mbgl after 10 mins.
Reported HSV data is the average of 3 readings.
Reported PP data is the average of 5 readings.

Borehole Log

Borehole No. **DS111A**

Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 24/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276388.00 N188660.11
Project No. 2111006.005	Drilling Equipment: Archway competitor	Level: 8.29m AOD
Hole Type: WS	Logged By: MT	Scale: 1:33

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30 - 0.70	ES					Dark brown, black and grey mottled slightly sandy slightly gravelly SILT with rare rootlets. Gravel of brick and slag. (MADE GROUND) *Blue textile membrane*
		1.00	SPT	N=34 (11,14/11,9,7,7)				
		1.50	SPT	N=50 (16,23/50 for 135mm)	1.50	6.79		End of Borehole at 1.50m

Remarks:
Refusal at 1.5mbgl on suspected brick cobble.

Borehole Log

Borehole No.
DS111B
Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 24/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276388.00 N188660.11
Project No. 2111006.005	Drilling Equipment: Archway competitor	Level: 8.29m AOD
Hole Type: WS	Logged By: MT	Scale: 1:33

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.60	SPT	N=50 (16,22/50 for 255mm)	0.60	7.69		Dark brown, black and grey mottled slightly sandy slightly gravelly SILT with rare rootlets. Gravel of brick and slag. (MADE GROUND)
								End of Borehole at 0.60m

Remarks:
Refusal at 0.6mbgl on suspected cobble of slag.

Borehole Log

Borehole No. **DS112**

Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 24/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276326.26 N188665.34
Project No. 2111006.005	Drilling Equipment: Archway competitor	Level: 8.64m AOD
Hole Type: WS	Logged By: MT	Scale: 1:33

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.20 - 0.60	ES					Dark brown and black mottled slightly sandy slightly gravelly SILT with rare rootlets. Gravel of slag and brick. (MADE GROUND)
					0.70	7.94		Light brown fine to medium SAND. (MADE GROUN)
		1.00	SPT	N=24 (6,6/7,6,6,5)	0.90	7.74		Dark brown and black mottled slightly gravelly sandy SILT. Gravel of slag and brick. (MADE GROUND)
		1.40 - 1.70	ES					
	▼	2.00	SPT	N=6 (1,1/2,1,1,2)	2.00	6.64		Dark grey and black mottled slightly gravelly very sandy CLAY. Gravel of brick and slag. (MADE GROUND)
		3.00	SPT	N=7 (1,1/2,1,3,1)	3.00	5.64		Black slightly gravelly sandy CLAY with rare decayed rootlets/plant matter and strong organic/tar odour. (TIDAL FLAT DEPOSITS)
		3.40 - 3.70	ES					
		4.00	SPT	N=5 (1,1/1,2,1,1)	3.90	4.74		Dark brownish grey fine to medium SAND with distinct organic/tar odour. (TIDAL FLAT DEPOSITS)
		5.00	SPT	N=2 (1,0/1,0,1,0)				
		5.80 - 6.00	ES		5.80	2.84		
					5.90	2.74		Light greyish brown fine to medium SAND. (TIDAL FLAT DEPOSITS)
		6.00	SPT	N=4 (1,1/1,1,1,1)	6.00	2.64		Soft dark brownish grey CLAY. (TIDAL FLAT DEPOSITS)
								End of Borehole at 6.00m

Remarks:

Groundwater strike at 2.0mbgl.
Groundwater resting at 4.5mbgl after 10 mins.

Borehole Log

Borehole No. **DS113**

Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 25/05/2023
Location: Port Talbot	Contractor: Apex Drilling Services	Co-ords: E276481.91 N188627.20
Project No. 2111006.005	Drilling Equipment: Archway competitor	Level: 7.29m AOD
Hole Type: WS	Logged By: MT	Scale: 1:33

Well	Water Strikes	Sample and In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.10 - 0.50	ES		0.30	6.99		Dark brown and black mottled slightly gravelly slightly clayey SILT. Gravel of wood, brick and slag. (MADE GROUND)
					0.75	6.54		Multicoloured slightly sandy silty GRAVEL of brick and slag. (MADE GROUND)
	▼	1.00	SPT	N=6 (1,2/1,2,1,2)				Brownish grey clayey fine to medium SAND. (TIDAL FLAT DEPOSITS)
		1.40 - 1.70	ES					
		2.00	SPT	N=0 (1 for 450mm/0 for 0mm)				
		3.00	SPT	N=0 (1 for 450mm/0 for 0mm)				
		4.00	SPT	N=1 (1 for 375mm/1 for 75mm)				
		5.00	SPT	N=2 (1,0/1,0,0,1)	5.00	2.29		End of Borehole at 5.00m

Remarks:

Groundwater strike at 1.1mbgl.
Groundwater resting at 0.9mbgl after 10 mins.

Trial Pit Log

Trial Pit No. **TP101** Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 15/05/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276191.59 N188690.16
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 8.48m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.40 - 0.60	ES					MADE GROUND: Dark brown silty very sandy gravel with occasional rootlets and roots up to 25mm and low cobble content. Gravel of brick, slag, clinker, concrete, metal fragments, glass and wood fragments. Cobbles of concrete and slag.
	0.80	D					
▽	1.80 - 2.20	ES					
				2.50	5.98		End of Trial Pit at 2.50m

1 2 3 4

Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
2.20	0.90	Unstable.						

Remarks:
Collapsing sides from 1.7m. Groundwater encountered at 1.7m, resting at 1.8m after 10minutes.

Trial Pit Log

Trial Pit No. **TP102** Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 15/05/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276234.52 N188608.81
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 8.92m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
				0.25	8.67		MADE GROUND: Dark brown slightly sandy gravelly silt with occasional rootlets and roots up to 15mm. Gravel of brick, porcelain fragments and wood fragments.
	0.40 - 0.60	ES					Yellowish brown to light brown slightly clayey gravelly silty SAND with occasional pockets of silty clay. Sand is fine to medium grained. Gravel of fine to coarse angular to subangular sandstone (TIDAL FLAT DEPOSITS)
	0.60 - 1.20	B					
				1.00	7.92		Soft to locally firm greyish brown mottled orangish brown sandy silty CLAY with occasional lenses of fine to medium grained sand. (TIDAL FLAT DEPOSITS)
	1.60 - 2.00	ES					
▽	1.80	D					
				2.10	6.82		Soft greyish brown mottled dark grey sandy silty CLAY with rare to occasional pockets of amorphous to pseudofibrous peat. Sand is fine to medium grained. (TIDAL FLAT DEPOSITS)
				2.60	6.32		End of Trial Pit at 2.60m

Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
2.00	0.90	Unstable.						

Remarks:
Collapsing sides from 0.8m. Groundwater encountered at 1.9m, resting at 2.4m after 10minutes. Terminated due to collapsing sides.

Trial Pit Log

Trial Pit No.
TP103
Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 24/05/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276279.26 N188748.37
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 7.98m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
				0.50	7.48		MADE GROUND: Brown to greyish brown slightly gravelly sandy silt with rare rootlets and roots up to 14mm and low cobble content. Gravel of brick, plastic, wood fragments, coke, metal fragments and plastic. Cobbles of brick.
							End of Trial Pit at 0.50m

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Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
2.80	0.75	Stable.						

Remarks:
No groundwater encountered. Terminated at depth due to encountered service tape (blue).

AGS

Trial Pit Log

Trial Pit No.
TP103A
Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 24/05/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276279.26 N188748.37
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 7.98m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.50	D					MADE GROUND: Brown to greyish brown slightly gravelly sandy silt with rare rootlets and roots up to 14mm and low cobble content. Gravel of brick, plastic, wood fragments, coke, metal fragments and plastic. Cobbles of brick and concrete.
	0.60 - 0.80	ES		0.60	7.38		MADE GROUND: Dark brown and greyish brown slightly gravelly silty sand with low cobble and boulder content. Gravel of coke, slag, rubber, plastic, clinker and brick. Cobbles and boulders of coke and concrete.
	1.20 - 1.80	B					
	1.80 - 2.00	ES					
				2.00	5.98		End of Trial Pit at 2.00m

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Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
2.90	0.75	Unstable.						

Remarks:
Groundwater (slight seepage) encountered at 1.8m, remaining dry after 10minutes. Terminated due to metal lintels/ columns.

Trial Pit Log

Trial Pit No.
TP104
Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 15/05/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276313.46 N188585.62
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 8.26m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.20 - 0.60	ES					MADE GROUND: Dark brown slightly gravelly sandy silt with rare rootlets and roots up to 25mm. Gravel of wood fragments, sandstone, brick, slag and plastic.
				0.75	7.51		
	1.00	D					Soft to locally firm low to medium strength sandy CLAY and (loose) yellowish brown, light brown and grey slightly clayey silty SAND with occasional pockets of silty clay. Sand is fine to medium grained. (WIND BLOWN SAND)
	1.00 - 1.40	B					
	1.20	PP	0.6 kg/cm2				
	1.20	HV	41 kPa				
▽				1.60	6.66		Soft grey mottled dark grey sandy silty CLAY with occasional pockets of amorphous peat. Sand is fine to medium grained. (TIDAL FLAT DEPOSITS)
	1.80 - 2.20	ES					
▼				3.60	4.66		End of Trial Pit at 3.60m

1 2 3 4

Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
2.20	0.90	Stable.						

Remarks:
Groundwater encountered at 1.5m, resting at 3.4m after 10minutes.

Trial Pit Log

Trial Pit No. **TP105** Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 17/05/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276378.51 N188660.27
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 8.21m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.20 - 0.40	ES					MADE GROUND: Brown to dark brown slightly sandy gravelly silt with occasional roots up to 20mm. Gravel of slag, metal wire and brick.
				0.65	7.56		MADE GROUND: Yellowish brown and grey slightly sandy gravel of slag.
				0.85	7.36		MADE GROUND: Brownish grey and brown slightly clayey silty very sandy gravel with low cobble content. Gravel of slag, coke, brick, plastic, tile, metal wire, metal fragments, glass, concrete and porcelain fragments.
	1.00 - 1.40	B					
	1.60 - 1.80	ES					
				2.20	6.01		End of Trial Pit at 2.20m

Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
2.00	0.80	Stable.						

Remarks:
Groundwater encountered at 0.75m, resting at 1.55m after 10minutes.

Trial Pit Log

Trial Pit No. **TP106** Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 15/05/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276364.92 N188726.68
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 8.73m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.40 - 0.60	ES					MADE GROUND: Black slightly clayey silty gravelly sand with occasional pockets of clay, rare rootlets and roots up to 35mm and low cobble and boulder content. Gravel of coke, slag, glass, rubber, plastic, concrete, tiles, brick and wood fragments.
▽	1.00	D					
				1.40	7.33		MADE GROUND: Dark grey gravel with low cobble content. Gravel of brick, tiles and concrete. Cobbles of concrete.
				1.50	7.23		End of Trial Pit at 1.60m

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Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
2.40	0.90	Unstable.						

Remarks:
Groundwater encountered at 1.25m, resting at 1.3m after 10minutes. Terminated on concrete slab.

Trial Pit Log

Trial Pit No. **TP107** Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 16/05/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276472.99 N188638.82
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 6.72m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
							MADE GROUND: Dark brown mottled greyish brown slightly gravelly very sandy silt. Gravel of wood fragments, coke, brick and glass.
				0.50	6.22		Yellowish brown silty fine to medium grained SAND.
				0.70	6.02		Light brown and greyish brown slightly clayey silty SAND. Sand is fine to medium grained.
				2.00	4.72		End of Trial Pit at 2.00m

Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
2.00	0.80	Unstable.						

Remarks:
Collapsing sides from 0.7m. Groundwater encountered at 0.6m, resting at 1.0m after 10minutes. Terminated at depth due to rapid ingress of groundwater.

Trial Pit Log

Trial Pit No. **TP108** Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 15/05/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276498.20 N188700.10
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 7.28m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
▽	0.40 - 0.60	ES					MADE GROUND: Dark brown slightly clayey slightly gravelly sandy silt with occasional rootlets and roots up to 32mm. Gravel of wood fragments, sandstone, plastic, brick and terracotta.
				0.70	6.58		MADE GROUND: Grey gravelly sand with low to medium boulder content. Gravel of concrete, slag and brick. Boulders of brick walls and brick footings.
	1.20	D					
	1.50 - 1.60	ES					
				1.80	5.48		End of Trial Pit at 1.80m

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Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
2.30	1.00	Unstable.						

Remarks:
Groundwater encountered at 0.7m, resting at 0.9m after 10minutes. Terminated due to refusal on boulders of concrete.

Trial Pit Log

Trial Pit No. **TP109** Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 15/05/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276500.71 N188748.61
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 6.86m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.20 - 0.40	ES					MADE GROUND: Dark brown slightly clayey slightly gravelly sandy silt with frequent rootlets and roots up to 12mm and low cobble and boulder content. Gravel of brick and concrete. Cobbles and boulders of concrete.
				0.60	6.26		Light brown slightly silty clayey SAND with occasional pockets of silty clay and moderately strong organic/? hydrocarbon odour. Sand is fine to medium grained. (TIDAL FLAT DEPOSITS)
▼	1.50	D					
	2.40 - 2.60	ES					
				3.00	3.86		End of Trial Pit at 3.00m

1 2 3 4

Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
2.40	1.00	Unstable.						

Remarks:
Collapsing sides from 1.6m. Groundwater encountered at 1.6m, resting at 1.6m after 10minutes.

Trial Pit Log

Trial Pit No. **TP110** Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 17/05/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276534.01 N188517.91
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 7.74m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.40 - 0.60	ES					MADE GROUND: Brown to dark brown slightly gravelly sandy silt with rare rootlets and roots up to 35mm. Gravel of wood fragments, coke, brick, slag and porcelain fragments.
				0.85	6.89		
	1.00 - 1.40	B					Light brown fine to medium grained SAND. (WIND BLOWN SAND)
	1.80	D					
	2.00 - 2.20	ES					
				2.50	5.24		End of Trial Pit at 2.50m

Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
2.00	1.20	Unstable.						

Remarks:
Collapsing sides from 0.9m. Groundwater encountered at 0.7m, resting at 0.8m after 10minutes. Terminated due to collapsing sides.

Trial Pit Log

Trial Pit No. **TP111** Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 17/05/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276547.94 N188564.50
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 8.52m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.40 - 0.60	ES					MADE GROUND: Dark grey slightly silty sandy gravel. Gravel of coke, slag, brick, glass, porcelain fragments and metal fragments.
				0.70	7.82		
▼							MADE GROUND: Brown slightly gravelly sand with low cobble content. Gravel plastic, brick and metal wire and cables. Cobbles of brick.
				0.90	7.62		
	1.00 - 1.40	B					(Very loose to loose) Yellowish brown and light brown slightly clayey slightly silty fine to medium grained SAND. (WIND BLOWN SAND)
▽							
	1.60 - 1.80	ES					
				2.00	6.52		End of Trial Pit at 2.00m

1 2 3 4

Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
2.30	1.20	Unstable.						

Remarks:
Collapsing sides from 0.4m. Groundwater encountered at 1.2m, resting at 0.8m after 10minutes. Terminated due to collapsing sides.

Trial Pit Log

Trial Pit No. **TP112** Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 16/05/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276590.85 N188696.22
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 7.64m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
							MADE GROUND: Dark brown to greyish brown silty gravelly sand with rare rootlets and roots up to 20mm and low cobble content. Gravel of slag, tiles, brick and concrete.
				0.50	7.14		
							MADE GROUND: Light brown and grey slightly sandy gravel with medium cobble and boulder content. Gravel of brick, concrete and coke. Cobbles and boulders of brick walls and brick footings.
				0.80	6.84		
▼	0.90 - 1.20	ES					MADE GROUND: Black slightly sandy gravel with white lime at southern end of trial pit. Gravel of coke and slag.
	1.80	D					
				2.50	5.14		End of Trial Pit at 2.50m

Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
2.40	0.80	Unstable.						

Remarks:
Collapsing sides from 1.5m. Groundwater encountered at 1.1m, resting at 1.1m after 10minutes.

Trial Pit Log

Trial Pit No. **TP113** Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 15/05/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276379.77 N188623.54
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 8.51m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.40 - 0.80	B					MADE GROUND: Dark brown silty gravelly sand rare rootlets and roots up to 15mm. And low boulders content. Gravel of brick, concrete, plastic, slag, wood fragments, railway sleeper, metal wire and metal fragments. Boulder of concrete.
	0.60	D					
	0.80 - 1.00	ES		0.80	7.71		
▽							MADE GROUND: Light grey and light blue slightly gravelly slightly sandy silt. Gravel of concrete, clinker, wood fragments, blue crystallised salts and pink crystallised salts.
	1.50	D					
	1.80 - 2.00	ES					
▼				2.50	6.01		End of Trial Pit at 2.50m

1 2 3 4

Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
3.00	0.90	Unstable.						

Remarks:
Collapsing sides from 1.3m. Groundwater encountered at 1.1m, resting at 2.2m after 10minutes. Terminated due to collapsing sides.

Trial Pit Log

Trial Pit No. **TP114** Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 17/05/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276434.02 N188547.84
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 8.01m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.40 - 0.60	ES		0.60	7.41		MADE GROUND: Brown to dark brown slightly gravelly sandy silt with rare rootlets and roots up to 25mm. Gravel of wood fragments, brick, slag and porcelain fragments.
▽	0.80 - 1.20	B					Light brown slightly clayey slightly silty fine to medium grained SAND. (WIND BLOWN SAND)
				2.50	5.51		End of Trial Pit at 2.50m

1 2 3 4

Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
2.40	1.00	Unstable.						

Remarks:
Collapsing sides from 0.3m. Groundwater encountered at 0.6m, resting at 1.0m after 10minutes. Terminated due to collapsing sides.

Trial Pit Log

Trial Pit No. **TP115** Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 16/05/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276396.65 N188660.99
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 8.23m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.30 - 0.50	ES					MADE GROUND: Dark brown slightly gravelly slightly sandy silt with rare rootlets and roots up to 35mm and low cobble content. Gravel of coke, plastic, brick, siltstone and wood fragments. Cobbles of concrete.
				0.95	7.28		MADE GROUND: Dark brown to dark grey gravelly silty sand with low cobble content. Gravel of concrete, brick and slag. Cobbles of brick and concrete.
▽	1.40	ES					
				2.00	6.23		Light brown to light grey silty fine grained SAND. (TIDAL FLAT DEPOSITS)
	2.20	D					
				2.50	5.73		End of Trial Pit at 2.50m

1 2 3 4

Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
2.20	0.75	Unstable.						

Remarks:
Collapsing sides from 1.1m. Groundwater encountered at 1.4m, resting at 1.8m after 10minutes. Terminated due to collapsing sides.

Trial Pit Log

Trial Pit No. **TP116** Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 15/05/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276221.65 N188622.31
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 9.69m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
				0.15	9.54		MADE GROUND: Dark brown slightly gravelly sandy silt with rare rootlets and roots up to 12mm. Gravel of wood fragments, sandstone and brick.
	0.40 - 0.60	ES					Light brown and yellowish brown slightly clayey silty SAND with occasional pockets of silty clay. Sand is fine grained. (WIND BLOWN SAND)
	0.60 - 1.20	B					
	1.40 - 1.80	D		1.40	8.29		Soft greyish brown mottled orangish brown and brown becoming light grey mottled blueish grey slightly sandy silty CLAY with occasional pockets of pseudofibrous to amorphous peat. (TIDAL FLAT DEPOSITS)
	1.80 - 2.40	ES					
	2.50	B					
				3.50	6.19		End of Trial Pit at 3.50m

Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
1.90	0.90	Stable.						

Remarks:
Collapsing sides from 0.4m. Groundwater encountered at 1.5m, resting at 2.4m after 10minutes.

Trial Pit Log

Trial Pit No. **TP117** Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 16/05/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276527.66 N188625.62
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 8.30m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
							MADE GROUND: Dark grey slightly clayey slightly gravelly sandy silt with occasional rootlets and roots up to 25mm. Gravel of slag, coke, brick, wood fragments and porcelain fragments.
				0.90	7.40		Grey CONCRETE SLAB.
	1.30 - 1.50	ES		1.20	7.10		MADE GROUND: Black to dark grey silty sandy gravel with moderately strong hydrocarbon odour. Gravel of coke, brick and wood fragments.
▽	1.80 - 2.00	ES		1.60	6.70		Grey to greenish grey slightly clayey SAND with occasional pockets of clay, amorphous to pseudofibrous peat and weak organic odour. Sand is fine medium grained. (TIDAL FLAT DEPOSITS)
	2.80	D					
				3.00	5.30		End of Trial Pit at 3.00m

Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
6.20	0.90	Unstable.						

Remarks:
Collapsing sides from 1.7m. Groundwater encountered at 1.8m, resting at 2.4m after 10minutes.

Trial Pit Log

Trial Pit No. **TP118** Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 26/04/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276342.10 N188729.31
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 8.24m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.50 - 0.80	ES					MADE GROUND: Dark grey to greyish brown very silty sandy gravel with low cobble content and occasional rootlets and roots to 25mm in diameter. Gravel of brick, concrete, slag and coke. Cobbles of brick and concrete.
				1.10	7.14		
	1.50	D					MADE GROUND: Dark grey, grey and yellowish brown slightly silty sandy gravel with low cobble and boulder content. Gravel of clinker, coke, slag, metal fragments, concrete, brick, glass, wood fragments, rubber and fabric (cloth). Cobbles and boulders of concrete.
				1.80	6.44		End of Trial Pit at 1.80m

1 2 3 4

Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
2.30	1.00	Stable.						

Remarks:
Groundwater encountered at 0.7m, resting at 0.9m after 10minutes. Terminated due to refusal on boulders of concrete.

Trial Pit Log

Trial Pit No.
TP119
Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 16/05/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276590.97 N188729.98
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 7.08m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
▼	0.60 - 0.80	ES		0.55	6.53		MADE GROUND: Dark brown grey and black mottled slightly gravelly sandy silt with rare roots up to 15mm. Gravel of brick, coke, concrete, plastic, metal fragments, metal piping, and metal wire.
				1.20	5.88		MADE GROUND: Black slightly gravelly silty sand. Gravel of coke and brick.
	1.80 - 2.20	ES					MADE GROUND: Black to dark grey slightly silty sandy gravel with low cobble content. Gravel of coke, slag, brick, wood fragments and metal fragments. Cobbles of coke, wood fragments and brick.
	2.50	D					
				2.80	4.28		End of Trial Pit at 2.80m

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Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
2.30	0.50	Unstable.						

Remarks:
Collapsing sides from 0.4m. Groundwater encountered at 0.6m, resting at 0.6m after 10minutes. Terminated due to collapsing sides.

Trial Pit Log

Trial Pit No. **TP120** Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 16/05/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276534.15 N188738.80
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 7.18m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
				0.10	7.08		MADE GROUND: Dark brown slightly sandy silt. Gravel of brick, concrete, plastic and metal fragments.
	0.40 - 0.60	ES		0.40	6.78		MADE GROUND: Brown sandy gravel with medium cobble and low boulder content. Gravel of brick and wood fragments. Cobbles and boulders of concrete.
▽				0.60	6.58		MADE GROUND: Dark brown to dark grey gravelly sandy silt with strong hydrocarbon odour and low cobble content. Gravel of brick slag, wood fragments. Cobbles of brick.
							MADE GROUND: Light brown and light grey clayey sand with weak hydrocarbon odour and low cobble content. Sand is fine to medium grained. Cobbles of brick.
▼	1.80 - 2.00	ES					
	2.20	D					
				2.50	4.68		End of Trial Pit at 2.50m

1 2 3 4

Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
2.20	0.50	Unstable.						

Remarks:
Collapsing sides from 0.8m. Groundwater encountered at 0.65m, resting at 0.16m after 10minutes.

Trial Pit Log

Trial Pit No. **TP121** Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 16/05/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276470.41 N188747.01
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 6.97m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
				0.50	6.47		MADE GROUND: Brown to dark brown slightly gravelly sandy silt. Gravel of wood fragments, brick, coke and metal fragments.
	0.60 - 0.80	ES		0.80	6.17		MADE GROUND: Orangish brown and greyish brown slightly sandy gravel. Gravel of coke and brick.
	1.40 - 1.60	ES		2.00	4.97		MADE GROUND: Brownish grey to brown slightly gravelly sand with low cobble content. Gravel of brick and concrete. Cobbles of brick.
	2.50	D		3.00	3.97		Light brown to brown slightly clayey SAND with occasional pockets of clay. Sand is fine to coarse grained. (TIDAL FLAT DEPOSITS)
							End of Trial Pit at 3.00m

1 2 3 4

Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
2.40	0.60	Unstable.						

Remarks:
Collapsing sides from 0.8m. Groundwater encountered at 0.45m, resting at 0.4m after 10minutes.

Trial Pit Log

Trial Pit No. **TP122** Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 26/04/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276254.05 N188690.89
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 8.49m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.40 - 0.60	ES					MADE GROUND: Dark grey to greyish brown very silty sandy gravel with low cobble content and occasional rootlets and roots to 30mm in diameter. Gravel of clinker, coke, metal fragments and concrete. Cobbles of brick and concrete.
				1.10	7.39		
▽	1.20 - 1.40	ES					MADE GROUND: Yellowish brown and dark grey slightly clayey slightly silty gravelly sand. Sand is fine to medium grained. Gravel of fine to coarse subangular slag.
	1.50	D					
	1.60	D					
				1.80	6.69		End of Trial Pit at 1.80m

1 2 3 4

Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
1.60	1.40	Unstable.						

Remarks:
Collapsing sides from 0.5m. Groundwater encountered at 1.4m, resting at 1.3m after 10minutes. Terminated due to collapsing sides.

Trial Pit Log

Trial Pit No. **TP123** Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 26/04/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276266.40 N188707.22
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 7.96m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
	1.00 - 1.20	ES					MADE GROUND: Dark grey to greyish brown slightly clayey sandy gravelly silt with low cobble and boulder content and occasional rootlets and roots to 40mm in diameter. Gravel of slag, coke, rebar, clinker and brick. Cobbles and boulders of concrete.
	1.80	D		1.60	6.36		MADE GROUND: Black silty sandy gravel with faint putrid odour. Gravel of coke, ?mudstone and rare metal fragments.
				2.00	5.96		End of Trial Pit at 2.00m

1 2 3 4

Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
2.30	1.10	Unstable.						

Remarks:
Collapsing sides from 1.5m. Groundwater encountered at 0.45m, resting at 1.2m after 10minutes. Terminated due to collapsing sides.

Trial Pit Log

Trial Pit No.
TP124
Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 24/05/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276393.06 N188776.96
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 7.62m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.30 - 0.50	ES		0.50	7.12		MADE GROUND: Dark brown and brown slightly gravelly sandy silt with rare roots up to 20mm and low cobble and boulder content. Gravel of wood fragments and brick. Cobble and boulders of concrete.
							End of Trial Pit at 0.50m

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Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
2.40	1.20	Stable.						

Remarks:
No groundwater encountered. Terminated at depth due to encountered services (90mm blue plastic pipe).

Trial Pit Log

Trial Pit No.
TP124A
Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 24/05/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276393.06 N188776.96
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 7.62m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
							MADE GROUND: Brown slightly sandy silt with occasional rootlets. Gravel of coke, plastic, brick.
				0.45	7.17		
				0.60	7.02		MADE GROUND: Yellowish brown to light brown and brownish grey slightly gravelly fine to medium grained sand. Gravel of brick.
							End of Trial Pit at 0.60m

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Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
2.40	1.40	Stable.						

Remarks:
No groundwater encountered. Terminated at depth due to encountered service tape (yellow).

Trial Pit Log

Trial Pit No.
TP125
Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 16/05/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276582.08 N188675.75
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 8.36m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
				0.10	8.26		MADE GROUND: Wood chipping.
	0.80 - 1.00	ES					MADE GROUND: Brown to dark brown mottled slightly gravelly sandy silt with low cobble and boulder content and rare rootlets and roots up to 20mm. Gravel of coke, brick, concrete, porcelain fragments, light blue crystallised salts, plastic and rubber. Cobbles and boulders of concrete.
	1.20	D					
				1.30	7.06		End of Trial Pit at 1.30m

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4

Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
10.00	0.80	Stable.						

Remarks:
No groundwater encountered. Terminated on conctrete slab.

AGS

Trial Pit Log

Trial Pit No.
TP126
Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 16/05/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276568.51 N188643.40
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 8.20m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.70 - 1.00	ES		0.65	7.55		MADE GROUND: Brown to dark brown gravel silty sand with rare rootlets and roots up to 6mm. Gravel of tile, brick, coke, slag, concrete and wood fragments.
				1.10	7.10		MADE GROUND: Brown, dark brown and brownish grey silty sandy gravel with low cobble content. Gravel of brick, concrete, metal fragments, corrugated sheeting (ACM) metal sheeting, metal piping, glass, sandstone, porcelain fragments and clear to off-white crystallised salts. Cobbles of brick and concrete. End of Trial Pit at 1.10m

1
2
3
4

Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
9.00	0.90	Stable.						

Remarks:
No groundwater encountered. Terminated on conctrete slab. Concrete column/footing recorded at northern end of trial pit with a width of 1.2m and height of 0.6m.

Trial Pit Log

Trial Pit No. **TP127** Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 16/05/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276493.17 N188635.02
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 7.52m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.40 - 0.60	ES					MADE GROUND: Dark brown silty gravelly sand with rare rootlets and root up to 25mm. Gravel of coke, brick, wood fragments, blue crystallised salts and concrete.
▽				0.80	6.72		
	1.40 - 1.80	ES					Yellowish brown to light brown slightly clayey SAND with rare pockets of silty clay. Sand is fine to medium grained. (TIDAL FLAT DEPOSITS)
	2.00	D					
				2.20	5.32		End of Trial Pit at 2.20m

1 2 3 4

Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
2.20	0.50	Unstable.						

Remarks:
Collapsing sides from 0.3m. Groundwater encountered at 0.8m, resting at 1.4m after 10minutes. Terminated due to collapsing sides.

Trial Pit Log

Trial Pit No. **TP128** Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 16/05/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276483.11 N188592.44
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 8.06m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.40 - 0.60	ES		0.60	7.46		MADE GROUND: Dark brown slightly gravelly sandy silt with occasional rootlets and roots up to 32mm. Gravel of clicker, coke and brick.
▽	1.70 - 1.90	ES					Yellowish brown to light brown slightly clayey slightly gravelly SAND with occasional pockets of silty clay. Sand is fine to coarse grained. Gravel of fine to coarse subangular to subrounded sandstone. (WIND BLOWN SAND)
	2.00 2.00	PP HV	0.4 kg/cm2 16 kPa	1.90	6.16		Very soft, very low strength grey to dark grey and greenish grey mottled slightly sandy silty organic CLAY with occasional pockets of amorphous to pseudofibrous peat. (TIDAL FLAT DEPOSITS)
▼	2.50	D		3.20	4.86		End of Trial Pit at 3.20m

1 2 3 4

Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
2.00	0.60	Stable.						

Remarks:
Groundwater seepage encountered at 1.0m, resting at 3.0m after 10minutes.

Trial Pit Log

Trial Pit No.
TP129
Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 17/05/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276555.49 N188547.30
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 8.56m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
				0.15	8.41		MADE GROUND: Brown slightly gravelly sandy silt with rare rootlets and roots up to 15mm. Gravel of wood fragments, brick and slag.
	0.80 - 1.00	ES					MADE GROUND: Brown slightly sandy gravel with high cobble content. Gravel of wood fragments, metal piping, sheeting (PCM) coke, glass, porcelain fragments, plastic, concrete, metal wire, brick, concrete pipe and tile. Cobbles of brick and concrete.
▽				1.20	7.36		Light brown fine to medium grained SAND. (WIND BLOWN SAND)
	1.50	D					
				2.00	6.56		End of Trial Pit at 2.00m

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Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
2.10	1.60	Stable.						

Remarks:
Groundwater encountered at 1.3m, resting at 1.2m after 10minutes.

Trial Pit Log

Trial Pit No. **TP130** Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 17/05/2023
Location: Port Talbot	Contractor: Tom Prichards Ltd	Co-ords: E276542.98 N188535.93
Project No. 2111006.005	Drilling Equipment: JCB 3CX	Level: 8.09m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.60 - 0.80	ES					MADE GROUND: Brown to dark brown slightly gravelly sandy silt with rare rootlets and roots up to 25mm. Gravel of wood fragments, metal fragments, plastic, glass, metal rebar, concrete, brick, slag and porcelain fragments.
▽				0.95	7.14		Light brown fine to medium grained SAND with rare decayed rootlets. (WIND BLOWN SAND)
				2.20	5.89		End of Trial Pit at 2.20m

1 2 3 4

Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
2.20	0.80	Unstable.						

Remarks:
Collapsing sides from 0.7m. Groundwater encountered at 1.0m, resting at 1.1m after 10minutes. Terminated due to collapsing sides.

Trial Pit Log

Trial Pit No.
HP101
Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 30/03/2023
Location: Port Talbot	Contractor: TEC	Co-ords: E276509.00 N188599.00
Project No. 2111006.005	Drilling Equipment: Hand tools	Level: 8.20m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.10 - 0.30	ES		0.14	8.06		MADE GROUND: Dark grey slightly clayey sandy gravel. Gravel of slag, coke, wood fragments, sandstone, metal fragments, glass and chert.
▼				0.27	7.93		MADE GROUND: Brown to orangish brown sandy gravel. Gravel of metal fragments, wood fragments, slag and coke.
				0.50	7.70		Yellowish brown to CONCRETE SLAB. Void
				0.90	7.30		MADE GROUND: Dark grey sandy gravel. Gravel of slag, concrete, brick and coke.
				1.00	7.20		End of Trial Pit at 0.90m

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2
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4

Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
0.50	0.50	Stable.						

Remarks:
Groundwater resting at 0.6m.

Trial Pit Log

Trial Pit No.
HP102
Sheet 1 of 1

Project Name: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	Client: LanzaTech UK Limited	Date: 30/03/2023
Location: Port Talbot	Contractor: TEC	Co-ords: E276482.00 N188769.00
Project No. 2111006.005	Drilling Equipment: Hand tools	Level: 7.00m AOD
Hole Type: TP	Logged By: RK	Scale: 1:25

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.05 - 0.10	ES		0.30	6.70		MADE GROUND: Brownish grey slightly gravelly sandy silt. Gravel of wood fragments, limestone, sandstone, plastic with occasional orangish brown and green to yellow algae.
							End of Trial Pit at 0.30m

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2
3
4

Dimensions		Trial Pit Support		Soakage Testing				
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Test No.	Date Test	Duration (hh:mm)	Soil Infiltration Rate (m/s)	Remarks
0.30	0.30	Stable.						

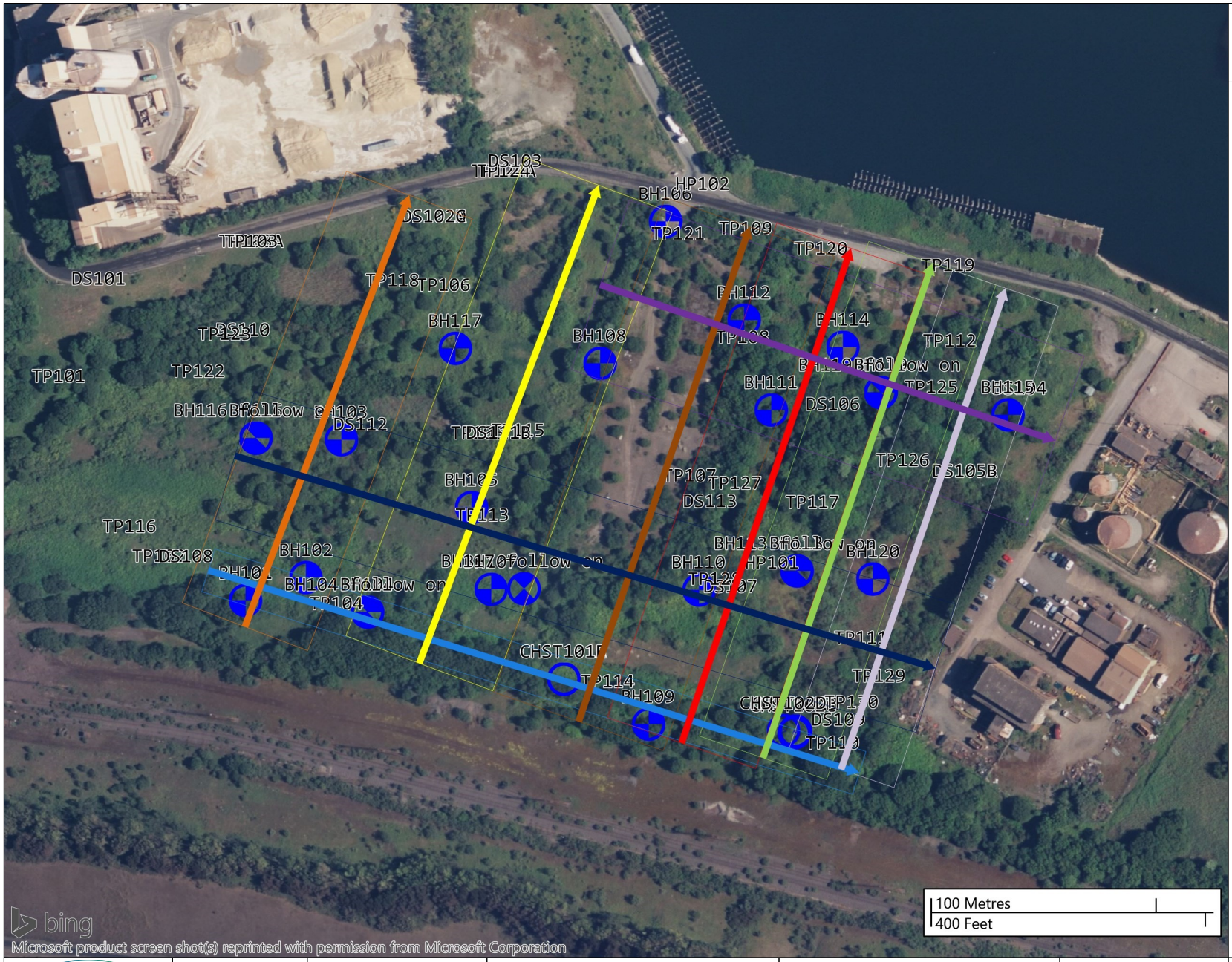
Remarks:
No groundwater encountered.

AGS

Appendix D

Ground Profile Cross-sections

Exploratory Hole Location Plan



Key:

- Sections - Section Line A
- Sections - Section Line B
- Sections - Section Line C
- Sections - Section Line D
- Sections - Section Line E
- Sections - Section Line F
- Sections - Section Line G
- Sections - Section Line H
- Sections - Section Line I
- Locations By Type - CP
- Locations By Type - RC
- Locations By Type - RO

TEC
The Old Chapel
35a Southover
Wells, Somerset
BA5 1UH

Tel: 01749 677760
Email: info@tecon.co.uk
Web: www.tecon.co.uk

Site Name:	Client:	Project No:	Figure No:	Date:	Scale:
Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility	LanzaTech UK Limited	2111006.005		August 2023	1:2500

Project Id: 2111006.005

Project Title: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility

Location: Port Talbot

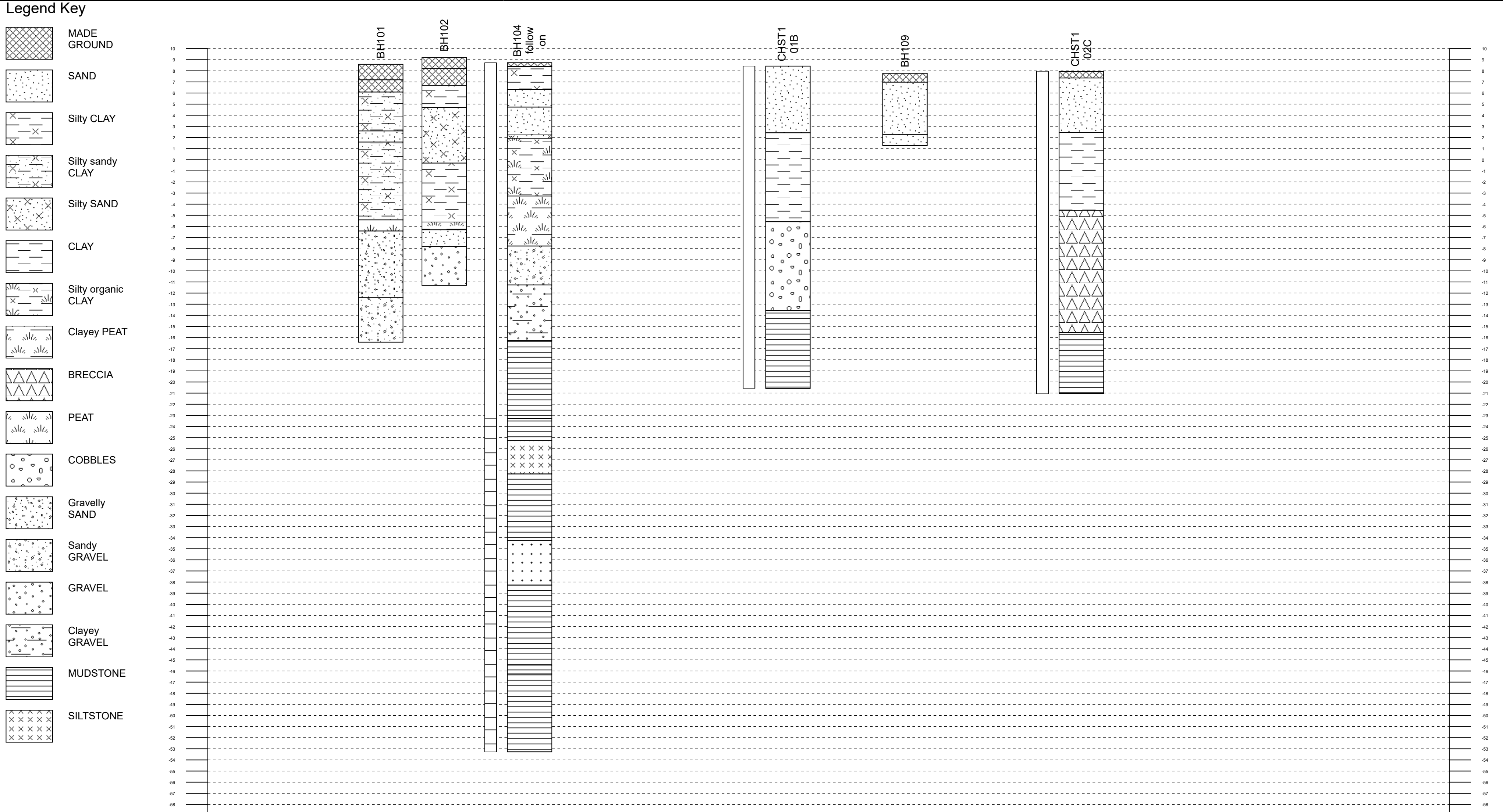
Client: LanzaTech UK Limited

Title: Section Line A

Vertical Scale: 1:500

Horizontal Scale: 1:2000

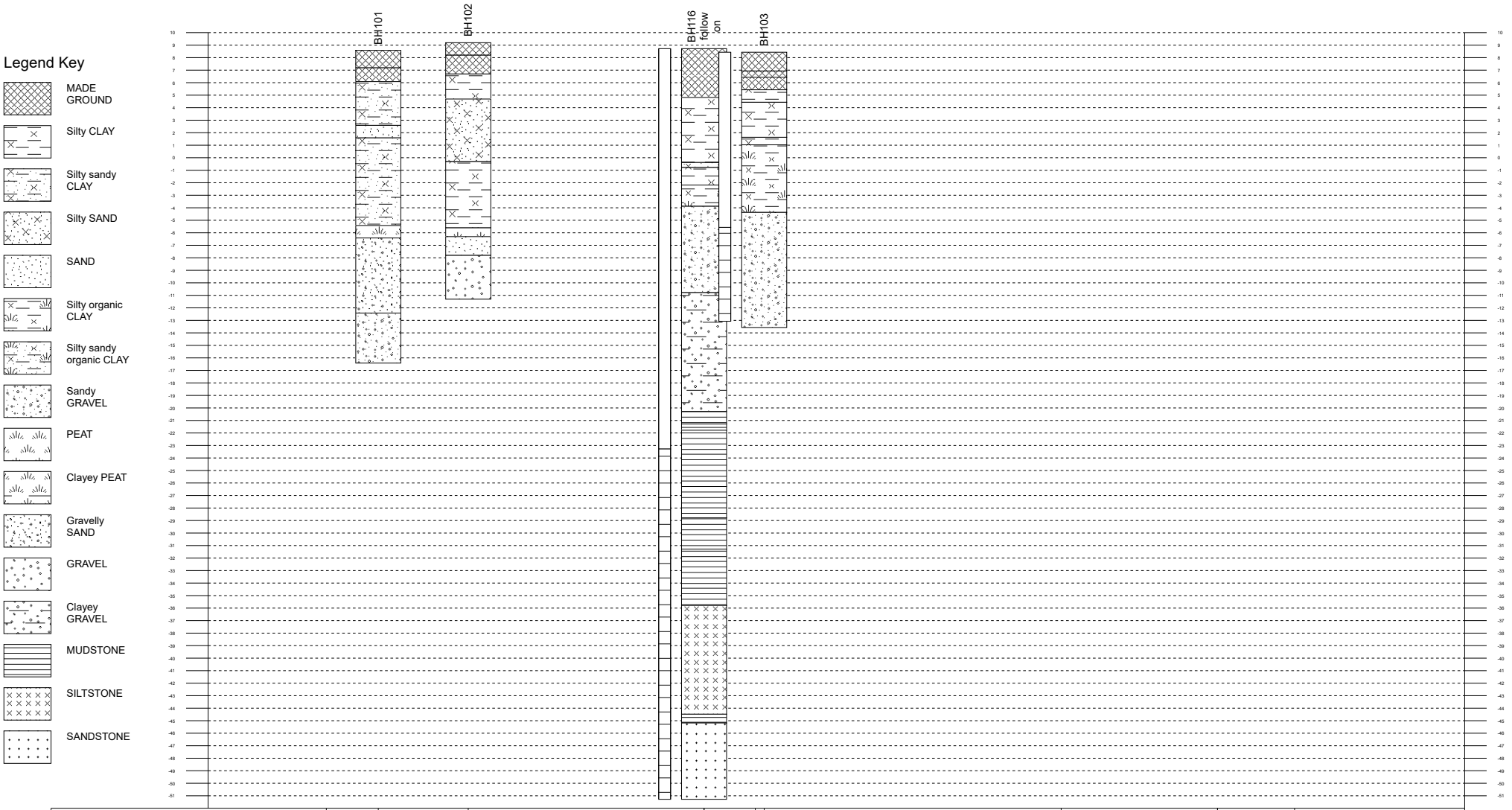
Engineer: MT/RK/OD



Chainage (m)	0.00	20.18	43.01	63.06	73.70	166.60	189.38	208.68	267.41	272.57	293.66	305.19
Elevation (mAOD)		7.95	9.80	8.94	3.18	0.65	6.20	7.32	7.88	9.22	8.50	
Offset (m)		8.59	9.19	8.26	8.73	8.48	8.01	7.77	7.93	7.95	7.94	

Project Id: 2111006.005
Project Title: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility
Location: Port Talbot
Client: LanzaTech UK Limited

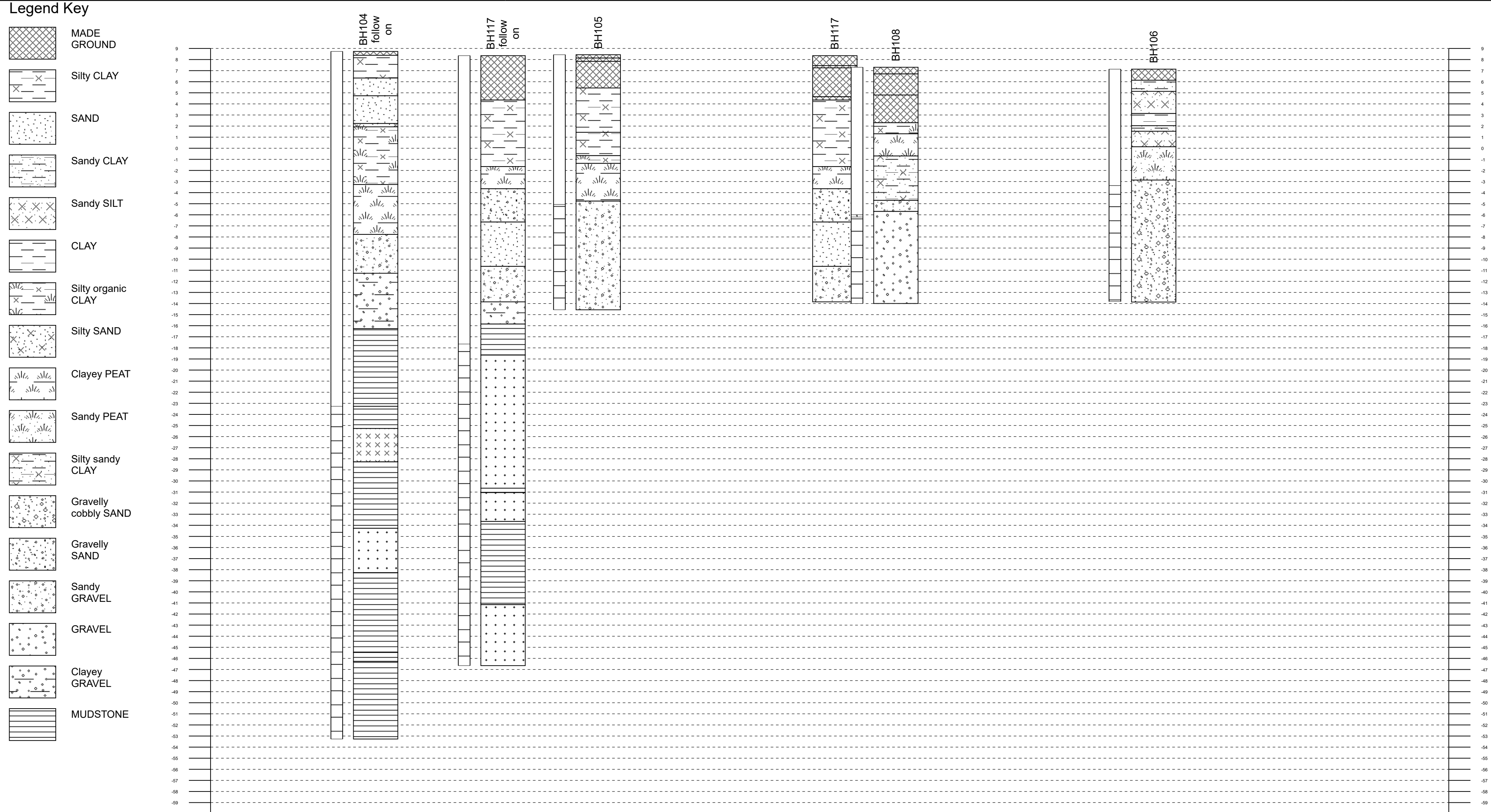
Title: Section Line B
Vertical Scale: 1:450
Horizontal Scale: 1:1200
Engineer: MT/RK/OD



Chainage (m)	0.00	11.07	30.24	**80.51**	91.44	99.33	156.63	**189.96**	206.39
Elevation (mAOD)		3.63	18.02	**25.09**	20.84	10.63	11.22	**18.37**	
Offset (m)		8.59	9.19	**8.72**	8.64	8.43	8.24	**8.25**	

Project Id: 2111006.005
Project Title: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility
Location: Port Talbot
Client: LanzaTech UK Limited

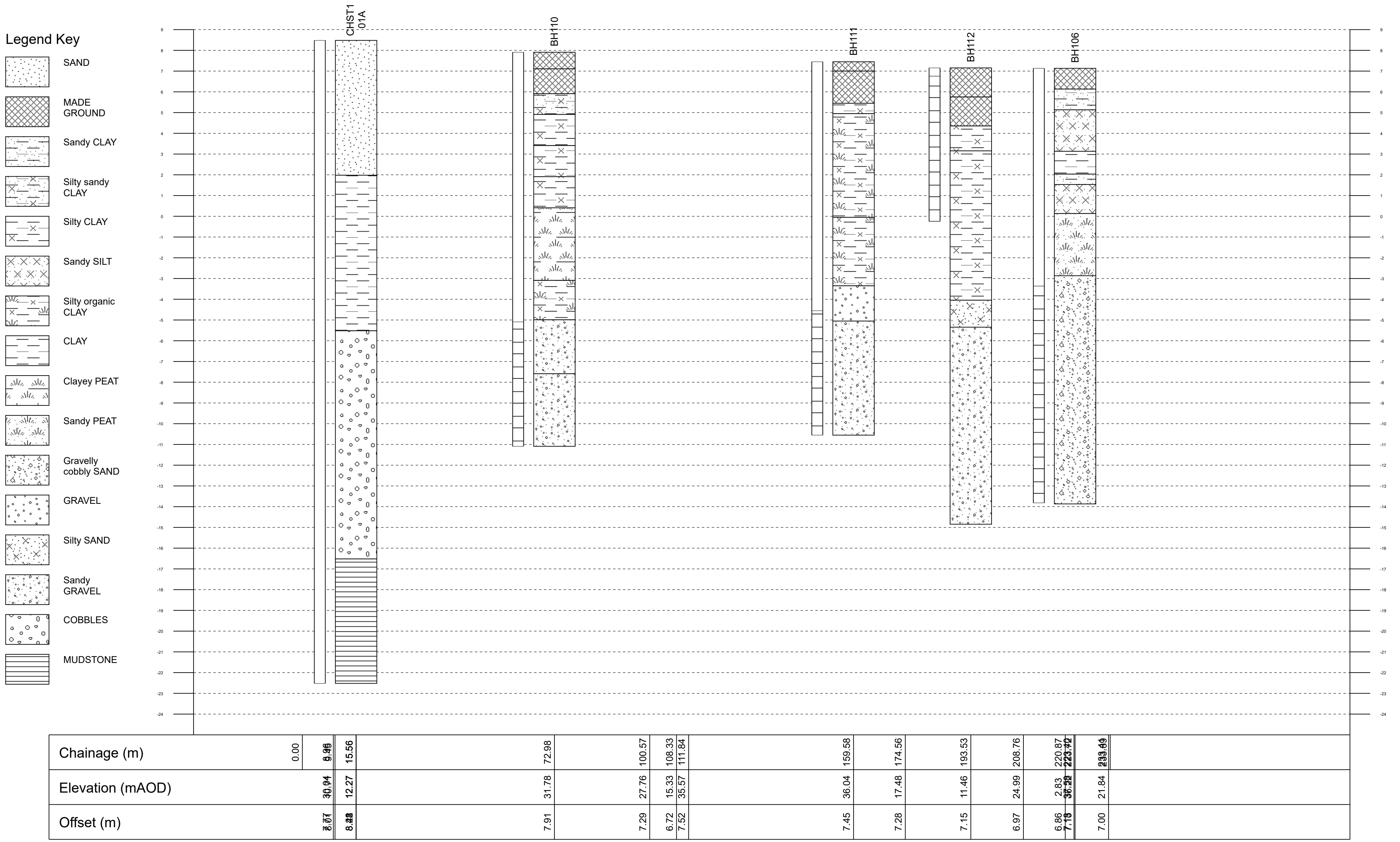
Title: Section Line C
Vertical Scale: 1:500
Horizontal Scale: 1:1500
Engineer: MT/RK/OD



Chainage (m)	0.00	13.13	42.15	47.58	60.42	73.33	94.01	97.41	101.46	137.30	153.80	213.65	223.52	228.17
Elevation (mAOD)		29.62	18.61	32.28	7.76	2.39	7.18	1.68	9.37	34.14	28.71	34.07	33.91	
Offset (m)		8.73	8.61	8.35	8.51	8.44	8.21	8.29	8.23	8.35	7.30	7.71	7.13	

Project Id: 2111006.005
Project Title: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility
Location: Port Talbot
Client: LanzaTech UK Limited

Title: Section Line D
Vertical Scale: 1:250
Horizontal Scale: 1:1500
Engineer: MT/RK/OD

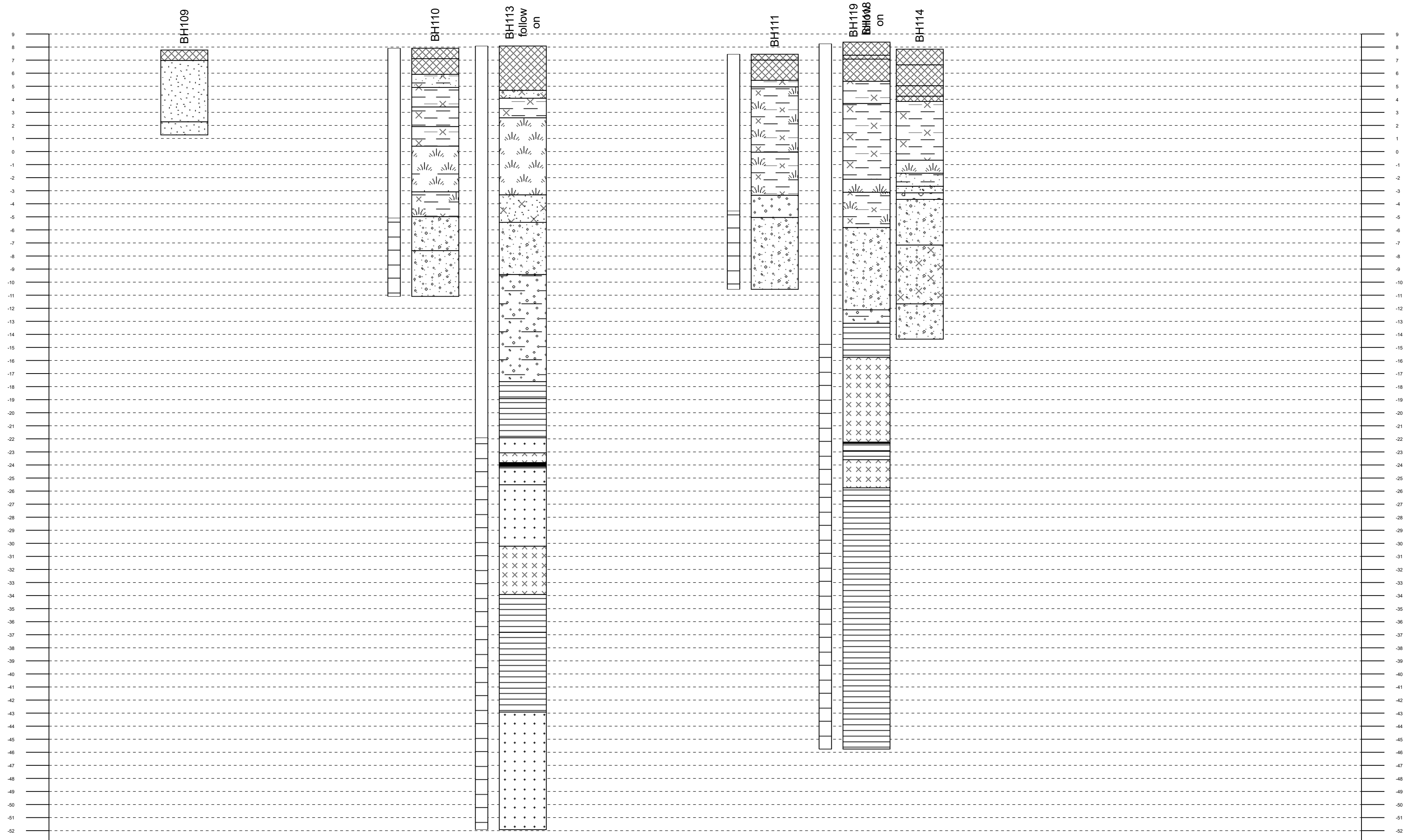


Project Id: 2111006.005
Project Title: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility
Location: Port Talbot
Client: LanzaTech UK Limited

Title: Section Line E
Vertical Scale: 1:450
Horizontal Scale: 1:1500
Engineer: MT/RK/OD

Legend Key

- MADE GROUND
- SAND
- Silty sandy CLAY
- Silty CLAY
- Silty organic CLAY
- Silty sandy GRAVEL
- PEAT
- Clayey PEAT
- Gravelly SAND
- COBBLES
- Silty SAND
- GRAVEL
- Sandy GRAVEL
- Clayey GRAVEL
- MUDSTONE
- SILTSTONE
- SANDSTONE



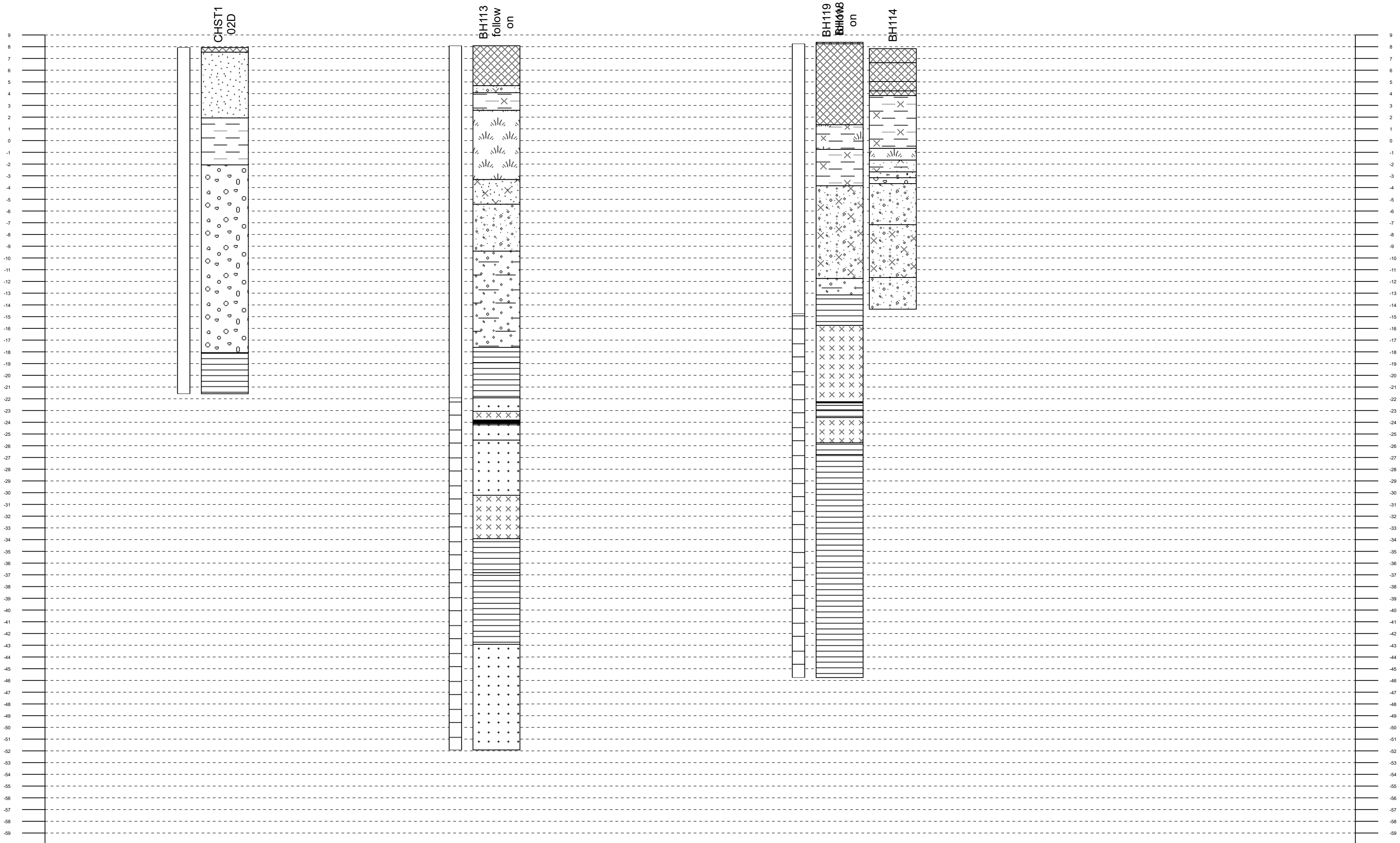
Chainage (m)	Elevation (mAOD)	Offset (m)
0.00		
3.03	16.67	7.77
[illegible]	[illegible]	[illegible]
67.04	14.73	7.91
77.61	16.53	8.20
89.36	24.01	8.08
94.64	18.67	7.29
102.44	31.07	6.72
105.89	10.83	7.52
109.06	24.78	8.30
[illegible]	[illegible]	[illegible]
168.66	28.73	7.28
177.04	33.87	[illegible]
187.65	34.69	7.15
190.63	11.19	7.84
217.44	8.48	7.18
233.65		

Project Id: 2111006.005
Project Title: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility
Location: Port Talbot
Client: LanzaTech UK Limited

Title: Section Line F
Vertical Scale: 1:500
Horizontal Scale: 1:1500
Engineer: MT/RK/OD

Legend Key

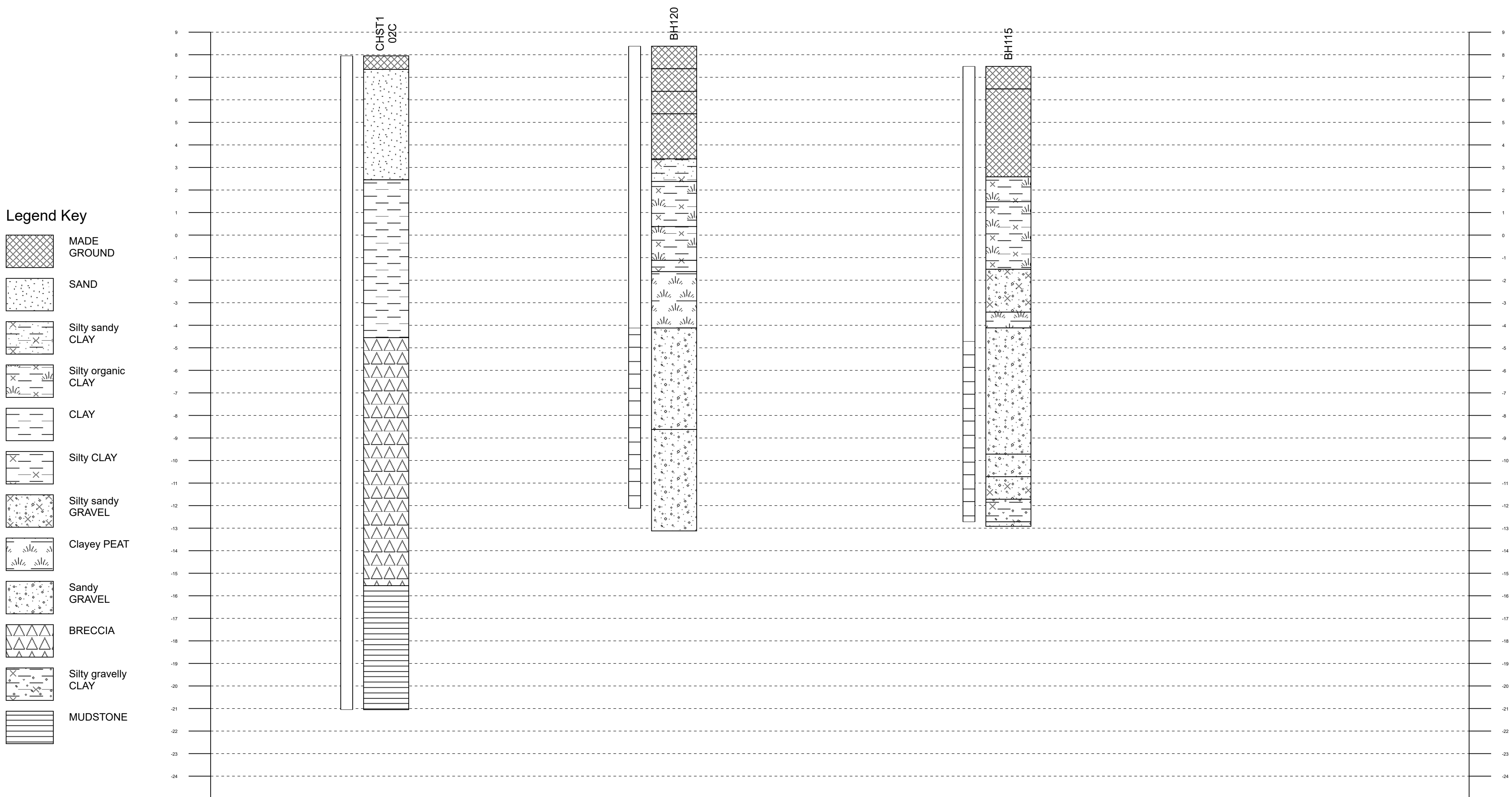
- MADE GROUND
- SAND
- Silty CLAY
- Silty sandy GRAVEL
- PEAT
- CLAY
- Silty organic CLAY
- Clayey PEAT
- Silty sandy CLAY
- COBBLES
- Gravelly SAND
- Silty SAND
- Sandy GRAVEL
- Clayey GRAVEL
- MUDSTONE
- SILTSTONE
- SANDSTONE



Chainage (m)	0.00	[illegible]	53.29	72.10	83.85	91.50	103.54	134.42	148.00	169.47	171.52	185.12	191.71	223.41	233.65
Elevation (mAOD)		[illegible]	28.41	20.09	12.62	20.89	11.84	20.28	17.35	21.75	2.75	25.44	22.86	11.25	
Offset (m)		[illegible]	8.52	8.20	8.08	8.38	8.30	8.20	8.07	8.36	[illegible]	7.84	7.64	7.08	

Project Id: 2111006.005
Project Title: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility
Location: Port Talbot
Client: LanzaTech UK Limited

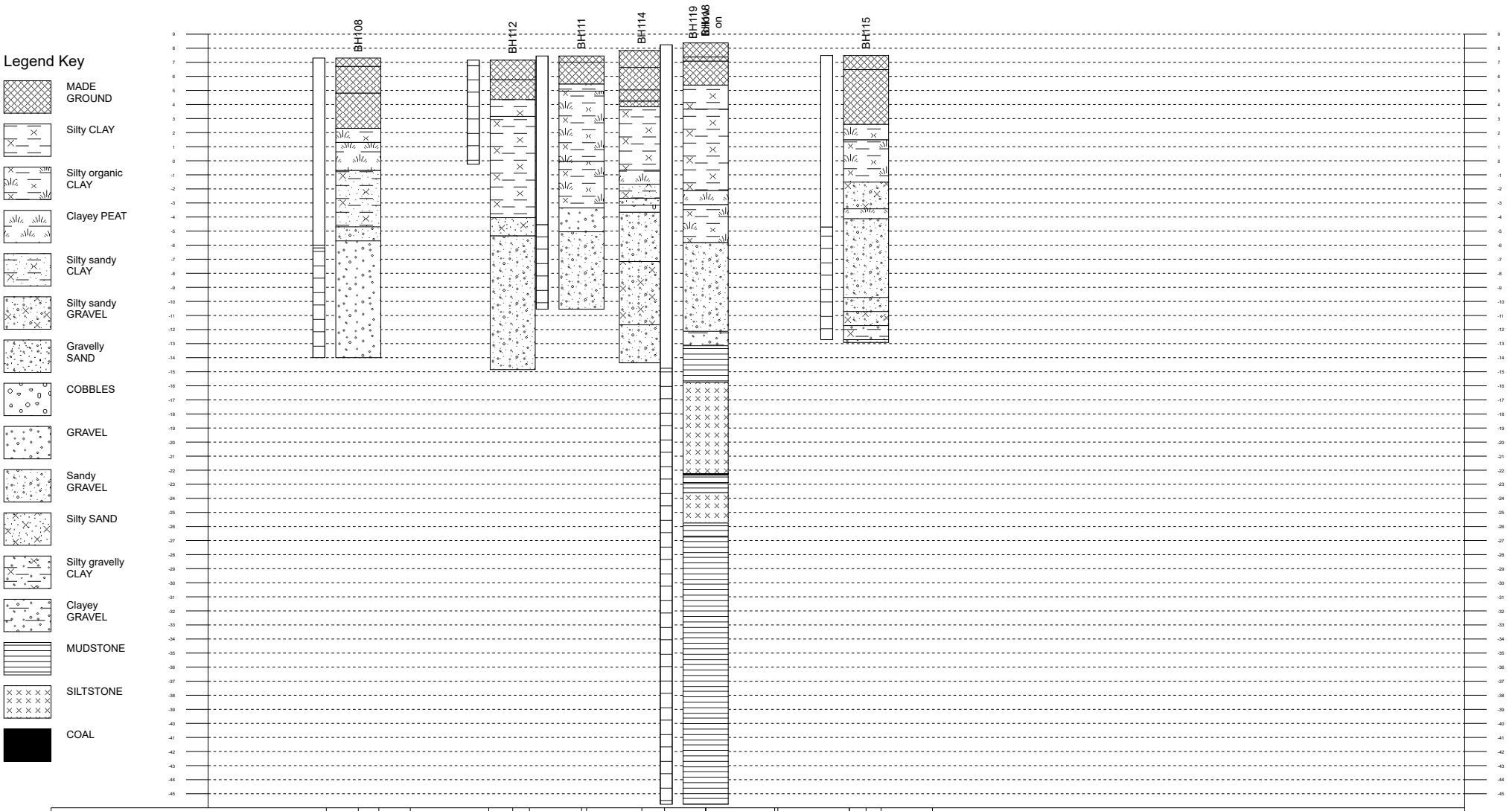
Title: Section Line G
Vertical Scale: 1:250
Horizontal Scale: 1:1500
Engineer: MT/RK/OD



Chainage (m)	0.00	5.03	[illegible]	25.04	40.04	53.58	91.80	134.72	139.15	169.77	180.73	192.01	223.72	235.05
Elevation (mAOD)		0.78	[illegible]	1.41	9.22	3.80	11.24	11.77	16.26	10.22	22.27	9.07	20.62	
Offset (m)		7.74	[illegible]	8.09	8.56	8.52	8.38	8.20	8.28	8.36	7.48	7.64	7.08	

Project Id: 2111006.005
Project Title: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility
Location: Port Talbot
Client: LanzaTech UK Limited

Title: Section Line H
Vertical Scale: 1:400
Horizontal Scale: 1:2000
Engineer: MT/RK/OD



Chainage (m)	0.00	11.36	18.65	29.82	57.69	66.21	72.15	90.65	92.45	112.09	120.15	134.76	159.27	160.40	185.78	191.75	197.08	215.32	
Elevation (mAOD)		33.34	36.19	21.19	33.19	5.82	13.18	28.23	35.58	8.76	28.37	4.86	6.93	15.91	37.52	4.07	5.40		
Offset (m)		7.30	7.13	6.97	6.86	7.15	7.28	7.45	7.18	7.84	8.07	8.28	8.36	7.84	8.28	7.48	7.51		

Project Id: 2111006.005

Project Title: Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility

Location: Port Talbot

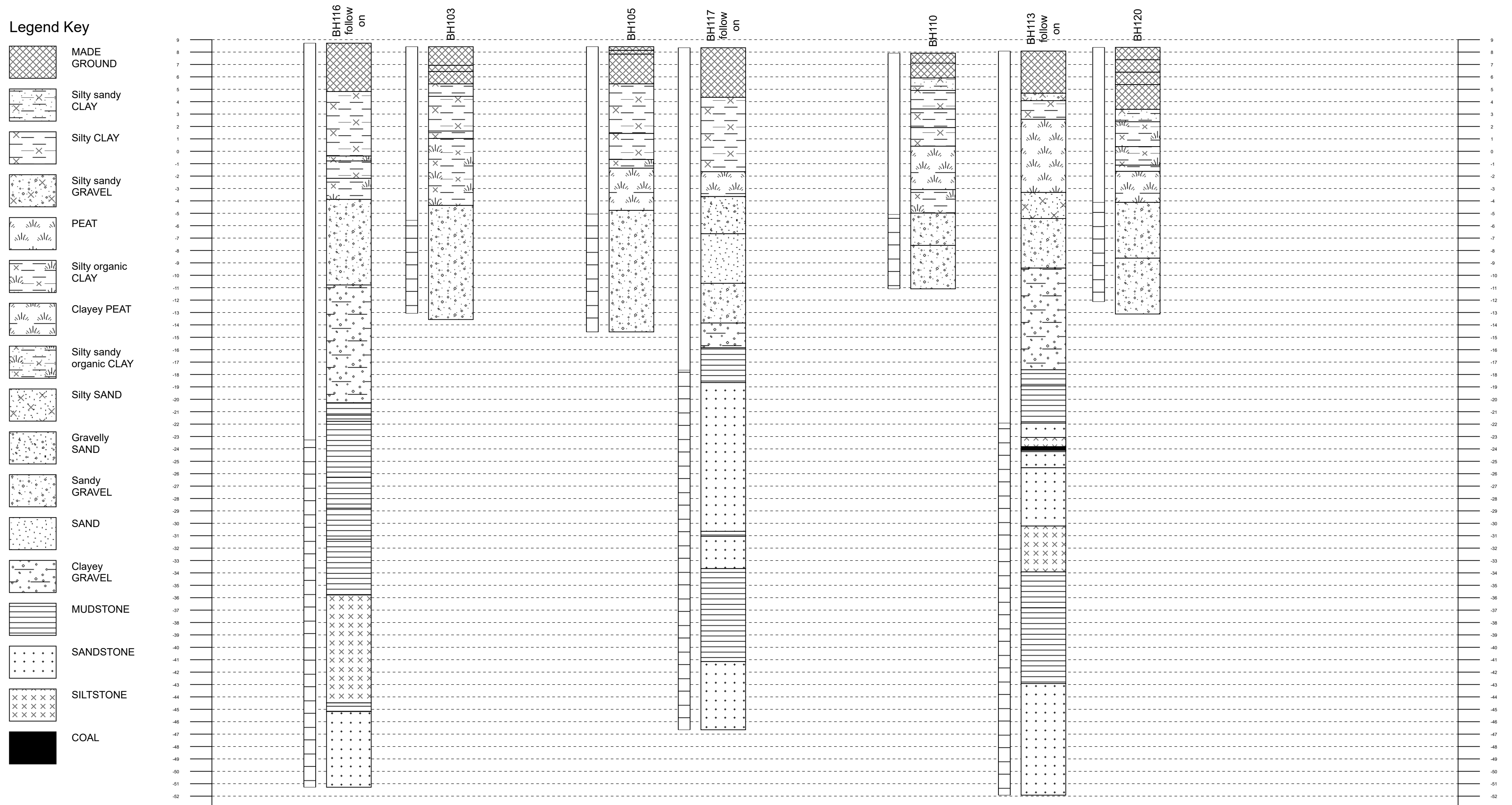
Client: LanzaTech UK Limited

Title: Section Line I

Vertical Scale: 1:450

Horizontal Scale: 1:2000

Engineer: MT/RK/OD



Chainage (m)	0.00	7.06	43.60	53.65	104.86	108.28	117.55	127.18	141.17	216.34	225.43	233.19	247.97	255.87	289.64	295.75	308.30	327.81
Elevation (mAOD)		10.27	20.53	17.91	29.44	8.49	5.06	24.00	19.48	2.65	2.26	3.44	12.07	23.53	29.94	8.51	22.49	
Offset (m)		8.72	8.43	8.64	8.21	8.44	8.51	8.61	8.35	7.91	8.06	8.08	8.20	8.08	8.38	8.52	8.56	

Appendix E

Geotechnical Laboratory Report

Appendix E

Geotechnical Laboratory Report

Summary of Natural Moisture Content, Liquid Limit and Plastic Limit Results

Job No.	Project Name	Programme	
33399	Phoenix Wharf, Port Talbot	Samples received	03/05/2023
		Schedule received	02/05/2023
Project No.	Client	Project started	04/05/2023
2111006.005	TEC	Testing Started	19/05/2023

Hole No.	Sample				Soil Description	NMC	Passing 425µm	LL	PL	PI	Remarks
	Ref	Top m	Base m	Type		%	%	%	%	%	
BH103	-	4.00	4.45	U	Very low strength dark grey clayey SAND with rare lumps of dark grey clay at base of sample	21	-	-	-	-	Non Plastic
BH103	-	9.50	9.95	U	Very low strength dark grey slightly sandy silty CLAY with occasional decomposed shell fragments	27	97	30	19	11	
BH106	-	5.60	6.00	U	Very low strength dark brownish occasionally stained black slightly sandy slightly peaty organic silty CLAY	46	100	58	28	30	
BH117	-	6.00	6.40	U	Medium strength grey mottled black slightly peaty slightly sandy organic silty CLAY	37	99	53	25	28	
BH117	-	9.00	9.40	U	Very low strength dark grey sandy silty CLAY	28	100	36	21	15	
BH117	-	11.50	11.90	U	Low strength grey mottled black and brown peaty slightly sandy silty CLAY with occasional pockets of decayed plant matter	50	100	68	35	33	
BH118	-	7.00	7.40	U	Low strength light grey mottled black sandy peaty organic silty CLAY with pockets of decayed wood	49	100	60	30	30	
BH118	-	10.00	10.40	U	Low strength dark grey slightly peaty sandy organic silty CLAY	36	100	46	24	22	
BH119	-	7.00	7.40	U	Very low strength black slightly sandy peaty silty CLAY	64	90	67	31	36	
BH119	-	10.00	10.40	U	Medium strength dark grey mottled brown clayey fibrous PEAT with frequent decayed plant and wood fragments	240	82	228	116	112	

Test Methods: BS1377: Part 2: 1990:
Natural Moisture Content : clause 3.2
Atterberg Limits: clause 4.3, 4.4 and 5.0
These results only apply to the items tested

NOTE: The report shall not be reproduced except in full without authority of the laboratory

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU

Tel: 01923 711 288
Email: James@k4soils.com

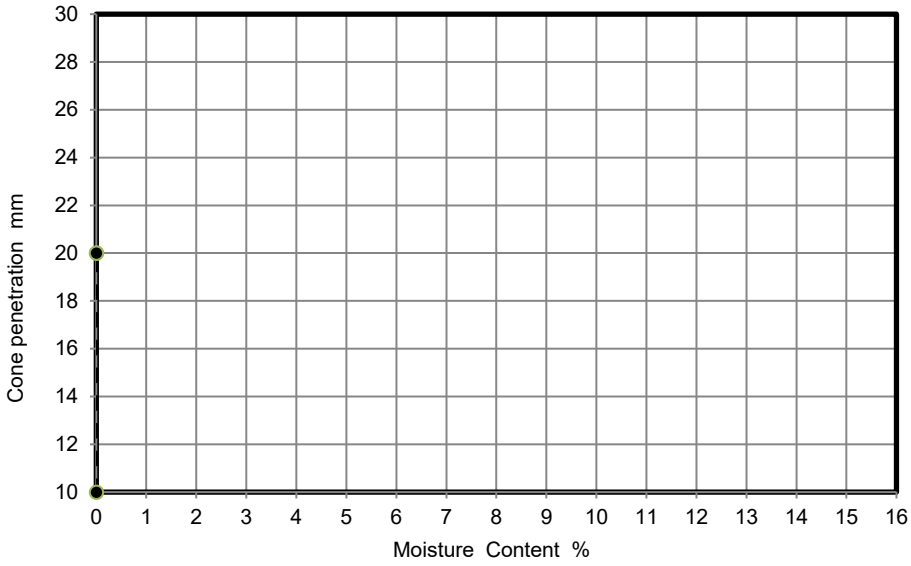
Checked and Approved

Initials J.P

Date: 02/06/2023

LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Job No.	33399				
Borehole/Pit No.	BH103				
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	4.00 m
Soil Description	Very low strength dark grey clayey SAND with rare lumps of dark grey clay at base of sample			Depth Base	4.45 m
				Sample Type	U
				Samples received	03/05/2023
				Schedules received	02/05/2023
				Project Started	04/05/2023
				Date Tested	19/05/2023

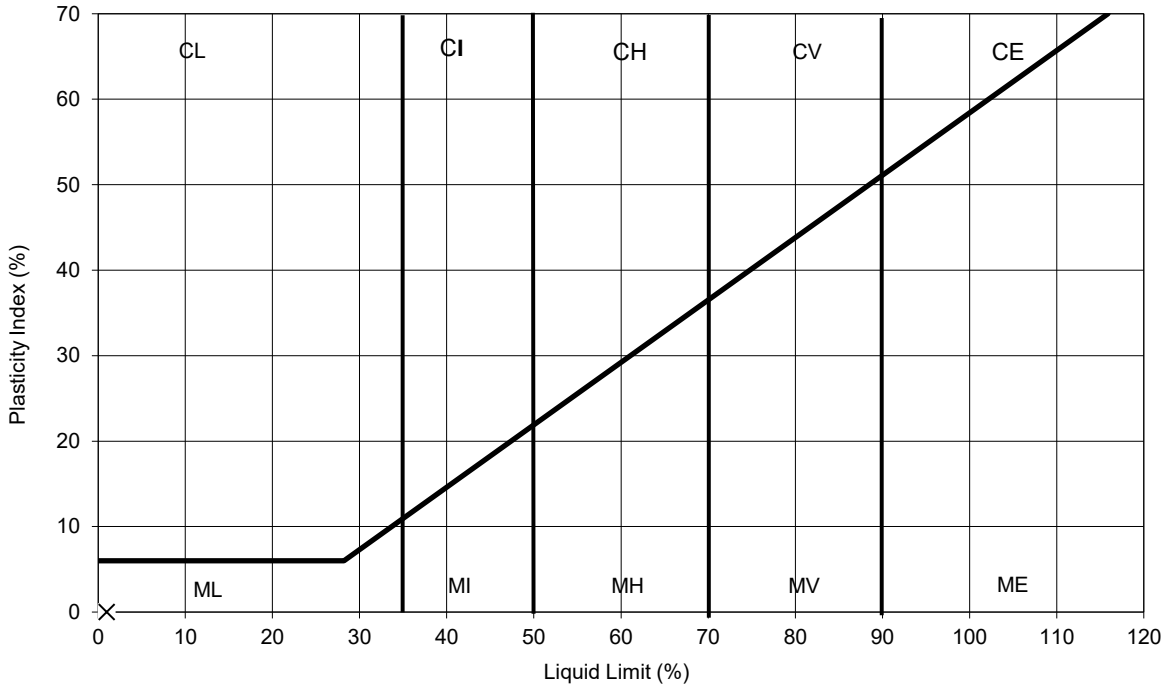


NATURAL MOISTURE CONTENT	**21**	**%**
% PASSING 425µm SIEVE	**-**	**%**
LIQUID LIMIT	**-**	**%**
PLASTIC LIMIT	**-**	**%**
PLASTICITY INDEX	**-**	**%**

Remarks

Non Plastic

PLASTICITY INDEX



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TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Checked and Approved

Initials: J.P
Date: 02/06/2023

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

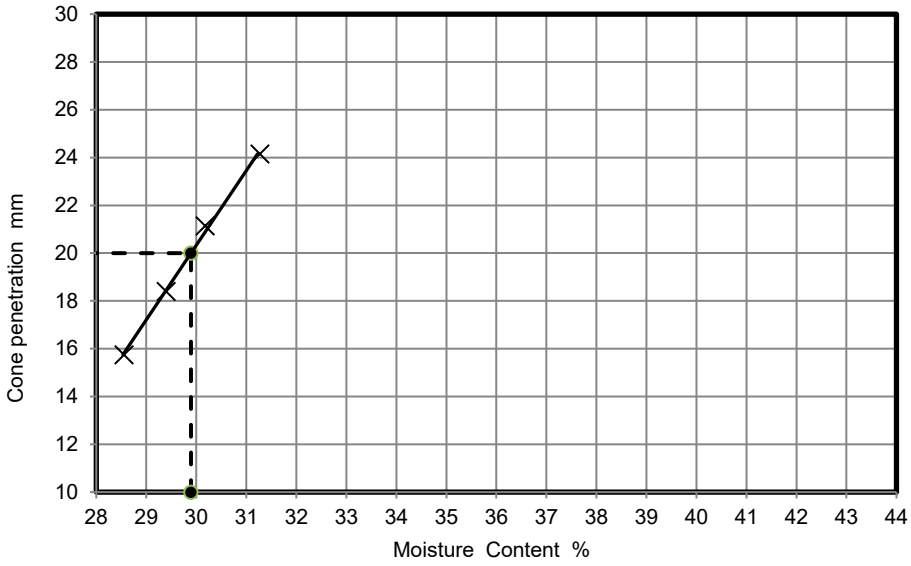
UKAS TESTING

2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

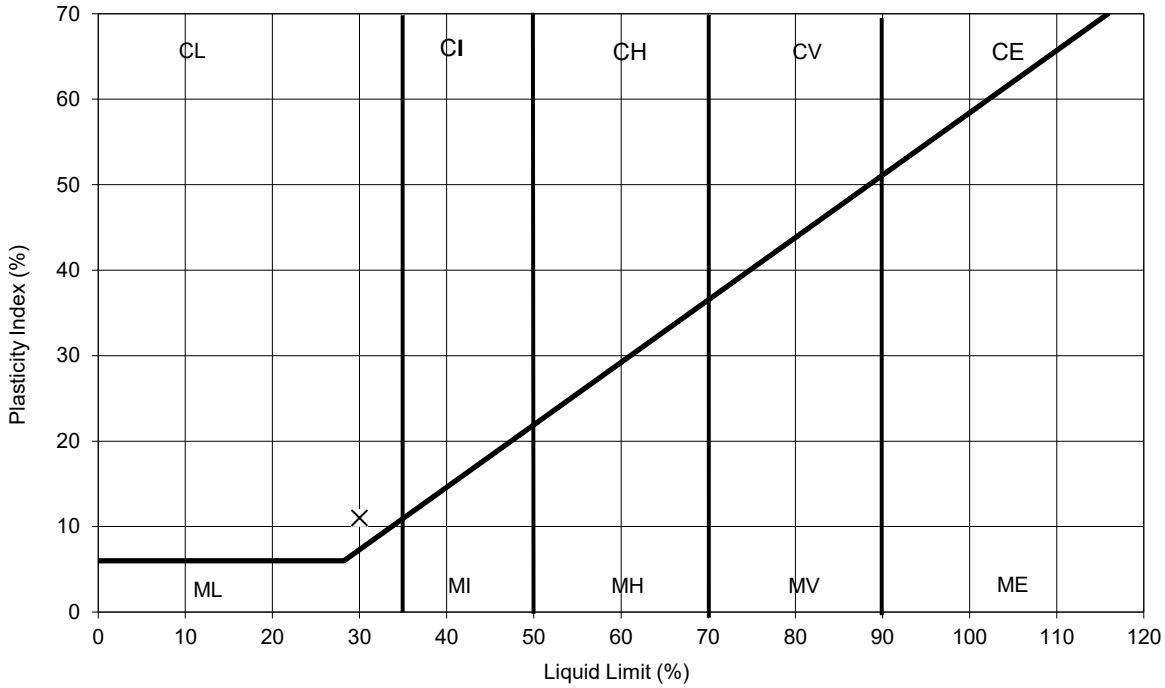
Site Name	Phoenix Wharf, Port Talbot			Job No.	33399
				Borehole/Pit No.	BH103
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	9.50 m
Soil Description	Very low strength dark grey slightly sandy silty CLAY with occasional decomposed shell fragments			Depth Base	9.95 m
				Sample Type	U
				Samples received	03/05/2023
				Schedules received	02/05/2023
				Project Started	04/05/2023
				Date Tested	19/05/2023



NATURAL MOISTURE CONTENT	**27**	**%**
% PASSING 425µm SIEVE	**97**	**%**
LIQUID LIMIT	**30**	**%**
PLASTIC LIMIT	**19**	**%**
PLASTICITY INDEX	**11**	**%**

Remarks

PLASTICITY INDEX



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BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

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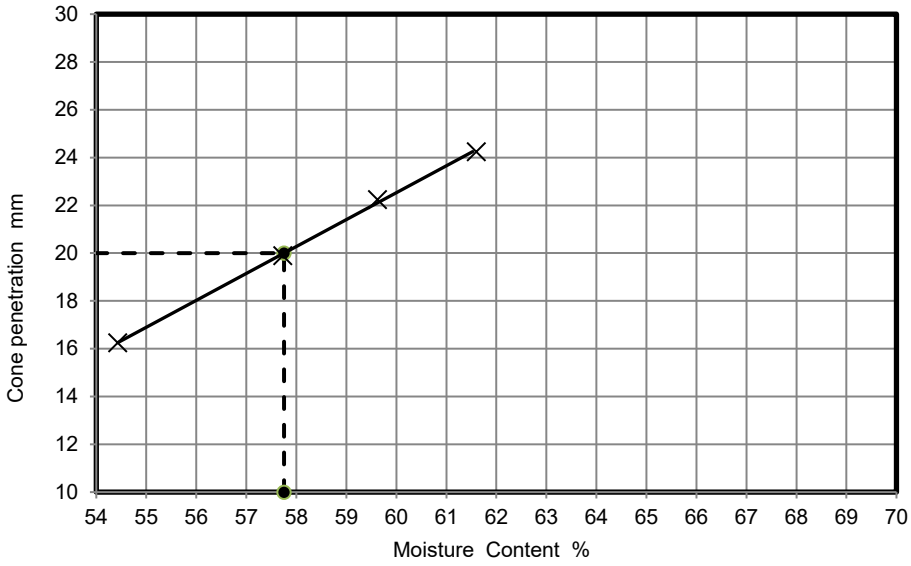
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

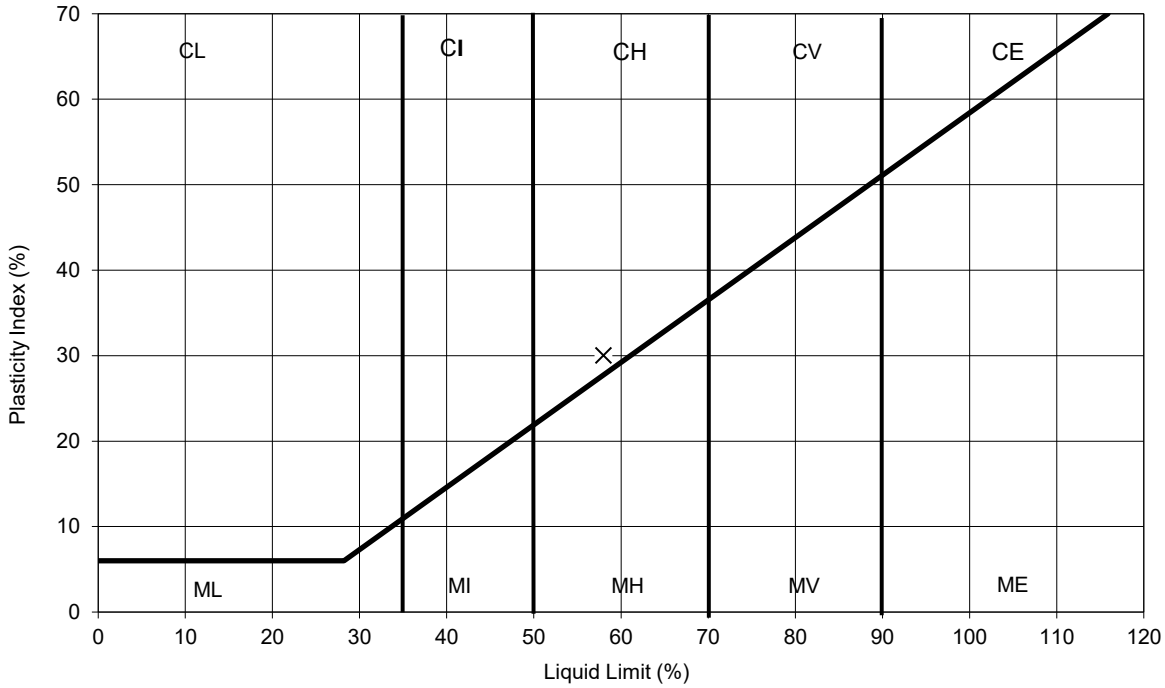
				Job No.	33399
				Borehole/Pit No.	BH106
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	5.60 m
Soil Description	Very low strength dark brownish occasionally stained black slightly sandy slightly peaty organic silty CLAY			Depth Base	6.00 m
				Sample Type	U
				Samples received	03/05/2023
				Schedules received	02/05/2023
				Project Started	04/05/2023
				Date Tested	18/05/2023



NATURAL MOISTURE CONTENT	**46**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**58**	**%**
PLASTIC LIMIT	**28**	**%**
PLASTICITY INDEX	**30**	**%**

Remarks

PLASTICITY INDEX



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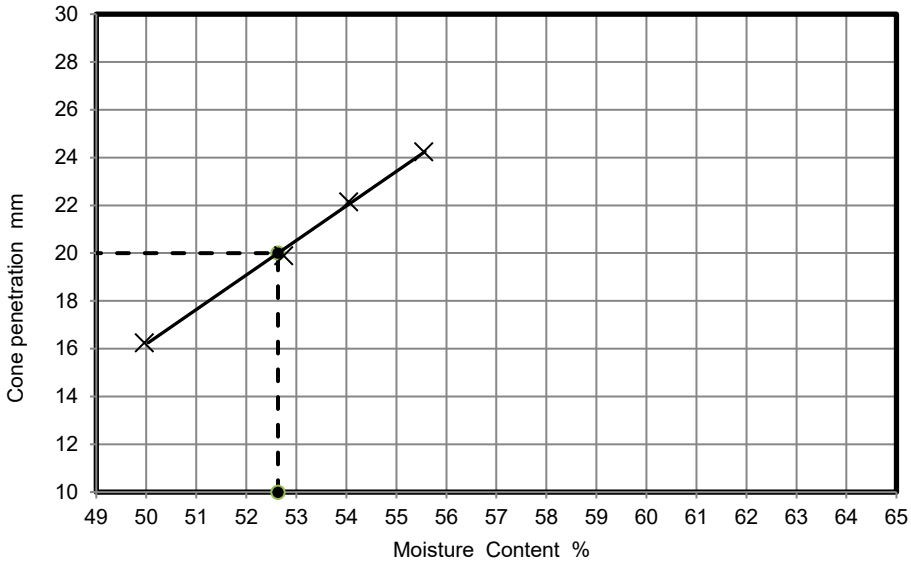
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

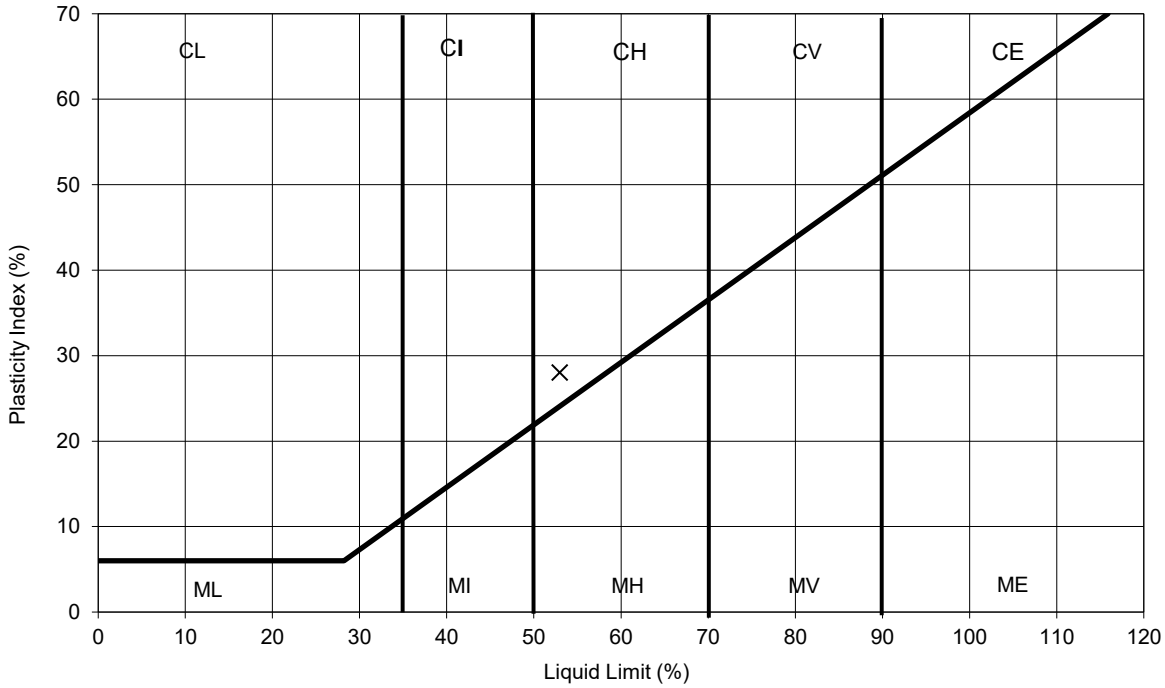
				Job No.	33399
				Borehole/Pit No.	BH117
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	6.00 m
Soil Description	Medium strength grey mottled black slightly peaty slightly sandy organic silty CLAY			Depth Base	6.40 m
				Sample Type	U
				Samples received	03/05/2023
				Schedules received	02/05/2023
				Project Started	04/05/2023
				Date Tested	18/05/2023



NATURAL MOISTURE CONTENT	**37**	**%**
% PASSING 425µm SIEVE	**99**	**%**
LIQUID LIMIT	**53**	**%**
PLASTIC LIMIT	**25**	**%**
PLASTICITY INDEX	**28**	**%**

Remarks

PLASTICITY INDEX



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BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

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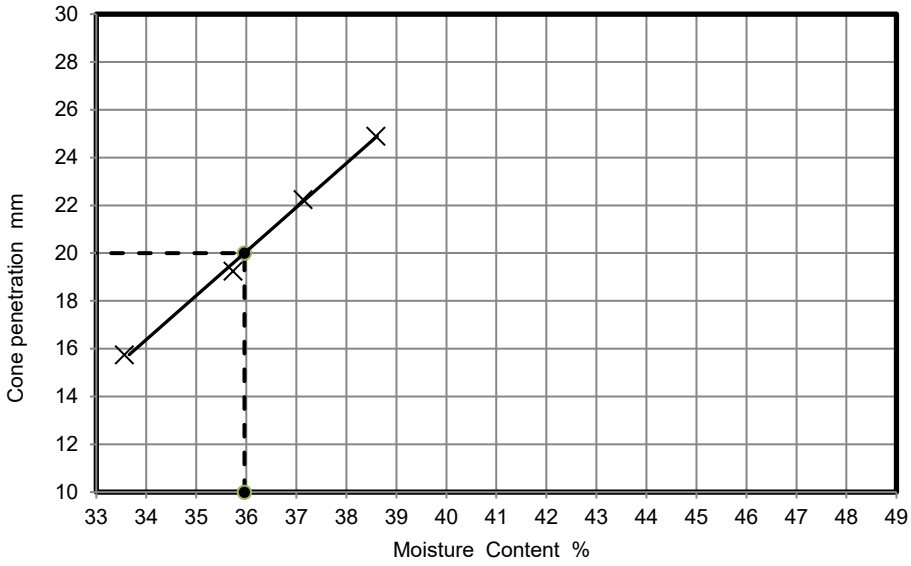
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

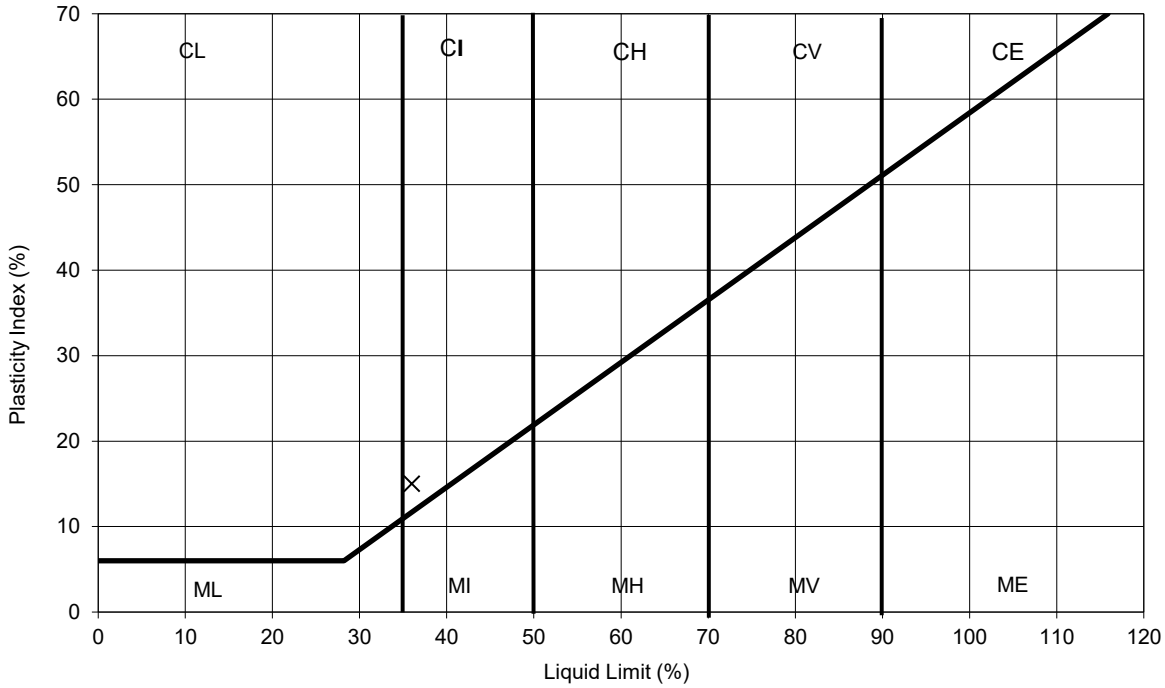
Job No.	33399				
Borehole/Pit No.	BH117				
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	9.00 m
Soil Description	Very low strength dark grey sandy silty CLAY			Depth Base	9.40 m
				Sample Type	U
				Samples received	03/05/2023
				Schedules received	02/05/2023
				Project Started	04/05/2023
				Date Tested	18/05/2023



NATURAL MOISTURE CONTENT	**28**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**36**	**%**
PLASTIC LIMIT	**21**	**%**
PLASTICITY INDEX	**15**	**%**

Remarks

PLASTICITY INDEX



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UKAS TESTING

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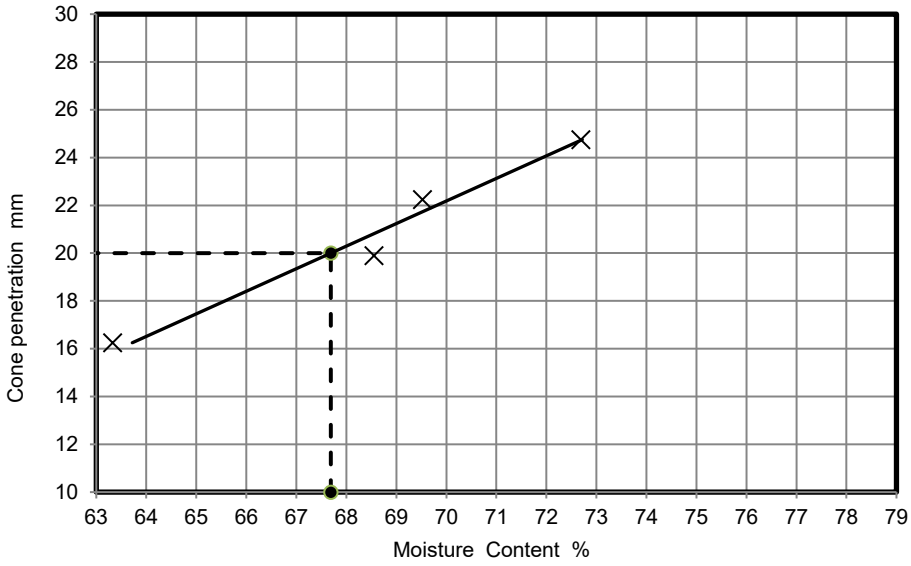
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

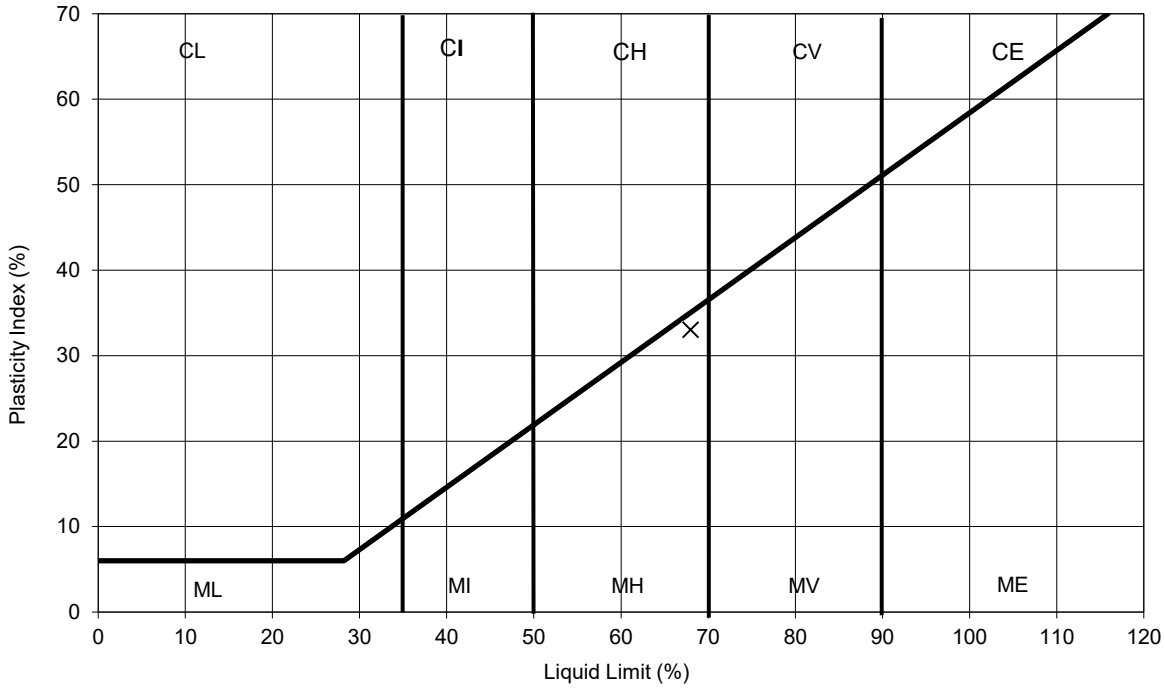
Job No.	33399				
Borehole/Pit No.	BH117				
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	11.50 m
Soil Description	Low strength grey mottled black and brown peaty slightly sandy silty CLAY with occasional pockets of decayed plant matter			Depth Base	11.90 m
				Sample Type	U
				Samples received	03/05/2023
				Schedules received	02/05/2023
				Project Started	04/05/2023
				Date Tested	18/05/2023



NATURAL MOISTURE CONTENT	**50**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**68**	**%**
PLASTIC LIMIT	**35**	**%**
PLASTICITY INDEX	**33**	**%**

Remarks

PLASTICITY INDEX



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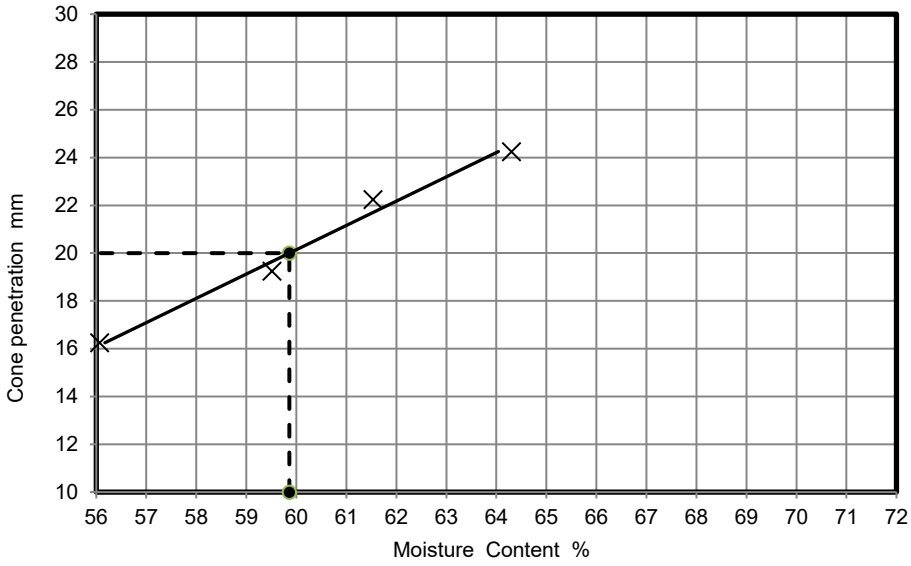
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

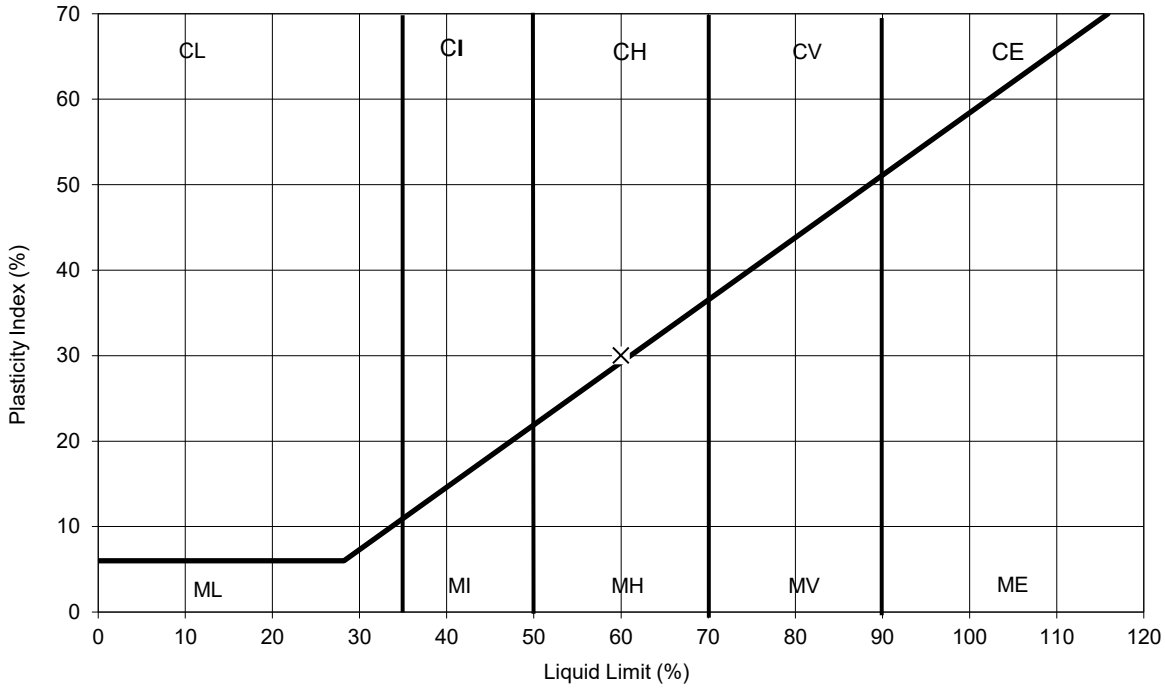
Site Name	Phoenix Wharf, Port Talbot			Job No.	33399
				Borehole/Pit No.	BH118
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	7.00 m
Soil Description	Low strength light grey mottled black sandy peaty organic silty CLAY with pockets of decayed wood			Depth Base	7.40 m
				Sample Type	U
				Samples received	03/05/2023
				Schedules received	02/05/2023
				Project Started	04/05/2023
				Date Tested	18/05/2023



NATURAL MOISTURE CONTENT	**49**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**60**	**%**
PLASTIC LIMIT	**30**	**%**
PLASTICITY INDEX	**30**	**%**

Remarks

PLASTICITY INDEX



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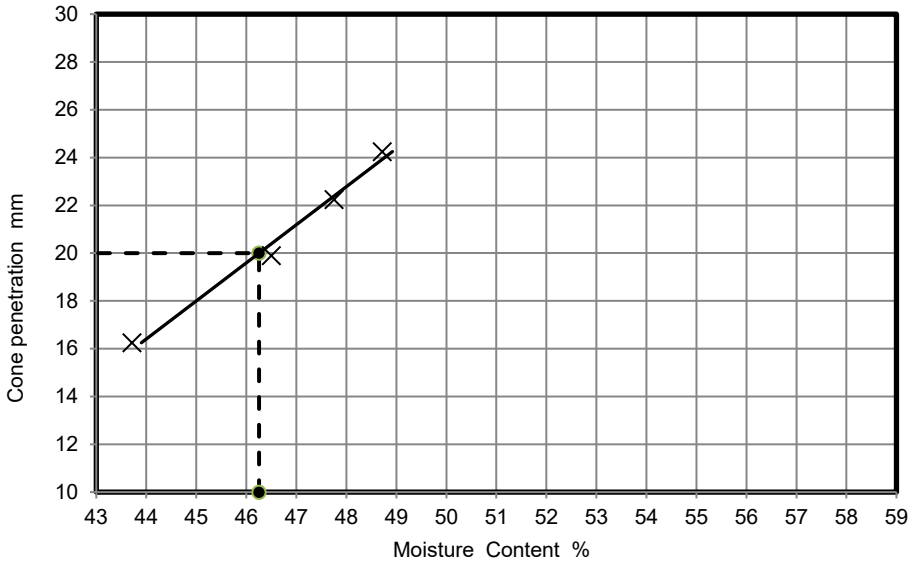
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

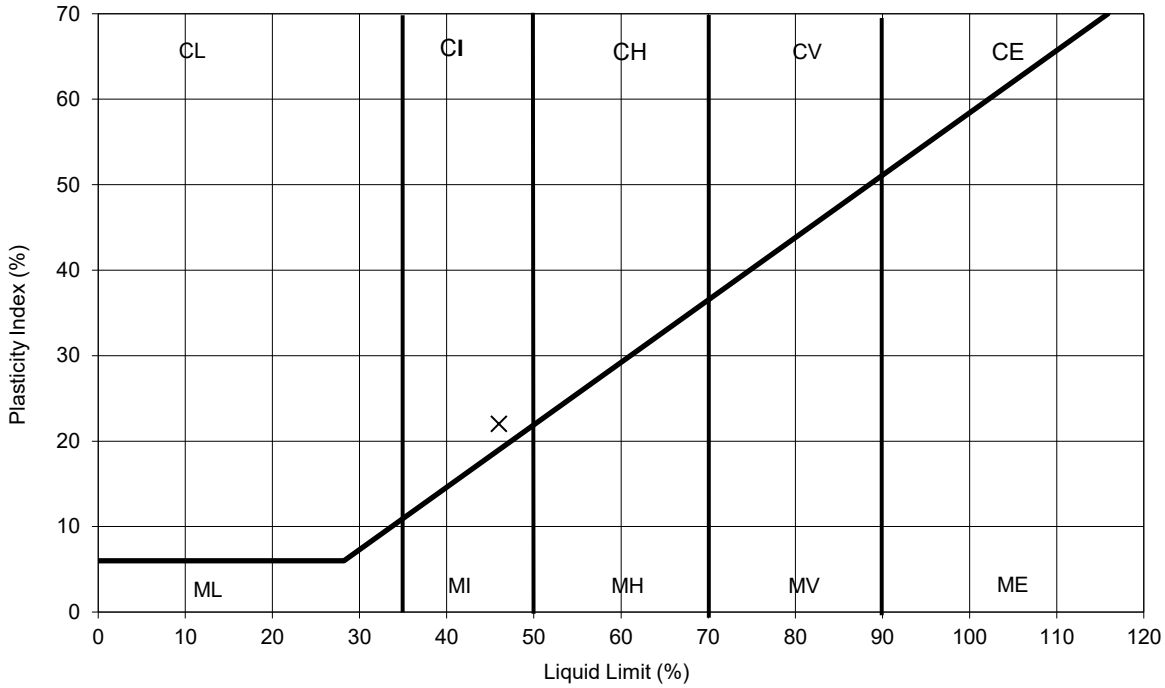
				Job No.	33399
				Borehole/Pit No.	BH118
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	10.00 m
Soil Description	Low strength dark grey slightly peaty sandy organic silty CLAY			Depth Base	10.40 m
				Sample Type	U
				Samples received	03/05/2023
				Schedules received	02/05/2023
				Project Started	04/05/2023
				Date Tested	18/05/2023



NATURAL MOISTURE CONTENT	**36**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**46**	**%**
PLASTIC LIMIT	**24**	**%**
PLASTICITY INDEX	**22**	**%**

Remarks

PLASTICITY INDEX



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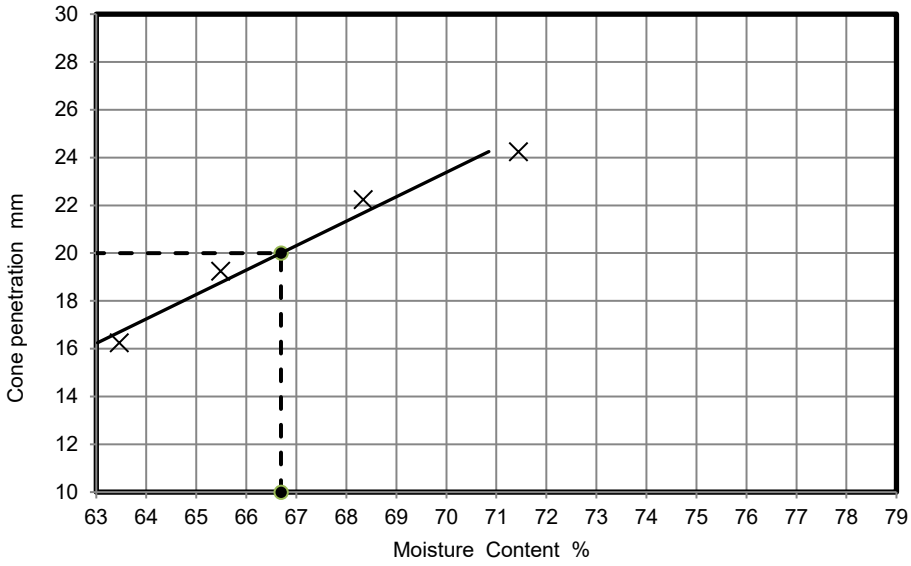
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	7.00 m
Soil Description	Very low strength black slightly sandy peaty silty CLAY			Depth Base	7.40 m
				Sample Type	U
				Samples received	03/05/2023
				Schedules received	02/05/2023
				Project Started	04/05/2023
				Date Tested	18/05/2023

Job No. 33399

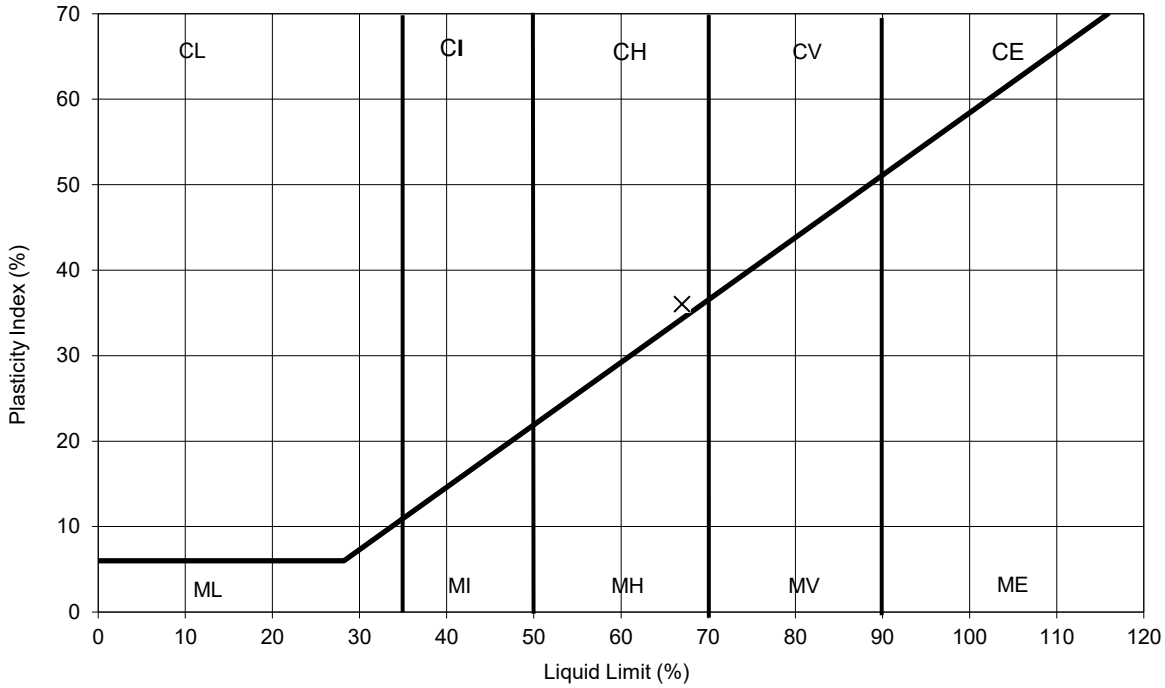
Borehole/Pit No. BH119



NATURAL MOISTURE CONTENT	**64**	**%**
% PASSING 425µm SIEVE	**90**	**%**
LIQUID LIMIT	**67**	**%**
PLASTIC LIMIT	**31**	**%**
PLASTICITY INDEX	**36**	**%**

Remarks

PLASTICITY INDEX



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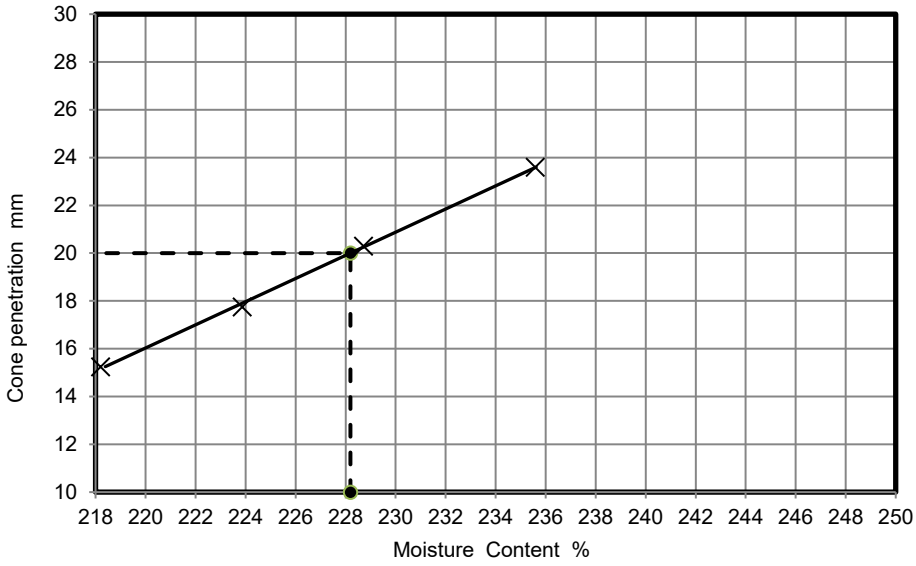
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

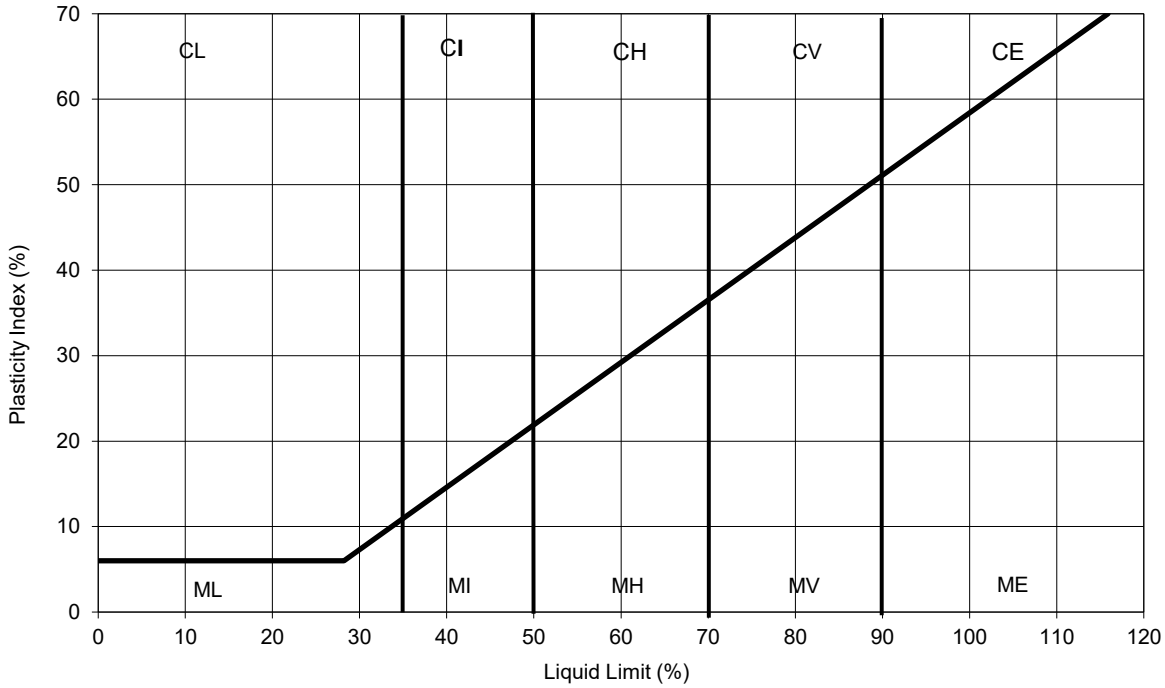
Site Name	Phoenix Wharf, Port Talbot			Job No.	33399
				Borehole/Pit No.	BH119
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	10.00 m
Soil Description	Medium strength dark grey mottled brown clayey fibrous PEAT with frequent decayed plant and wood fragments			Depth Base	10.40 m
				Sample Type	U
				Samples received	03/05/2023
				Schedules received	02/05/2023
				Project Started	04/05/2023
				Date Tested	19/05/2023



NATURAL MOISTURE CONTENT	**240**	**%**
% PASSING 425µm SIEVE	**82**	**%**
LIQUID LIMIT	**228**	**%**
PLASTIC LIMIT	**116**	**%**
PLASTICITY INDEX	**112**	**%**

Remarks

PLASTICITY INDEX



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Unconsolidated Undrained Triaxial Compression tests without measurement of pore pressure
Summary of Results

Tests carried out in accordance with BS1377:Part 7 : 1990 clause 8 or 9 as appropriate to test

Job No.	Project Name	Programme	
33399	Phoenix Wharf, Port Talbot	Samples received	03/05/2023
		Schedule received	02/05/2023
Project No.	Client	Project started	04/05/2023
2111006.005	TEC	Testing Started	16/05/2023

Hole No.	Sample Ref	Top m	Base m	Type	Soil Description	Test Type	Density bulk Mg/m3	Density dry Mg/m3	w %	Length mm	Diameter mm	σ3 kPa	At failure: Axial strain %	At failure: σ1 - σ3 kPa	At failure: cu kPa	At failure: Mode	Remarks
BH103	-	4.00	4.45	U	Very low strength dark grey clayey SAND with rare lumps of dark grey clay at base of sample	UUM	1.90	1.53	24	198	103	45 90 180	12.1 16.2 18.7	33 37 42	16 19 21	P	
BH103	-	9.50	9.95	U	Very low strength dark grey slightly sandy silty CLAY with occasional decomposed shell fragments	UUM	1.93	1.27	52	198	103	80 160 320	17.2 18.7 20.2	8 9 10	4 4 5	P	
BH106	-	5.60	6.00	U	Very low strength dark brownish occasionally stained black slightly sandy slightly peaty organic silty CLAY	UUM	1.68	1.14	47	198	103	50 100 200	12.6 15.2 18.2	15 16 16	8 8 8	C	
BH117	-	6.00	6.40	U	Medium strength grey mottled black slightly peaty slightly sandy organic silty CLAY	UUM	1.89	1.48	28	198	103	55 110 220	17.2 18.7 20.2	102 103 105	51 52 53	C	
BH117	-	9.00	9.40	U	Very low strength dark grey sandy silty CLAY	UUM	1.93	1.50	29	198	103	85 170 340	11.6 14.1 15.2	27 28 28	13 14 14	C	
BH117	-	11.50	11.90	U	Low strength grey mottled black and brown peaty slightly sandy silty CLAY with occasional pockets of decayed plant matter	UUM	1.65	1.11	49	198	103	100 200 400	15.7 18.2 19.7	47 48 49	23 24 25	C	
BH118	-	7.00	7.40	U	Low strength light grey mottled black sandy peaty organic silty CLAY with pockets of decayed wood	UUM	1.83	1.10	67	198	103	65 130 260	17.2 18.7 20.2	56 57 61	28 29 30	C	
BH118	-	10.00	10.40	U	Low strength dark grey slightly peaty sandy organic silty CLAY	UUM	1.81	1.32	37	198	103	95 190 380	17.2 18.7 19.7	47 49 53	23 24 26	C	
BH119	-	7.00	7.40	U	Very low strength black slightly sandy peaty silty CLAY	UUM	1.64	1.03	59	198	102	65 130 260	9.6 13.6 19.7	14 15 15	7 7 7	C	
BH119	-	10.00	10.40	U	Medium strength dark grey mottled brown clayey fibrous PEAT with frequent decayed plant and wood fragments	UUM	1.08	0.25	327	198	103	95 190 380	14.6 16.7 18.7	94 102 108	47 51 54	C	

Legend
UU - single stage test (single and multiple specimens) — σ3 Cell pressure — Mode of failure ; B - Brittle
UUM - Multistage test on a single specimen — σ1 - σ3 Maximum corrected deviator stress — P - Plastic
suffix R - remoulded or recompacted — cu Undrained shear strength, ½ (σ1 - σ3) — C - Compound

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Unit 8 Olds Close Olds Approach
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Checked and Approved

Initials: J.P
Date: 02/06/2023

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Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - Multistage test

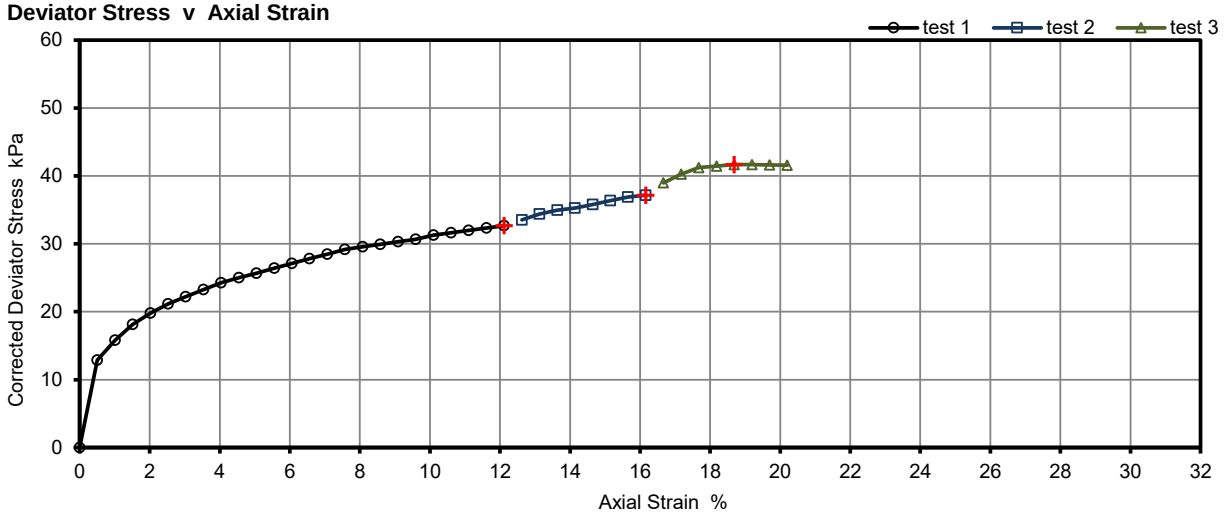
Site Name	Phoenix Wharf, Port Talbot			Job Ref	33399
				Borehole/Pit No.	BH103
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	4.00 m
Soil Description	Very low strength dark grey clayey SAND with rare lumps of dark grey clay at base of sample			Depth Base	4.45 m
				Sample Type	U
				Samples received	03/05/2023
				Schedules received	02/05/2023
Test Method	BS1377:Part 7:1990, clause 9, multistage test on a single specimen			Date of test	16/05/2023

Remarks

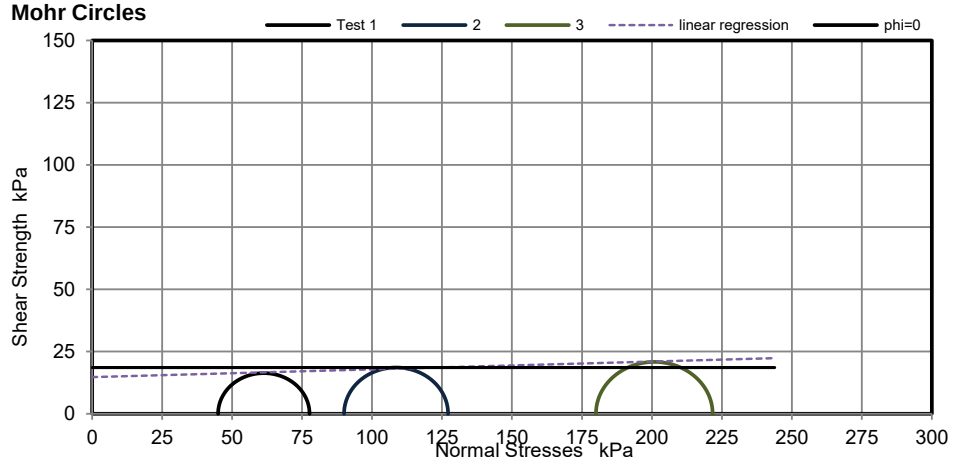
Length	mm	198.0		
Diameter	mm	103.0		
Bulk Density	Mg/m3	1.90		
Moisture Content	%	24		
Dry Density	Mg/m3	1.53		
Rate of Strain	%/min	2.00		
Stage Number		1	2	3
Cell Pressure	kPa	45	90	180
Axial Strain	%	12	16	19
Deviator Stress, (σ1 - σ3)f	kPa	33	37	42
Shear strength, cu	kPa	16	19	21
Mode of failure		Plastic		

Position within sample

Deviator Stress v Axial Strain



Mohr Circles



ϕu = 0

Average cu 19 kPa

Linear Regression

ϕu 1.8 °

cu 15 kPa

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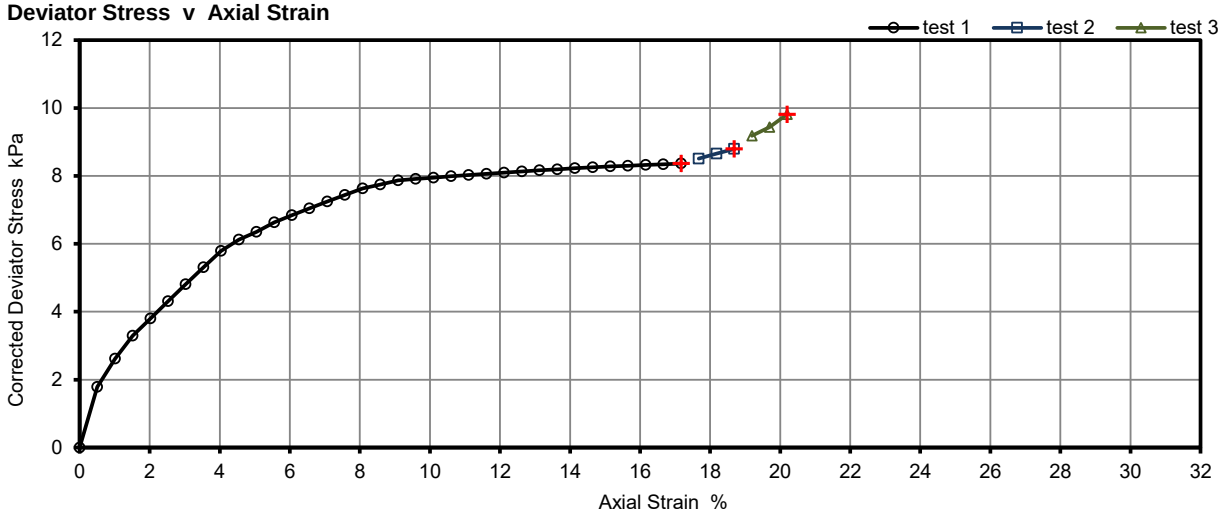
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - Multistage test			Job Ref	33399
				Borehole/Pit No.	BH103
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	9.50 m
Soil Description	Very low strength dark grey slightly sandy silty CLAY with occasional decomposed shell fragments			Depth Base	9.95 m
				Sample Type	U
				Samples received	03/05/2023
				Schedules received	02/05/2023
Test Method	BS1377:Part 7:1990, clause 9, multistage test on a single specimen			Date of test	16/05/2023

Remarks

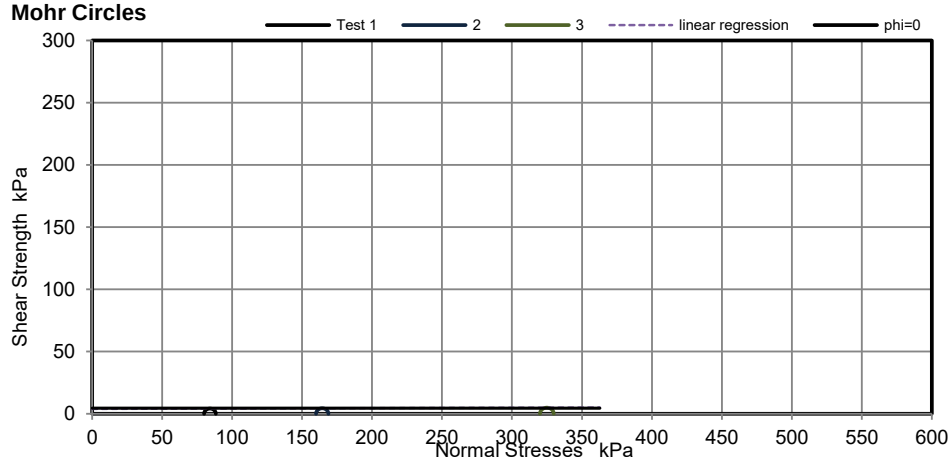
Length	mm	198.0		
Diameter	mm	103.0		
Bulk Density	Mg/m3	1.93		
Moisture Content	%	52		
Dry Density	Mg/m3	1.27		
Rate of Strain	%/min	2.00		
Stage Number		1	2	3
Cell Pressure	kPa	80	160	320
Axial Strain	%	17	19	20
Deviator Stress, (σ1 - σ3)f	kPa	8.4	8.8	9.8
Shear strength, cu	kPa	4.2	4.4	4.9
Mode of failure		Plastic		

Position within sample

Deviator Stress v Axial Strain



Mohr Circles



ϕu = 0

Average cu 4 kPa

Linear Regression

ϕu 0.2 °

cu 4 kPa

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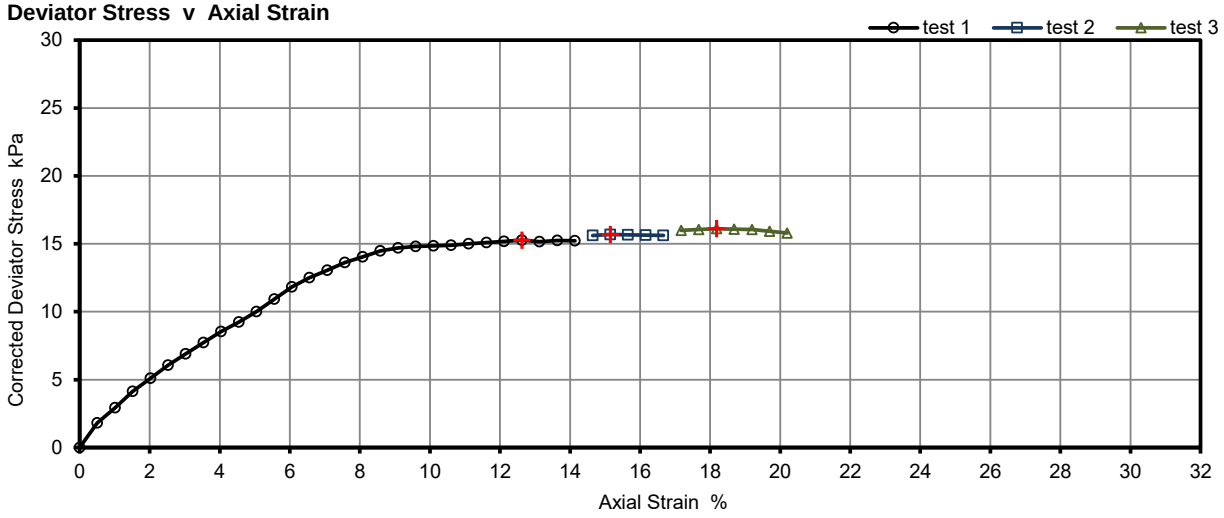
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - Multistage test			Job Ref	33399
				Borehole/Pit No.	BH106
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	5.60 m
Soil Description	Very low strength dark brownish occasionally stained black slightly sandy slightly peaty organic silty CLAY			Depth Base	6.00 m
				Sample Type	U
				Samples received	03/05/2023
				Schedules received	02/05/2023
Test Method	BS1377:Part 7:1990, clause 9, multistage test on a single specimen			Date of test	16/05/2023

Remarks

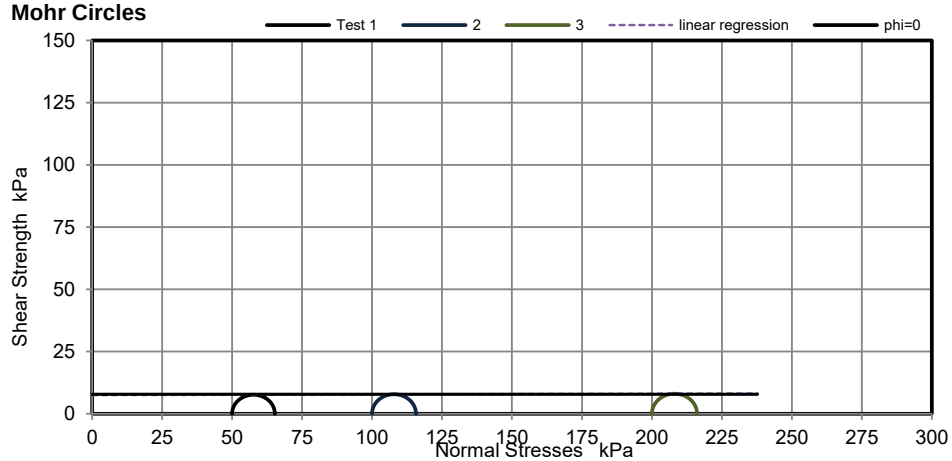
Length	mm	198.0		
Diameter	mm	103.0		
Bulk Density	Mg/m3	1.68		
Moisture Content	%	47		
Dry Density	Mg/m3	1.14		
Rate of Strain	%/min	2.00		
Stage Number		1	2	3
Cell Pressure	kPa	50	100	200
Axial Strain	%	13	15	18
Deviator Stress, (σ1 - σ3)f	kPa	15	16	16
Shear strength, cu	kPa	7.6	7.8	8.1
Mode of failure		Compound		

Position within sample

Deviator Stress v Axial Strain



Mohr Circles



ϕu = 0

Average cu 8 kPa

Linear Regression

ϕu 0.2 °

cu 8 kPa

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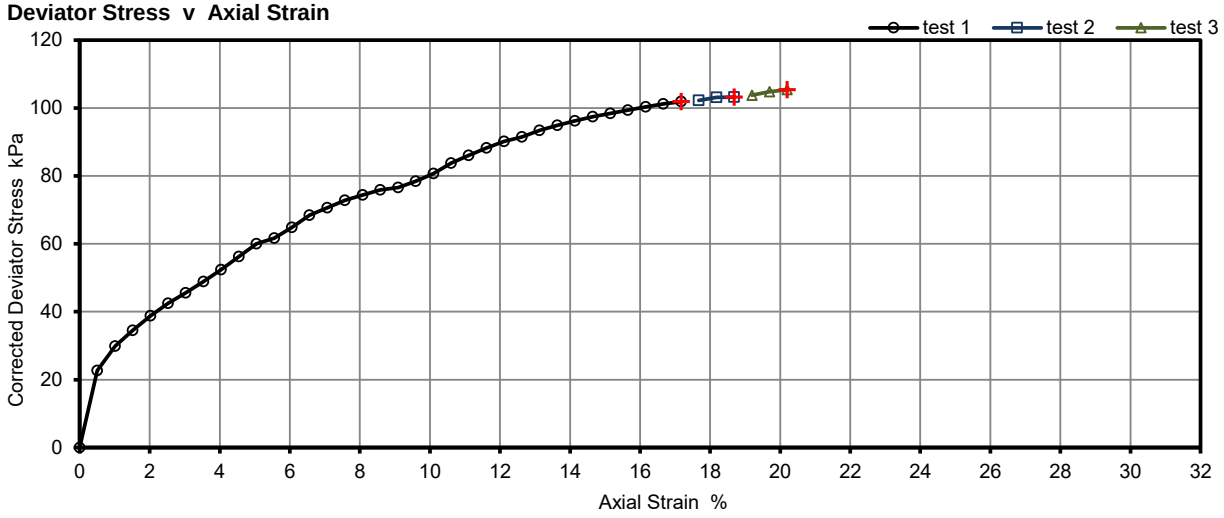
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - Multistage test			Job Ref	33399
				Borehole/Pit No.	BH117
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	6.00 m
Soil Description	Medium strength grey mottled black slightly peaty slightly sandy organic silty CLAY			Depth Base	6.40 m
				Sample Type	U
				Samples received	03/05/2023
				Schedules received	02/05/2023
Test Method	BS1377:Part 7:1990, clause 9, multistage test on a single specimen			Date of test	16/05/2023

Remarks

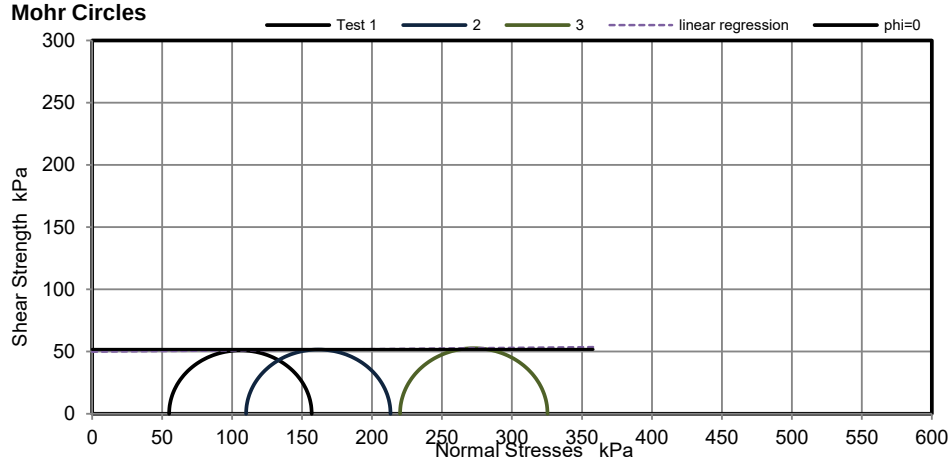
Length	mm	198.0		
Diameter	mm	103.0		
Bulk Density	Mg/m3	1.89		
Moisture Content	%	28		
Dry Density	Mg/m3	1.48		
Rate of Strain	%/min	2.00		
Stage Number		1	2	3
Cell Pressure	kPa	55	110	220
Axial Strain	%	17	19	20
Deviator Stress, (σ1 - σ3)f	kPa	102	103	105
Shear strength, cu	kPa	51	52	53
Mode of failure		Compound		

Position within sample

Deviator Stress v Axial Strain



Mohr Circles



ϕu = 0

Average cu 52 kPa

Linear Regression

ϕu 0.6 °

cu 50 kPa

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Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - Multistage test

Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	9.00 m
Soil Description	Very low strength dark grey sandy silty CLAY			Depth Base	9.40 m
				Sample Type	U
				Samples received	03/05/2023
				Schedules received	02/05/2023
Test Method	BS1377:Part 7:1990, clause 9, multistage test on a single specimen			Date of test	16/05/2023

Job Ref: 33399

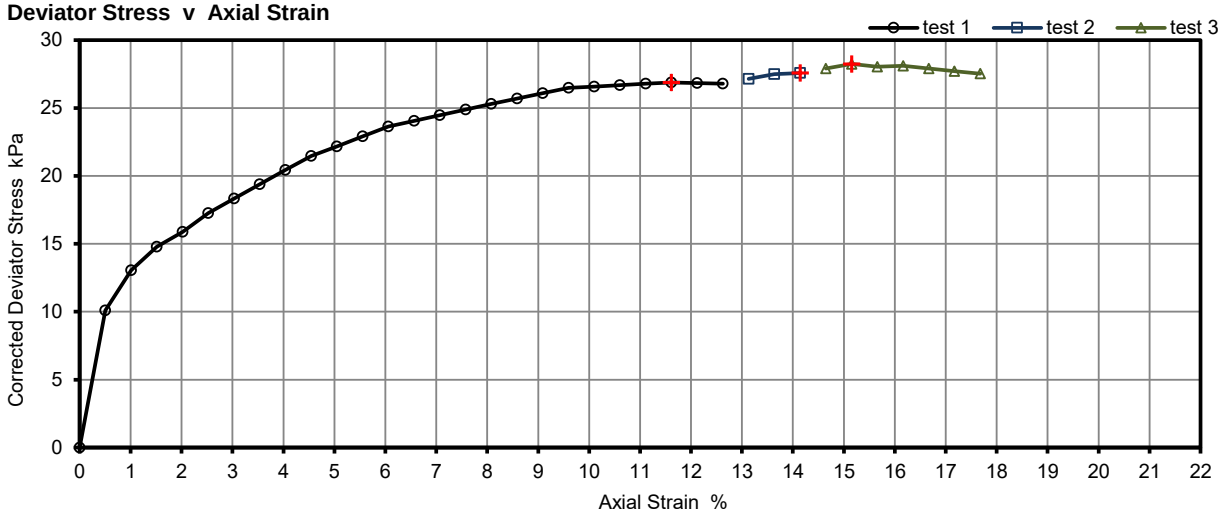
Borehole/Pit No.: BH117

Remarks

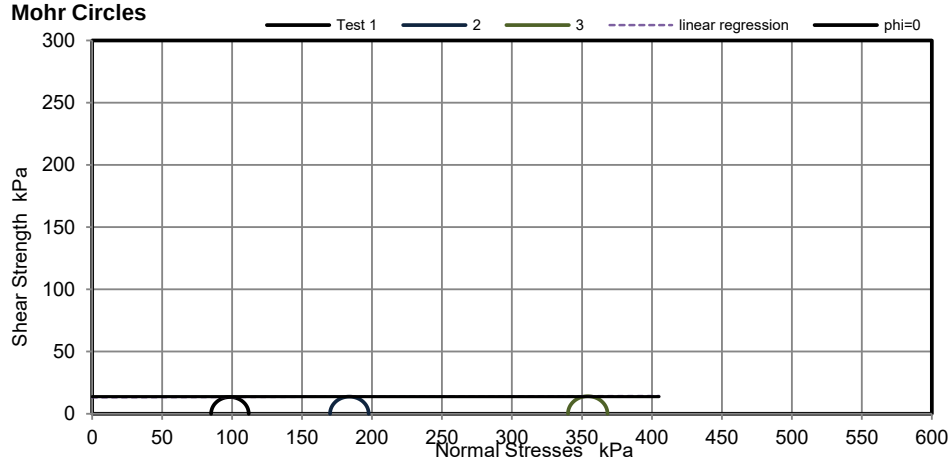
Position within sample

Length	mm	198.0		
Diameter	mm	103.0		
Bulk Density	Mg/m3	1.93		
Moisture Content	%	29		
Dry Density	Mg/m3	1.50		
Rate of Strain	%/min	2.00		
Stage Number		1	2	3
Cell Pressure	kPa	85	170	340
Axial Strain	%	12	14	15
Deviator Stress, (σ1 - σ3)f	kPa	27	28	28
Shear strength, cu	kPa	13	14	14
Mode of failure		Compound		

Deviator Stress v Axial Strain



Mohr Circles



ϕu = 0

Average cu 14 kPa

Linear Regression

ϕu 0.1 °

cu 13 kPa

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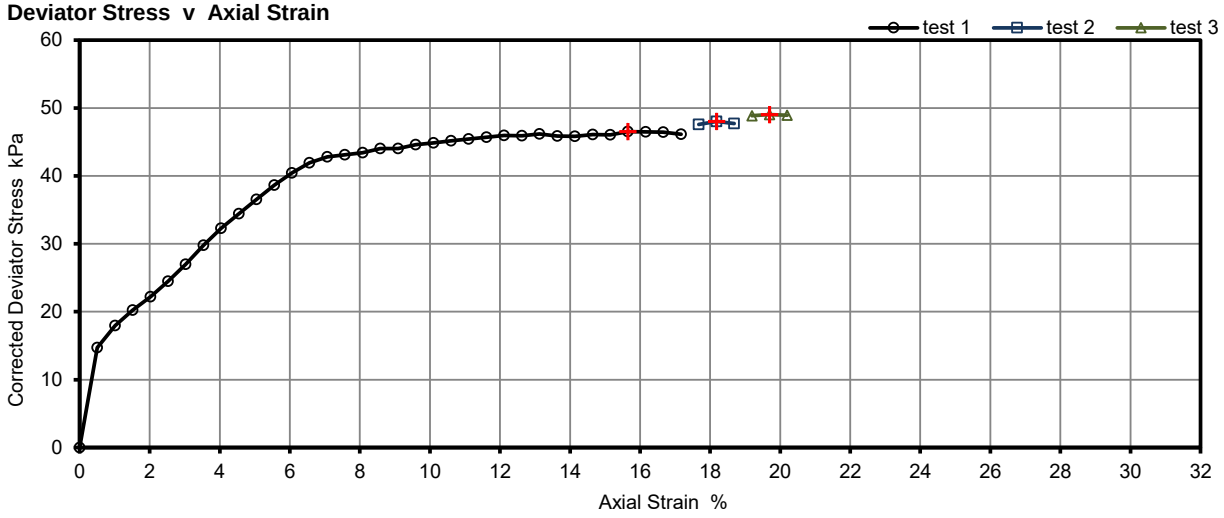
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - Multistage test			Job Ref	33399
				Borehole/Pit No.	BH117
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	11.50 m
Soil Description	Low strength grey mottled black and brown peaty slightly sandy silty CLAY with occasional pockets of decayed plant matter			Depth Base	11.90 m
				Sample Type	U
				Samples received	03/05/2023
				Schedules received	02/05/2023
Test Method	BS1377:Part 7:1990, clause 9, multistage test on a single specimen			Date of test	16/05/2023

Remarks

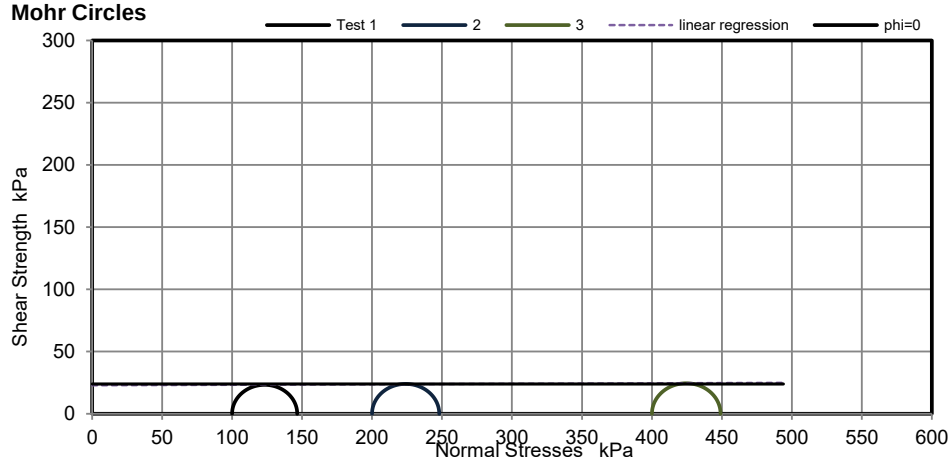
Length	mm	198.0		
Diameter	mm	103.0		
Bulk Density	Mg/m3	1.65		
Moisture Content	%	49		
Dry Density	Mg/m3	1.11		
Rate of Strain	%/min	2.00		
Stage Number		1	2	3
Cell Pressure	kPa	100	200	400
Axial Strain	%	16	18	20
Deviator Stress, (σ1 - σ3)f	kPa	47	48	49
Shear strength, cu	kPa	23	24	25
Mode of failure		Compound		

Position within sample

Deviator Stress v Axial Strain



Mohr Circles



ϕu = 0

Average cu 24 kPa

Linear Regression

ϕu 0.2 °

cu 23 kPa

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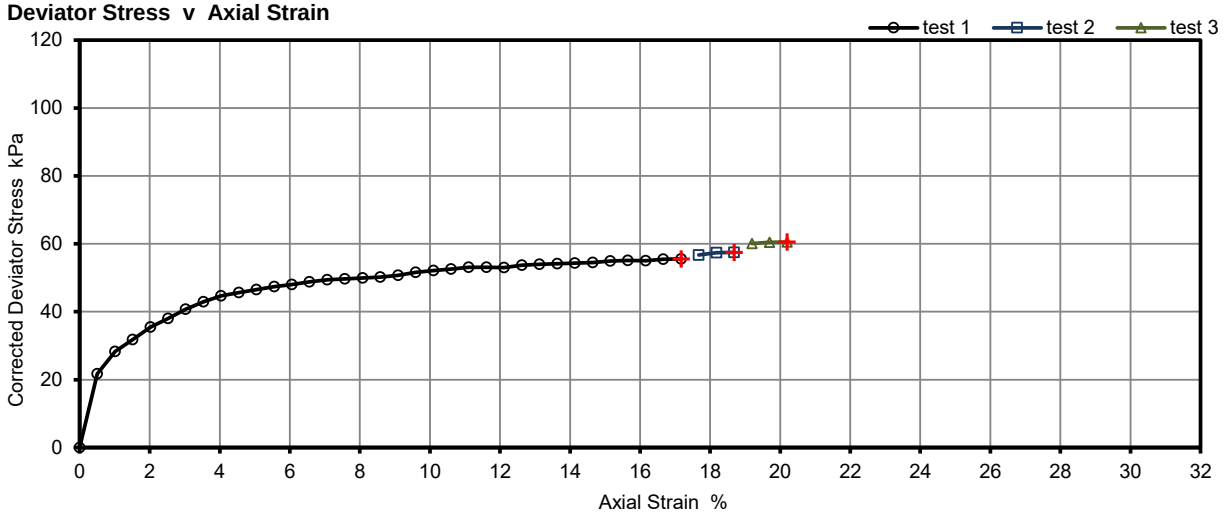
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - Multistage test			Job Ref	33399
				Borehole/Pit No.	BH118
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	7.00 m
Soil Description	Low strength light grey mottled black sandy peaty organic silty CLAY with pockets of decayed wood			Depth Base	7.40 m
				Sample Type	U
				Samples received	03/05/2023
				Schedules received	02/05/2023
Test Method	BS1377:Part 7:1990, clause 9, multistage test on a single specimen			Date of test	16/05/2023

Remarks

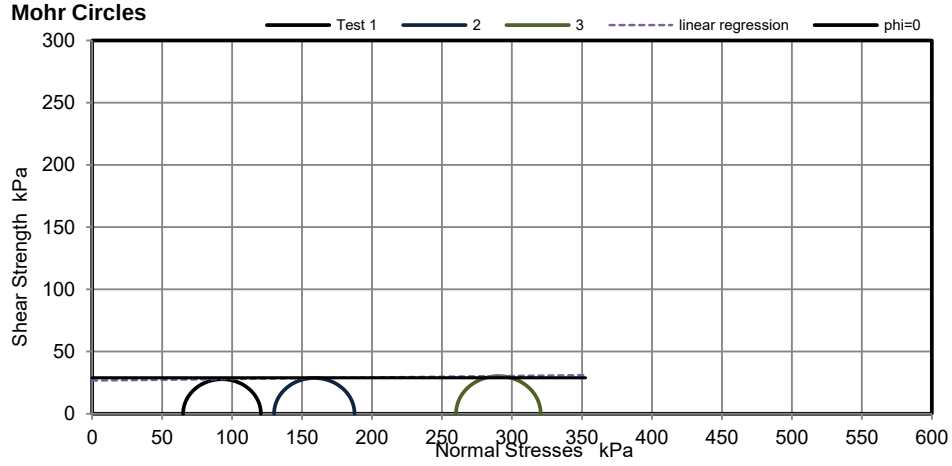
Length	mm	198.0		
Diameter	mm	103.0		
Bulk Density	Mg/m3	1.83		
Moisture Content	%	67		
Dry Density	Mg/m3	1.10		
Rate of Strain	%/min	2.00		
Stage Number		1	2	3
Cell Pressure	kPa	65	130	260
Axial Strain	%	17	19	20
Deviator Stress, (σ1 - σ3)f	kPa	56	57	61
Shear strength, cu	kPa	28	29	30
Mode of failure		Compound		

Position within sample

Deviator Stress v Axial Strain



Mohr Circles



ϕu = 0

Average cu 29 kPa

Linear Regression

ϕu 0.7 °

cu 27 kPa

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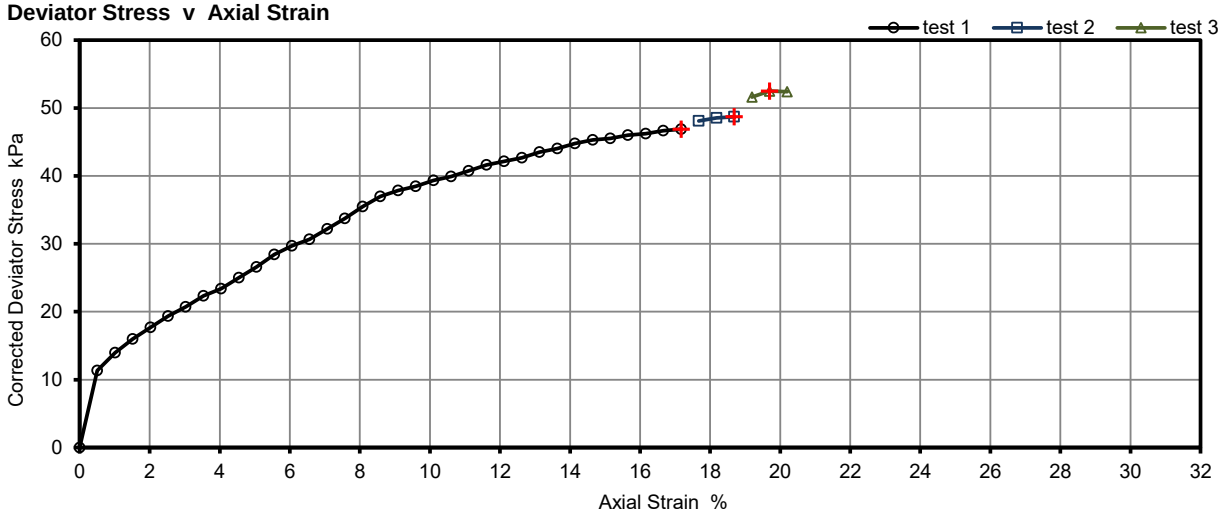
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - Multistage test			Job Ref	33399
				Borehole/Pit No.	BH118
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	10.00 m
Soil Description	Low strength dark grey slightly peaty sandy organic silty CLAY			Depth Base	10.40 m
				Sample Type	U
				Samples received	03/05/2023
				Schedules received	02/05/2023
Test Method	BS1377:Part 7:1990, clause 9, multistage test on a single specimen			Date of test	17/05/2023

Remarks

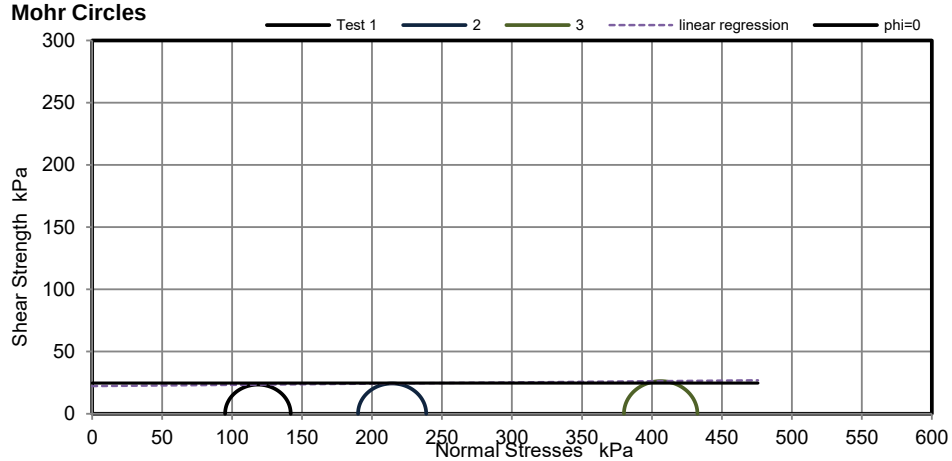
Length	mm	198.0		
Diameter	mm	103.0		
Bulk Density	Mg/m3	1.81		
Moisture Content	%	37		
Dry Density	Mg/m3	1.32		
Rate of Strain	%/min	2.00		
Stage Number		1	2	3
Cell Pressure	kPa	95	190	380
Axial Strain	%	17	19	20
Deviator Stress, (σ1 - σ3)f	kPa	47	49	53
Shear strength, cu	kPa	23	24	26
Mode of failure		Compound		

Position within sample

Deviator Stress v Axial Strain



Mohr Circles



ϕu = 0

Average cu 25 kPa

Linear Regression

ϕu 0.6 °

cu 22 kPa

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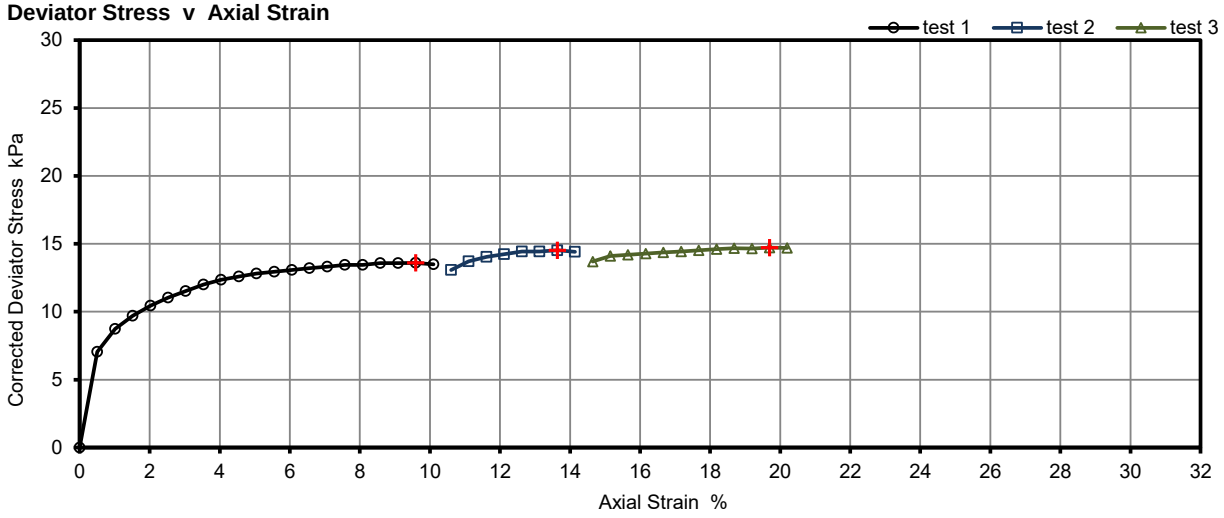
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - Multistage test			Job Ref	33399
				Borehole/Pit No.	BH119
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	7.00 m
Soil Description	Very low strength black slightly sandy peaty silty CLAY			Depth Base	7.40 m
				Sample Type	U
				Samples received	03/05/2023
				Schedules received	02/05/2023
Test Method	BS1377:Part 7:1990, clause 9, multistage test on a single specimen			Date of test	17/05/2023

Remarks

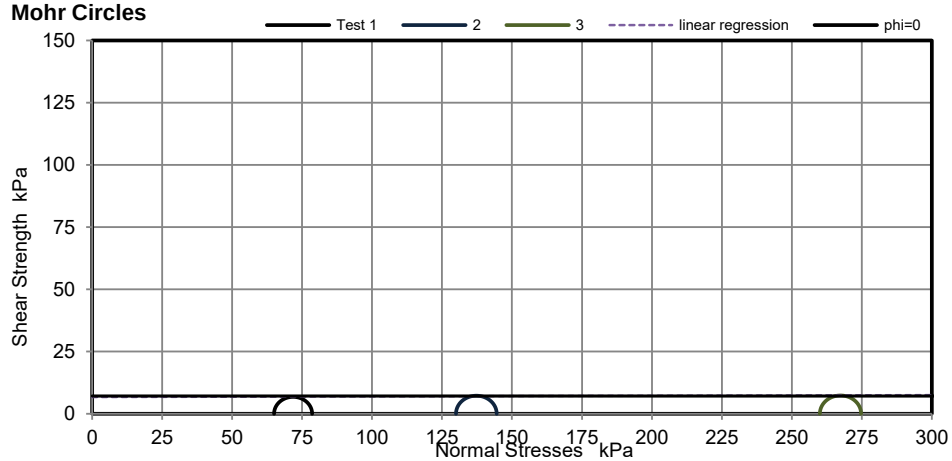
Length	mm	198.0		
Diameter	mm	102.0		
Bulk Density	Mg/m3	1.64		
Moisture Content	%	59		
Dry Density	Mg/m3	1.03		
Rate of Strain	%/min	2.00		
Stage Number		1	2	3
Cell Pressure	kPa	65	130	260
Axial Strain	%	9.6	14	20
Deviator Stress, (σ1 - σ3)f	kPa	14	15	15
Shear strength, cu	kPa	6.8	7.3	7.4
Mode of failure		Compound		

Position within sample

Deviator Stress v Axial Strain



Mohr Circles



ϕu = 0

Average cu 7 kPa

Linear Regression

ϕu 0.1 °

cu 7 kPa

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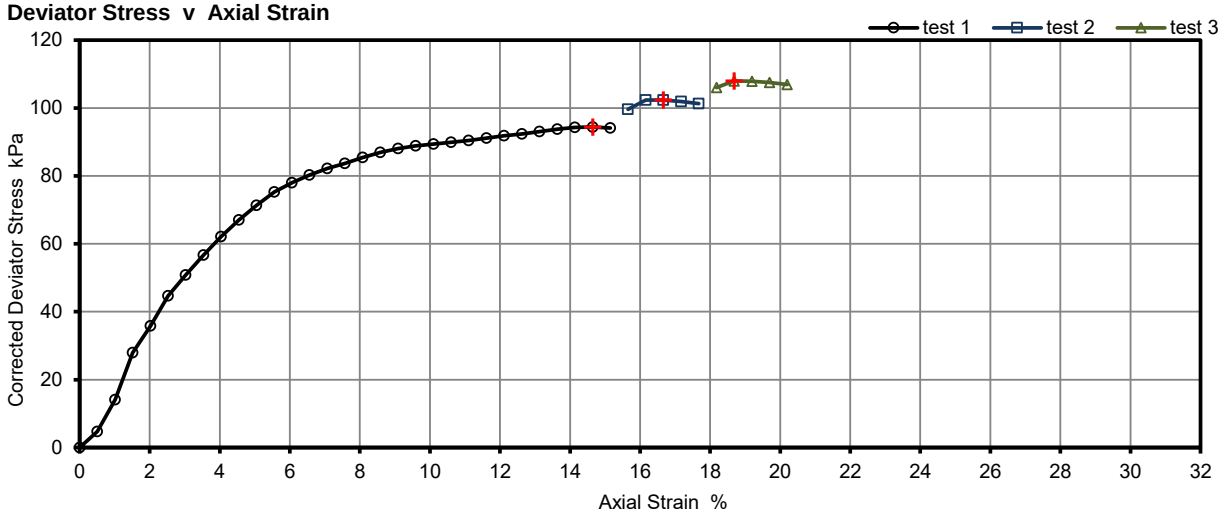
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - Multistage test			Job Ref	33399
				Borehole/Pit No.	BH119
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	10.00 m
Soil Description	Medium strength dark grey mottled brown clayey fibrous PEAT with frequent decayed plant and wood fragments			Depth Base	10.40 m
				Sample Type	U
				Samples received	03/05/2023
				Schedules received	02/05/2023
Test Method	BS1377:Part 7:1990, clause 9, multistage test on a single specimen			Date of test	17/05/2023

Remarks

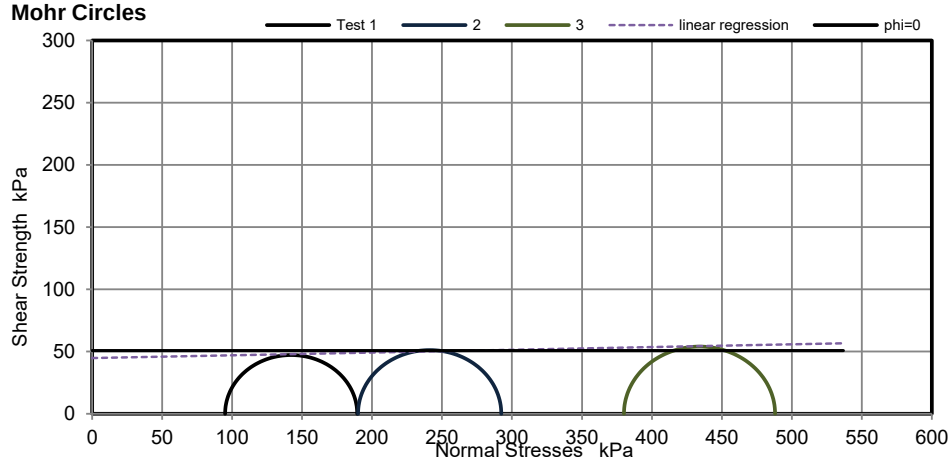
Length	mm	198.0		
Diameter	mm	103.0		
Bulk Density	Mg/m3	1.08		
Moisture Content	%	327		
Dry Density	Mg/m3	0.25		
Rate of Strain	%/min	2.00		
Stage Number		1	2	3
Cell Pressure	kPa	95	190	380
Axial Strain	%	15	17	19
Deviator Stress, (σ1 - σ3)f	kPa	94	102	108
Shear strength, cu	kPa	47	51	54
Mode of failure		Compound		

Position within sample

Deviator Stress v Axial Strain



Mohr Circles



ϕu = 0

Average cu 51 kPa

Linear Regression

ϕu 1.3 °

cu 45 kPa

Mohr circles and their interpretation is not covered by BS1377. These are provided for information only.

Test Report by K4 SOILS LABORATORY
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Tel: 01923 711 288 Email: James@k4soils.com

Checked and Approved

Initials: J.P

Date: 02/06/2023

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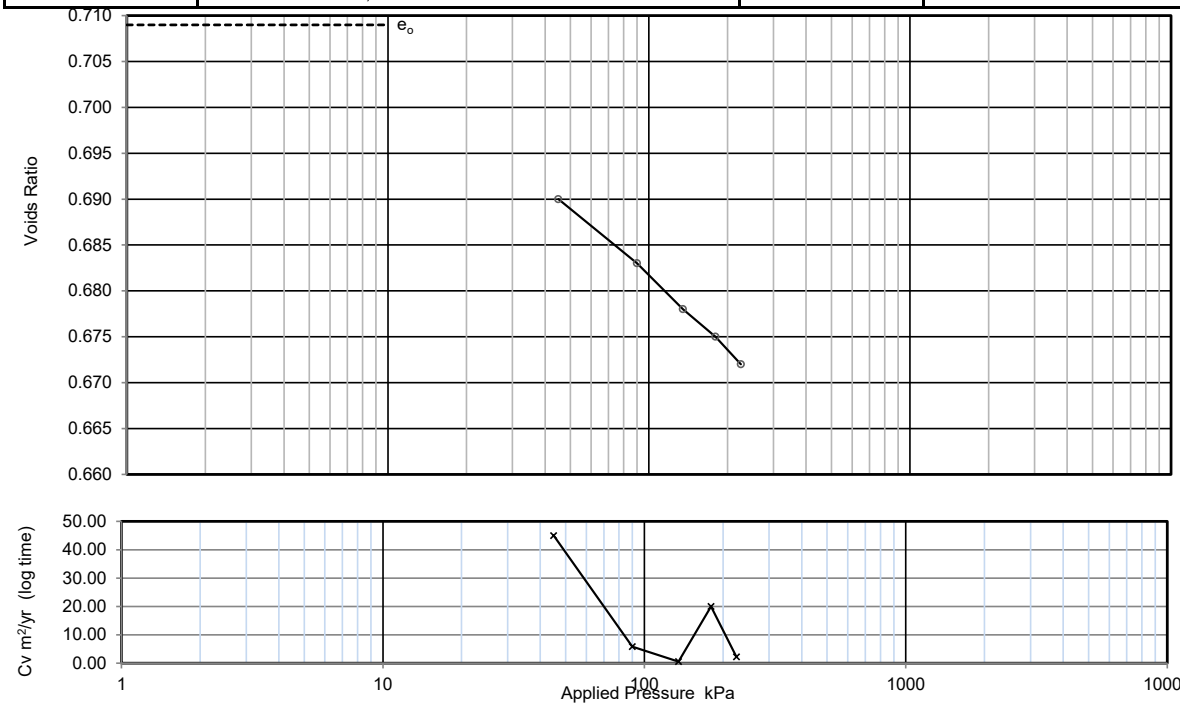
ONE DIMENSIONAL CONSOLIDATION TEST

				Job Ref	33399
				Borehole/Pit No.	BH103
				Sample No.	-
Site Name	Phoenix Wharf, Port Talbot			Depth Top	4.00 m
Project ID	2111006.005	Client	TEC	Depth Base	4.45 m
Soil Description	Very low strength dark grey clayey SAND with rare lumps of dark grey clay at base of sample			Sample Type	U
				Sample Received	03/05/2023
				Schedule received	02/05/2023
				Project Started	04/05/2023
Test Method	BS1377:Part 5: 1990, clause 3			Date Test started	17/05/2023



Applied Pressure	Voids ratio	Mv	Cv (t50, log)	Cv (t90, root)
kPa		m2/MN	m2/yr	m2/yr
2.0	0.709	-	-	-
45	0.690	0.26	45	42
90	0.683	0.09	5.8	6.6
135	0.678	0.064	0.55	0.57
180	0.675	0.043	20	0.41
225	0.672	0.041	2.2	2

Preparation

Orientation wthin sample: Vertical

Particle density: measured 2.67 Mg/m3

Specimen details	Initial	Final	
Diameter	76.24	-	mm
Height	18.90	18.49	mm
Moisture Content	25	26	%
Bulk density	1.95	2.01	Mg/m3
Dry density	1.56	1.60	Mg/m3
Voids Ratio	0.709	0.672	
Saturation	94	103	%
Average temperature for test	20.0		oC
Swelling Pressure			kPa
Settlement on saturation			%

Remarks

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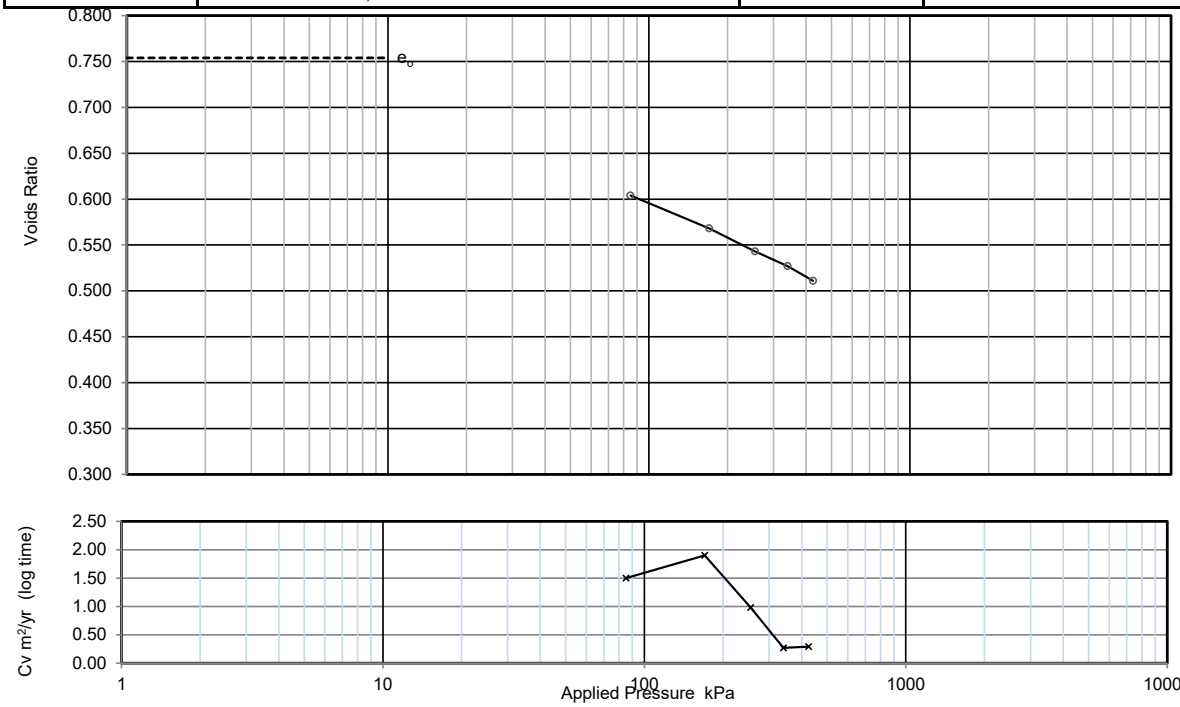
ONE DIMENSIONAL CONSOLIDATION TEST

				Job Ref	33399
				Borehole/Pit No.	BH117
				Sample No.	-
Site Name	Phoenix Wharf, Port Talbot			Depth Top	9.00 m
Project ID	2111006.005	Client	TEC	Depth Base	9.40 m
Soil Description	Very low strength dark grey sandy silty CLAY			Sample Type	U
				Sample Received	03/05/2023
				Schedule received	02/05/2023
				Project Started	04/05/2023
Test Method	BS1377:Part 5: 1990, clause 3			Date Test started	17/05/2023



Applied Pressure	Voids ratio	Mv	Cv (t50, log)	Cv (t90, root)
kPa		m2/MN	m2/yr	m2/yr
2.0	0.754	-	-	-
85	0.604	1	1.5	1.2
170	0.568	0.26	1.9	1.9
255	0.543	0.19	0.98	1.5
340	0.527	0.13	0.27	0.43
425	0.511	0.12	0.29	0.46

Preparation

Orientation wthin sample: Vertical

Particle density: assumed 2.70 Mg/m3

Specimen details	Initial	Final	
Diameter	75.00	-	mm
Height	18.78	16.18	mm
Moisture Content	30	23	%
Bulk density	2.00	2.20	Mg/m3
Dry density	1.54	1.79	Mg/m3
Voids Ratio	0.754	0.511	
Saturation	107	122	%
Average temperature for test	20.0		oC
Swelling Pressure			kPa
Settlement on saturation			%

Remarks

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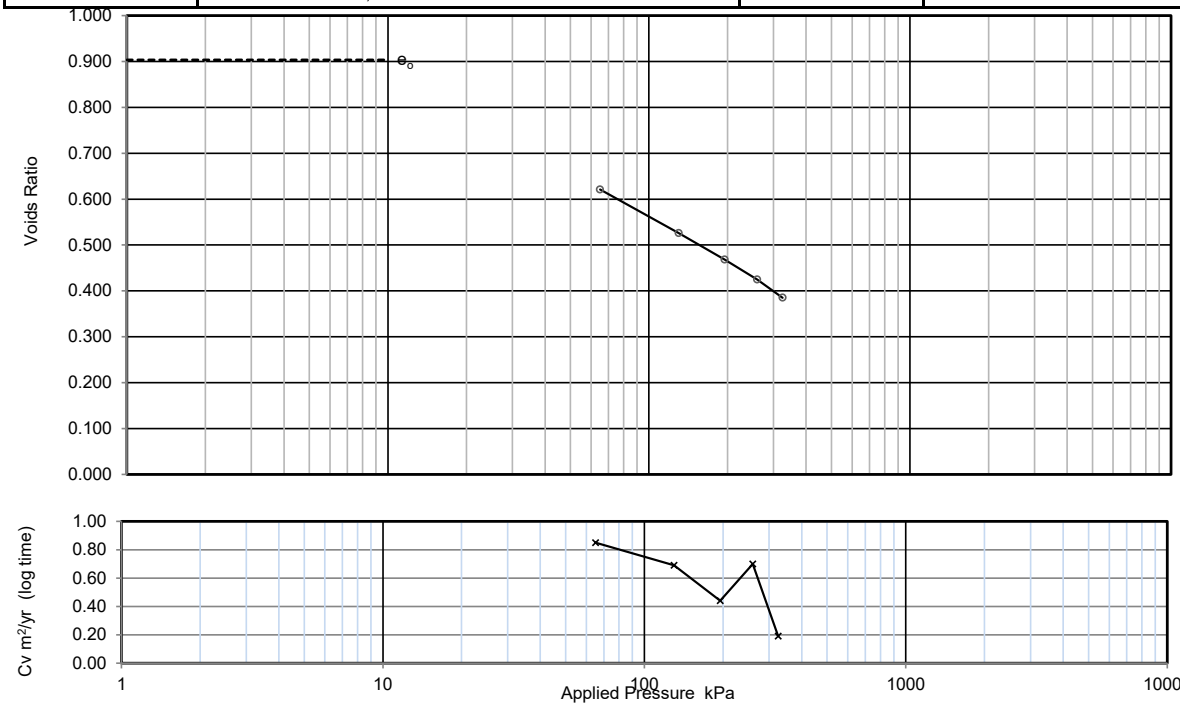
MSF-5-R6

ONE DIMENSIONAL CONSOLIDATION TEST

				Job Ref	33399
				Borehole/Pit No.	BH119
				Sample No.	-
Site Name	Phoenix Wharf, Port Talbot			Depth Top	7.00 m
Project ID	2111006.005	Client	TEC	Depth Base	7.40 m
Soil Description	Very low strength black slightly sandy peaty silty CLAY			Sample Type	U
				Sample Received	03/05/2023
				Schedule received	02/05/2023
				Project Started	04/05/2023
Test Method	BS1377:Part 5: 1990, clause 3			Date Test started	17/05/2023



Applied Pressure	Voids ratio	Mv	Cv (t50, log)	Cv (t90, root)
kPa		m2/MN	m2/yr	m2/yr
2.0	0.903	-	-	-
65	0.621	2.4	0.85	1
130	0.526	0.91	0.69	1
195	0.468	0.59	0.44	0.66
260	0.425	0.45	0.7	0.39
325	0.385	0.43	0.19	0.26

Preparation

Orientation wthin sample: Vertical

Particle density: measured 2.56 Mg/m3

Specimen details	Initial	Final	
Diameter	75.00	-	mm
Height	18.91	13.76	mm
Moisture Content	18	1.8	%
Bulk density	1.58	1.88	Mg/m3
Dry density	1.34	1.85	Mg/m3
Voids Ratio	0.903	0.385	
Saturation	50	12	%
Average temperature for test	20.0		oC
Swelling Pressure			kPa
Settlement on saturation			%

Remarks

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Summary of Particle Density Test Results

Job No.	Project Name	Programme	
33399	Phoenix Wharf, Port Talbot	Samples received	03/05/2023
		Schedule received	02/05/2023
Project No.	Client	Project started	04/05/2023
2111006.005	TEC	Testing Started	24/05/2023

Hole No.	Sample				Soil Description	Particle density	Method	Remarks
	Ref	Top m	Base m	Type		Mg/m3		
BH103	-	4.00	4.45	U	Very low strength dark grey clayey SAND with rare lumps of dark grey clay at base of sample	2.67	small pyknometer	
BH103	-	9.50	9.95	U	Very low strength dark grey slightly sandy silty CLAY with occasional decomposed shell fragments	2.69	small pyknometer	
BH119	-	7.00	7.40	U	Very low strength black slightly sandy peaty silty CLAY	2.56	small pyknometer	
BH119	-	10.00	10.40	U	Medium strength dark grey mottled brown clayey fibrous PEAT with frequent decayed plant and wood fragments	1.84	small pyknometer	

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Test Methods: BS1377: Part 2: 1990:
Particle Density: (gas jar) clause 8.2 (pyknometer) 8.
Density: (linear) clause 7.2 (immersion) clause 7.3

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Checked and Approved

Initials **J.P**

Date: 02/06/2023

Summary of Natural Moisture Content, Liquid Limit and Plastic Limit Results

Job No.	Project Name	Programme	
33432	Phoenix Wharf, Port Talbot	Samples received	10/05/2023
		Schedule received	09/05/2023
Project No.	Client	Project started	11/05/2023
2111006.005	TEC	Testing Started	30/05/2023

Hole No.	Sample				Soil Description	NMC	Passing 425µm	LL	PL	PI	Remarks
	Ref	Top m	Base m	Type		%	%	%	%	%	
BH112	-	5.00	5.40	U	Very low strength black slightly mottled dark grey slightly fine sandy peaty possibly organic silty CLAY with rare decayed wood fragments	56	100	64	27	37	
BH112	-	8.00	8.40	U	Very low strength grey mottled black sandy slightly peaty possibly organic silty CLAY with occasional decayed wood fragments	43	100	48	26	22	
BH114	-	8.00	8.40	U	Extremely low strength dark grey slightly fine sandy slightly peaty possibly organic silty CLAY	53	100	63	24	39	
BH114	-	9.50	9.90	U	Extremely low strength black and brown mottled clayey pseudo-fibrous PEAT with occasional lumps of grey slightly fine sandy silty clay	191	100	223	119	104	
BH115	-	6.00	6.40	U	Extremely low strength black slightly fine sandy peaty possibly organic silty CLAY with occasional decayed wood fragments	57	100	59	29	30	

Test Methods: BS1377: Part 2: 1990:
Natural Moisture Content : clause 3.2
Atterberg Limits: clause 4.3, 4.4 and 5.0
These results only apply to the items tested

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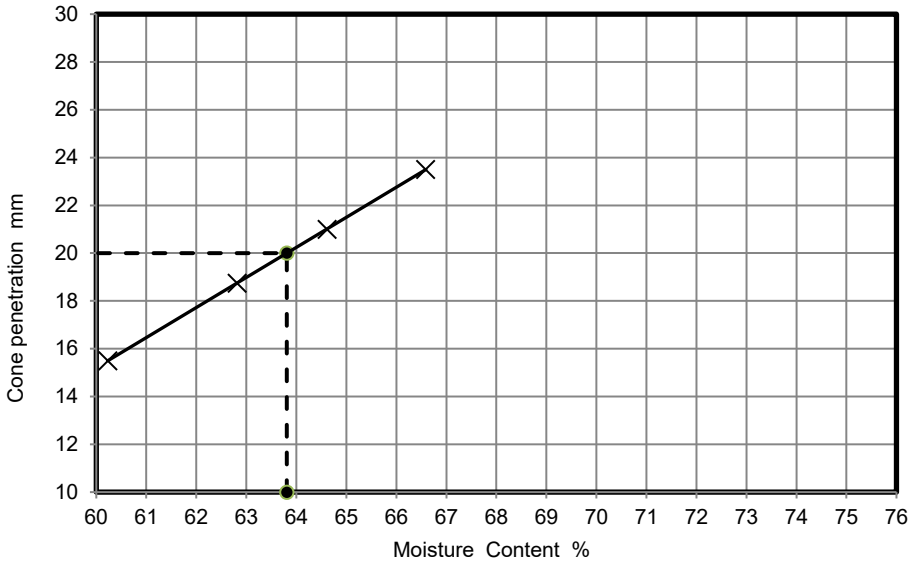
Date: 21/06/2023

LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

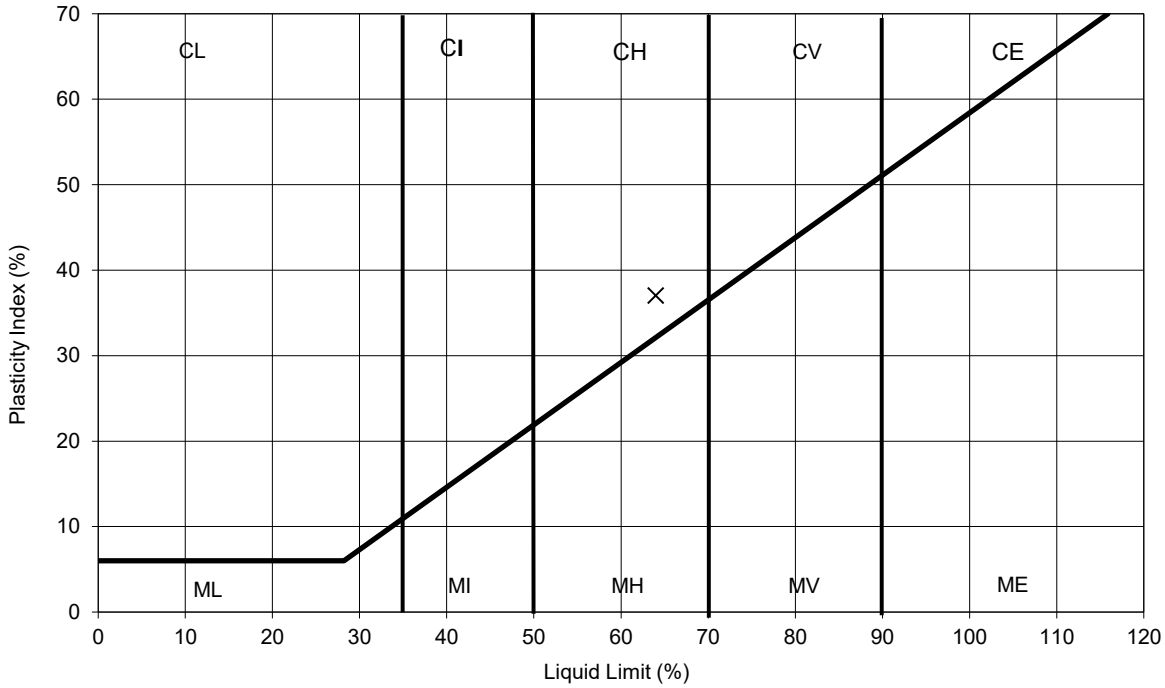
				Job No.	33432
				Borehole/Pit No.	BH112
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	5.00 m
Soil Description	Very low strength black slightly mottled dark grey slightly fine sandy peaty possibly organic silty CLAY with rare decayed wood fragments			Depth Base	5.40 m
				Sample Type	U
				Samples received	10/05/2023
				Schedules received	09/05/2023
				Project Started	11/05/2023
				Date Tested	30/05/2023



NATURAL MOISTURE CONTENT	**56**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**64**	**%**
PLASTIC LIMIT	**27**	**%**
PLASTICITY INDEX	**37**	**%**

Remarks

PLASTICITY INDEX



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TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Checked and Approved

Initials: J.P
Date: 21/06/2023

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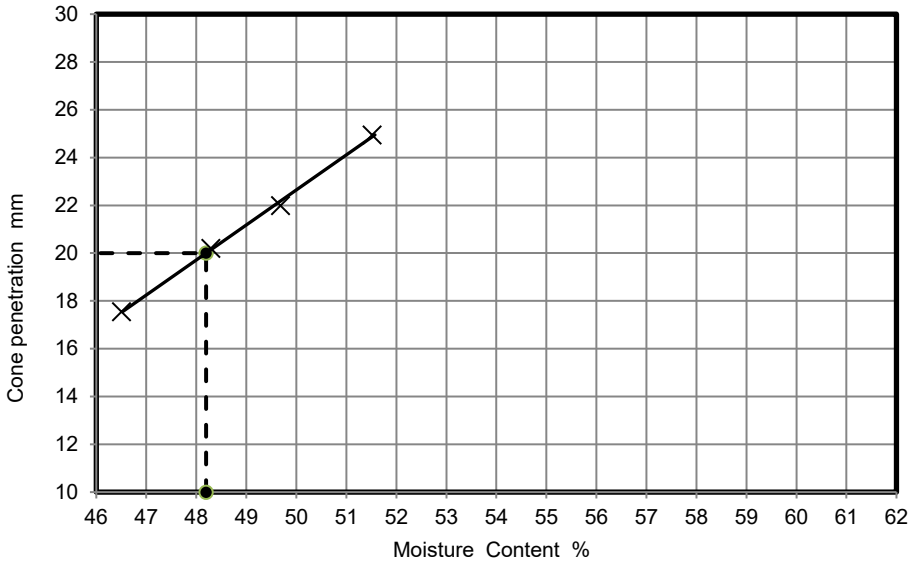
UKAS TESTING

2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

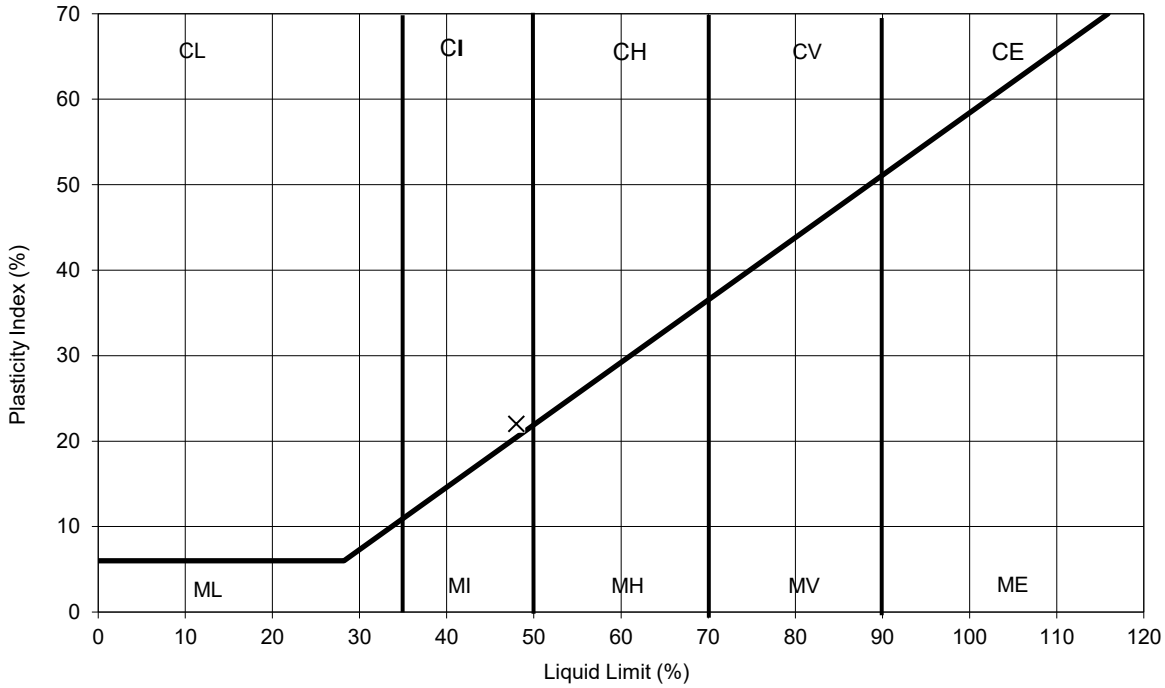
K4 SOILS	**LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX**			Job No.	33432
				Borehole/Pit No.	BH112
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	8.00 m
Soil Description	Very low strength grey mottled black sandy slightly peaty possibly organic silty CLAY with occasional decayed wood fragments			Depth Base	8.40 m
				Sample Type	U
				Samples received	10/05/2023
				Schedules received	09/05/2023
				Project Started	11/05/2023
				Date Tested	30/05/2023



NATURAL MOISTURE CONTENT	**43**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**48**	**%**
PLASTIC LIMIT	**26**	**%**
PLASTICITY INDEX	**22**	**%**

Remarks

PLASTICITY INDEX



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BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

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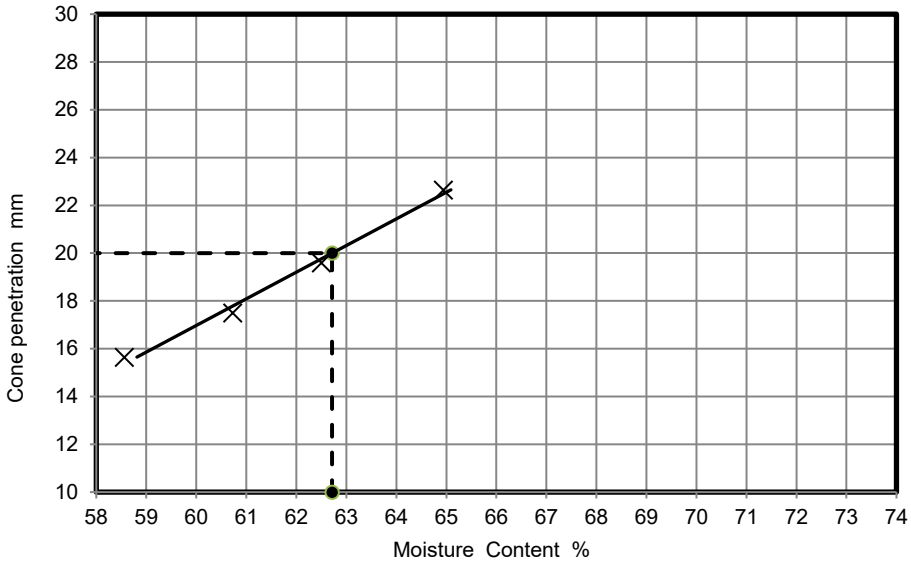
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

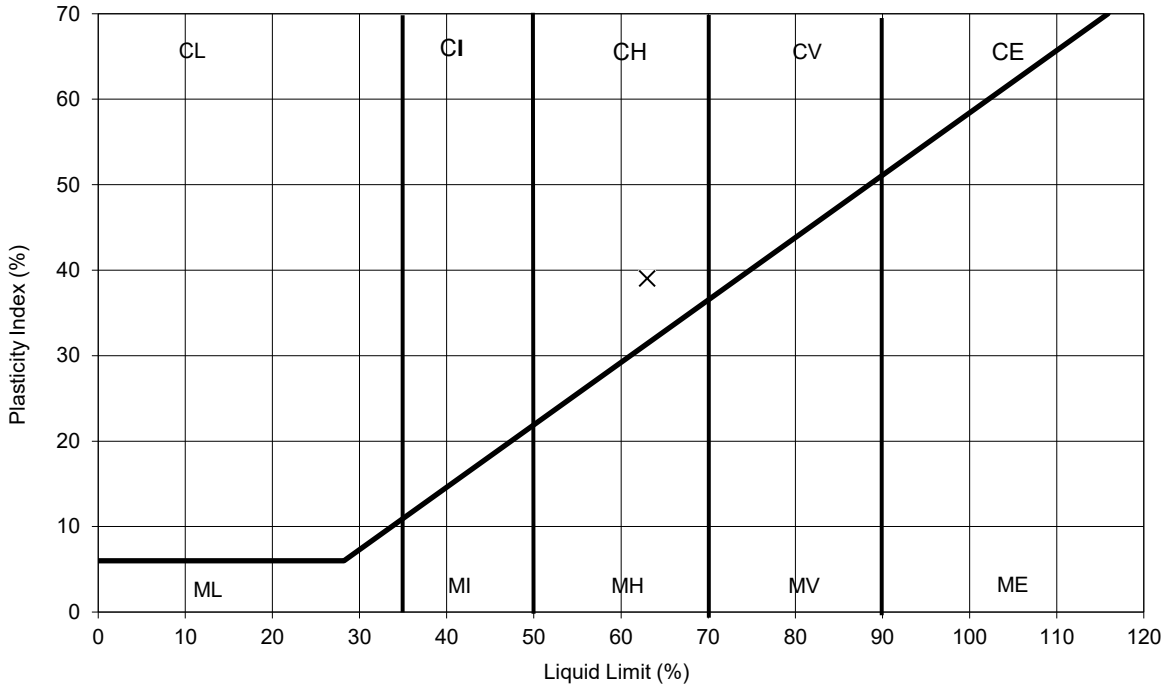
				Job No.	33432
				Borehole/Pit No.	BH114
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	8.00 m
Soil Description	Extremely low strength dark grey slightly fine sandy slightly peaty possibly organic silty CLAY			Depth Base	8.40 m
				Sample Type	U
				Samples received	10/05/2023
				Schedules received	09/05/2023
				Project Started	11/05/2023
				Date Tested	30/05/2023



NATURAL MOISTURE CONTENT	**53**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**63**	**%**
PLASTIC LIMIT	**24**	**%**
PLASTICITY INDEX	**39**	**%**

Remarks

PLASTICITY INDEX



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TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

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UKAS TESTING

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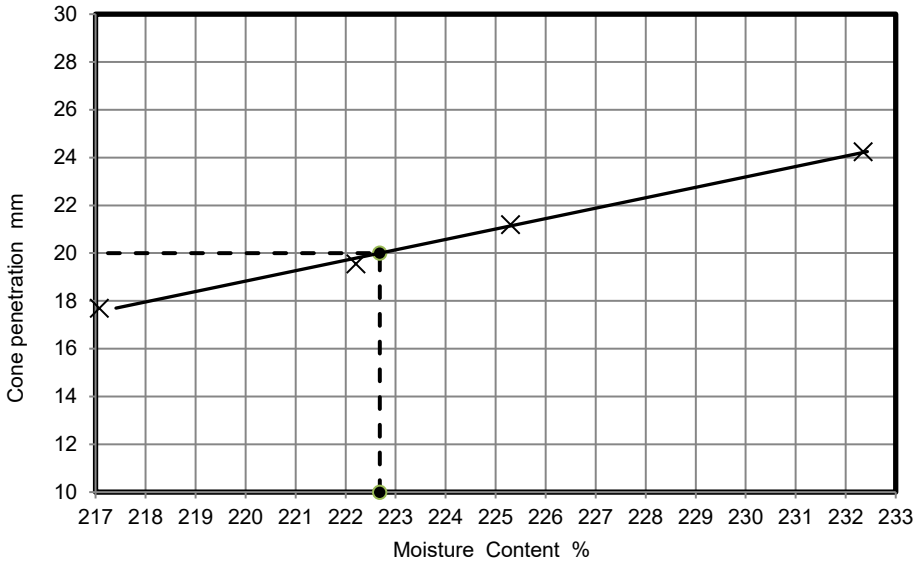
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

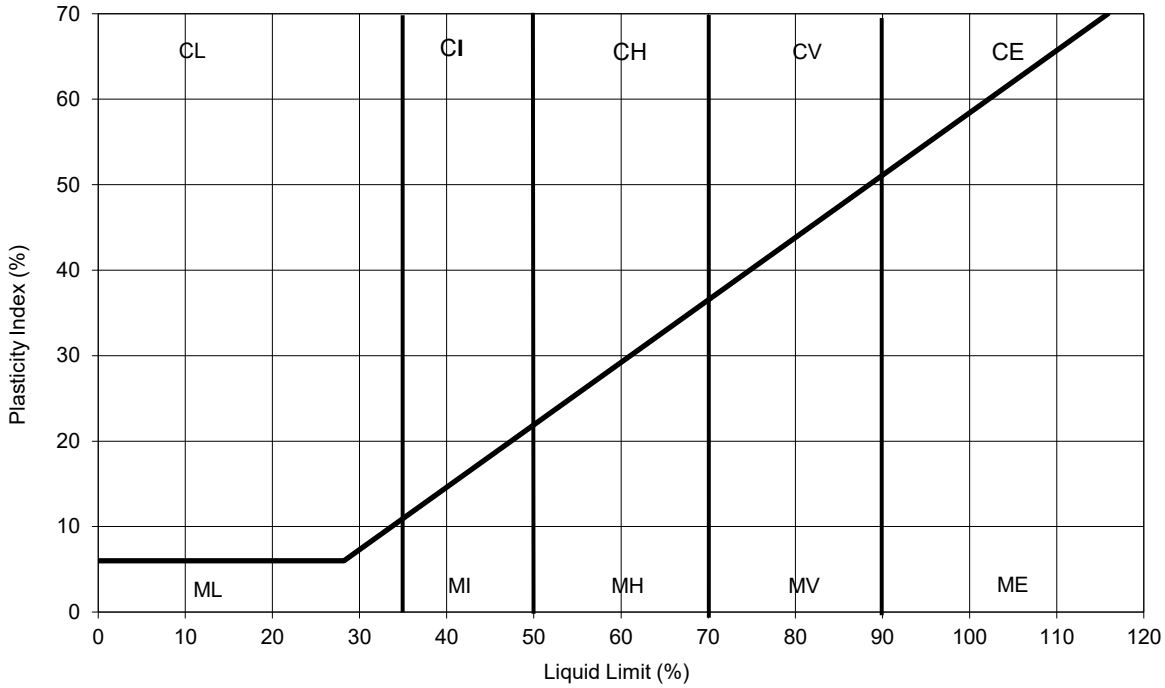
Site Name	Phoenix Wharf, Port Talbot			Job No.	33432
				Borehole/Pit No.	BH114
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	9.50 m
Soil Description	Extremely low strength black and brown mottled clayey pseudo-fibrous PEAT with occasional lumps of grey slightly fine sandy silty clay			Depth Base	9.90 m
				Sample Type	U
				Samples received	10/05/2023
				Schedules received	09/05/2023
				Project Started	11/05/2023
				Date Tested	31/05/2023



NATURAL MOISTURE CONTENT	**191**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**223**	**%**
PLASTIC LIMIT	**119**	**%**
PLASTICITY INDEX	**104**	**%**

Remarks

PLASTICITY INDEX



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BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

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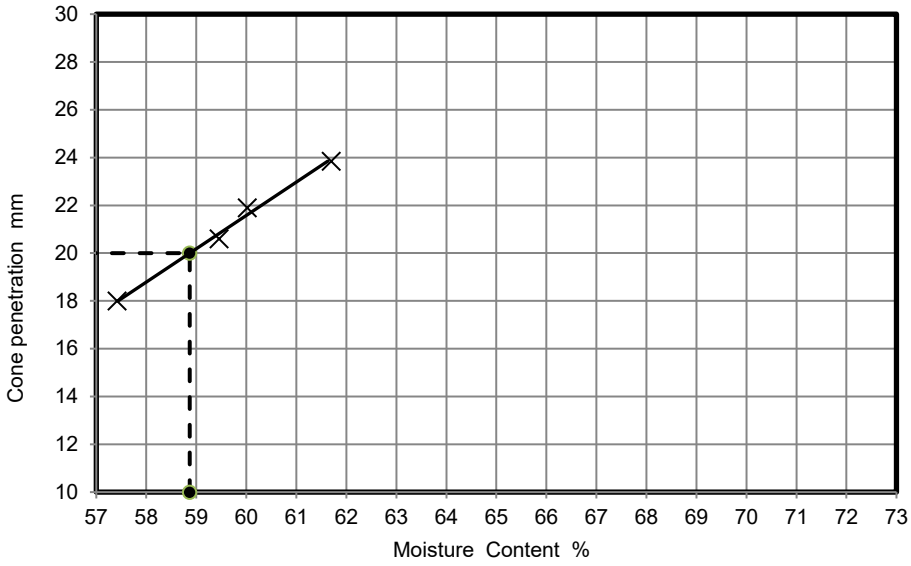
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

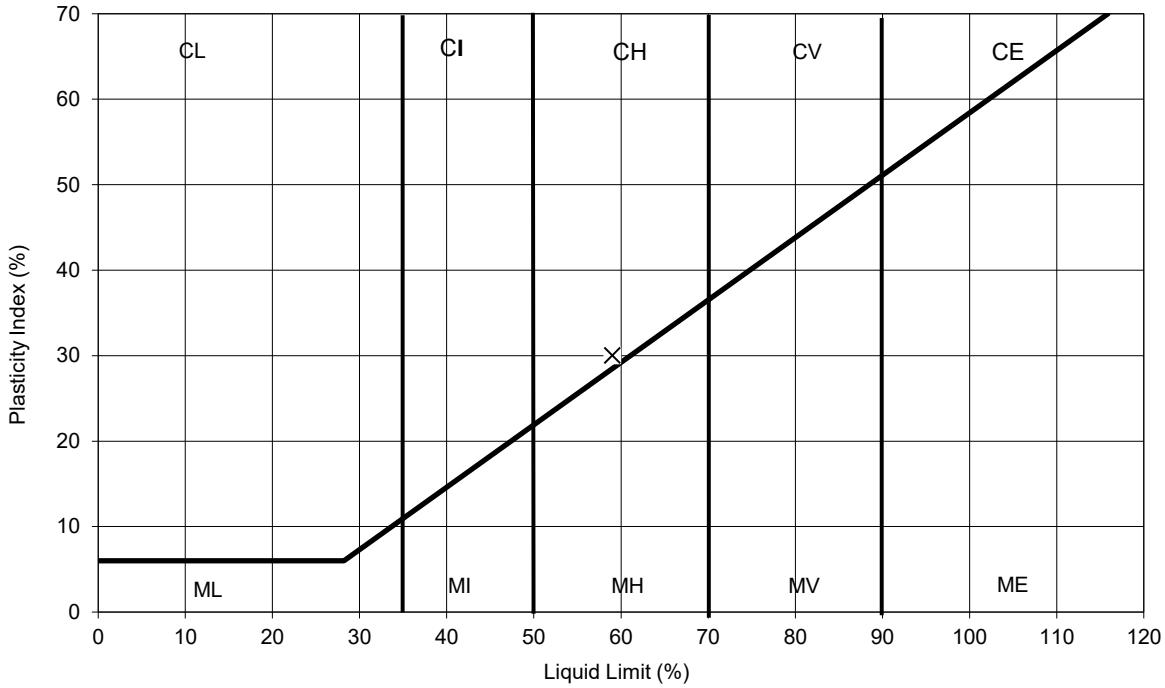
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	6.00 m
Soil Description	Extremely low strength black slightly fine sandy peaty possibly organic silty CLAY with occasional decayed wood fragments			Depth Base	6.40 m
				Sample Type	U
				Samples received	10/05/2023
				Schedules received	09/05/2023
				Project Started	11/05/2023
				Date Tested	31/05/2023
				Job No.	33432
				Borehole/Pit No.	BH115



NATURAL MOISTURE CONTENT	**57**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**59**	**%**
PLASTIC LIMIT	**29**	**%**
PLASTICITY INDEX	**30**	**%**

Remarks

PLASTICITY INDEX



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TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

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UKAS TESTING

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Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

Unconsolidated Undrained Triaxial Compression tests without measurement of pore pressure
Summary of Results

Tests carried out in accordance with BS1377:Part 7 : 1990 clause 8 or 9 as appropriate to test

Job No.	Project Name	Programme	
33432	Phoenix Wharf, Port Talbot	Samples received	10/05/2023
		Schedule received	09/05/2023
Project No.	Client	Project started	11/05/2023
2111006.005	TEC	Testing Started	24/05/2023

Hole No.	Sample Ref	Top m	Base m	Type	Soil Description	Test Type	Density bulk Mg/m3	Density dry Mg/m3	w %	Length mm	Diameter mm	σ3 kPa	At failure Axial strain %	At failure σ1 - σ3 kPa	At failure cu kPa	Mode	Remarks
BH112	-	5.00	5.40	U	Very low strength black slightly mottled dark grey slightly fine sandy peaty possibly organic silty CLAY with rare decayed wood fragments	UUM	1.68	1.10	53	198	103	45 90 180	12.1 14.1 15.2	23 23 23	12 12 12	P	
BH112	-	8.00	8.40	U	Very low strength grey mottled black sandy slightly peaty possibly organic silty CLAY with occasional decayed wood fragments	UUM	1.74	1.19	46	198	103	75 150 300	13.6 14.1 16.7	28 28 30	14 14 15	P	
BH114	-	8.00	8.40	U	Extremely low strength dark grey slightly fine sandy slightly peaty possibly organic silty CLAY	UUM	1.69	1.10	54	198	103	75 150 300	7.1 13.1 17.7	10 11 11	5 5 6	P	
BH114	-	9.50	9.90	U	Extremely low strength black and brown mottled clayey pseudo-fibrous PEAT with occasional lumps of grey slightly fine sandy silty clay	UUM	1.18	0.42	183	198	103	80 160 320	8.1 11.1 16.7	14 16 16	7 8 8	P	
BH115	-	6.00	6.40	U	Extremely low strength black slightly fine sandy peaty possibly organic silty CLAY with occasional decayed wood fragments	UUM	1.68	1.06	58	198	103	55 110 220	8.6 11.6 13.1	12 13 13	6 6 7	P	

Legend
UU - single stage test (single and multiple specimens) σ3 Cell pressure Mode of failure ; B - Brittle
UUM - Multistage test on a single specimen σ1 - σ3 Maximum corrected deviator stress P - Plastic
suffix R - remoulded or recompacted cu Undrained shear strength, ½ (σ1 - σ3) C - Compound

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
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Checked and Approved

Initials: J.P
Date: 21/06/2023

UKAS TESTING
2519
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Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

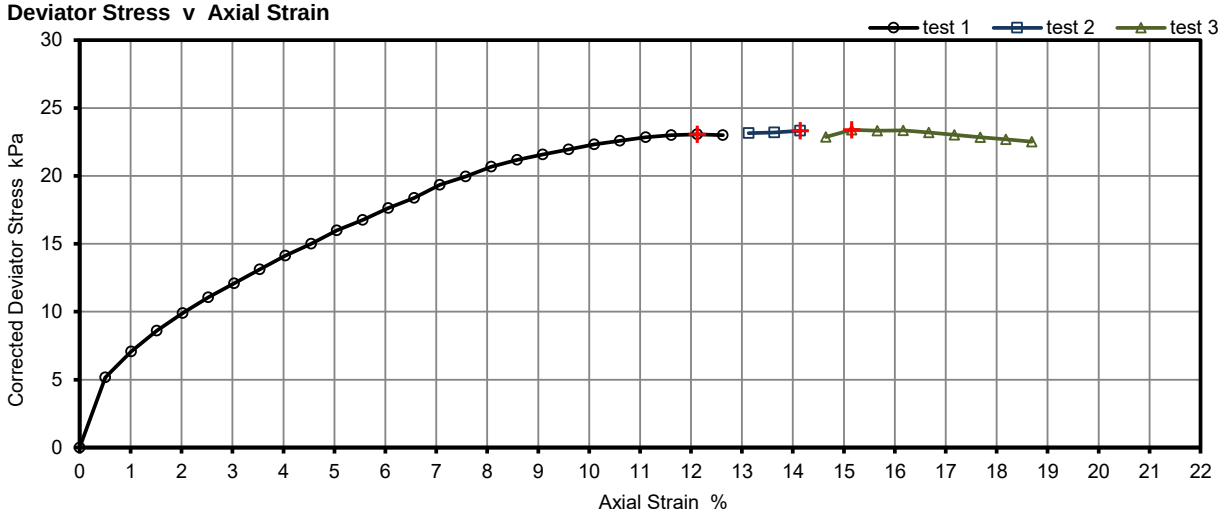
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - Multistage test			Job Ref	33432
				Borehole/Pit No.	BH112
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	5.00 m
Soil Description	Very low strength black slightly mottled dark grey slightly fine sandy peaty possibly organic silty CLAY with rare decayed wood fragments			Depth Base	5.40 m
				Sample Type	U
				Samples received	10/05/2023
				Schedules received	09/05/2023
Test Method	BS1377:Part 7:1990, clause 9, multistage test on a single specimen			Date of test	25/05/2023

Remarks

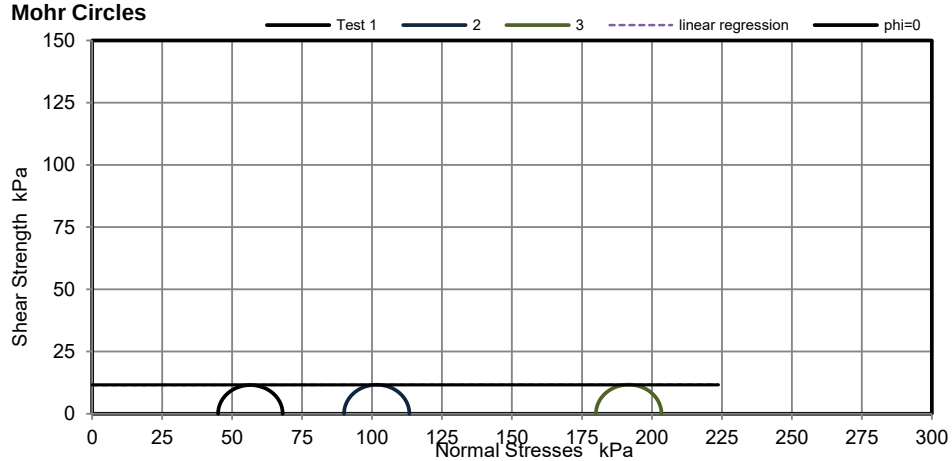
Length	mm	198.0		
Diameter	mm	103.0		
Bulk Density	Mg/m3	1.68		
Moisture Content	%	53		
Dry Density	Mg/m3	1.10		
Rate of Strain	%/min	2.00		
Stage Number		1	2	3
Cell Pressure	kPa	45	90	180
Axial Strain	%	12	14	15
Deviator Stress, (σ1 - σ3)f	kPa	23	23	23
Shear strength, cu	kPa	12	12	12
Mode of failure		Plastic		

Position within sample

Deviator Stress v Axial Strain



Mohr Circles



ϕu = 0

Average cu 12 kPa

Linear Regression

ϕu 0.1 °

cu 12 kPa

Mohr circles and their interpretation is not covered by BS1377. These are provided for information only.

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UKAS TESTING 2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

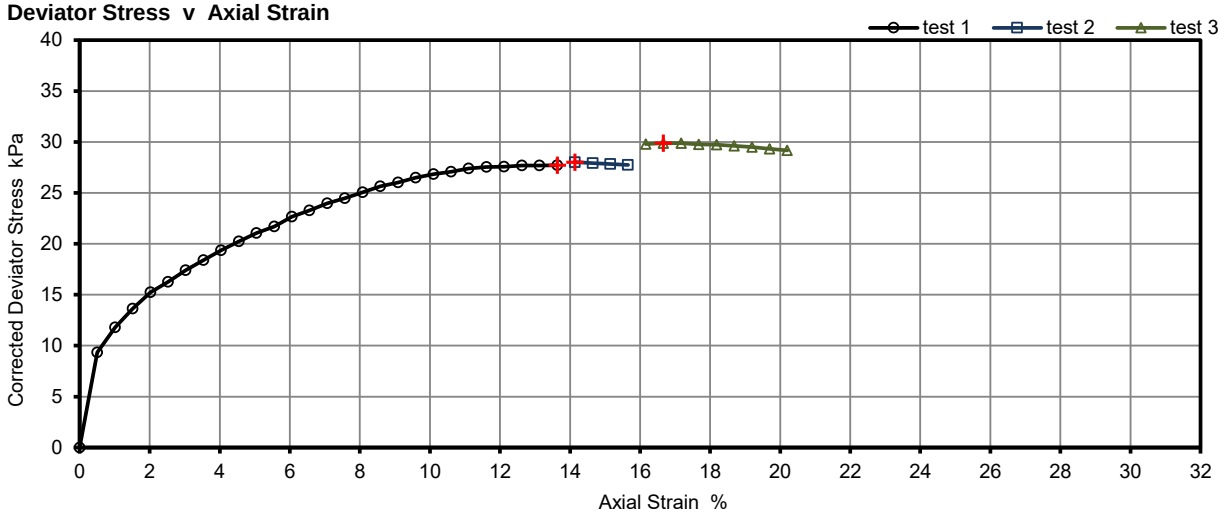
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - Multistage test			Job Ref	33432
				Borehole/Pit No.	BH112
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	8.00 m
Soil Description	Very low strength grey mottled black sandy slightly peaty possibly organic silty CLAY with occasional decayed wood fragments			Depth Base	8.40 m
				Sample Type	U
				Samples received	10/05/2023
				Schedules received	09/05/2023
Test Method	BS1377:Part 7:1990, clause 9, multistage test on a single specimen			Date of test	25/05/2023

Remarks

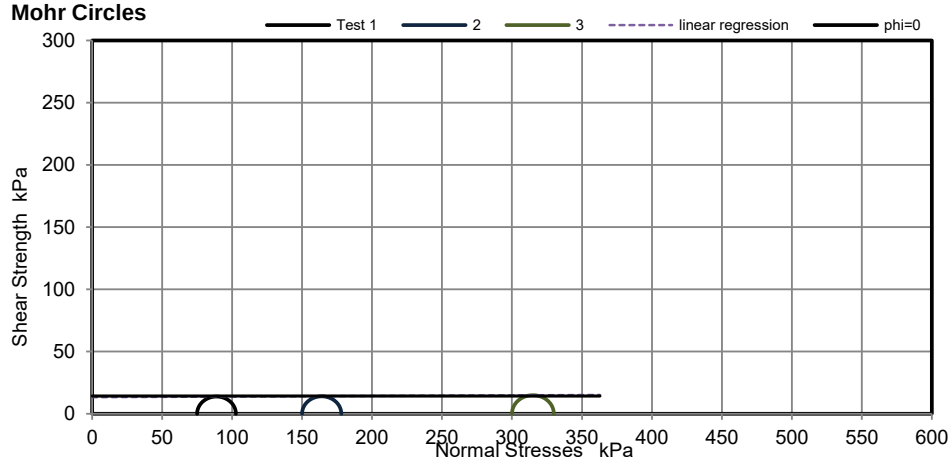
Length	mm	198.0		
Diameter	mm	103.0		
Bulk Density	Mg/m3	1.74		
Moisture Content	%	46		
Dry Density	Mg/m3	1.19		
Rate of Strain	%/min	2.00		
Stage Number		1	2	3
Cell Pressure	kPa	75	150	300
Axial Strain	%	14	14	17
Deviator Stress, (σ1 - σ3)f	kPa	28	28	30
Shear strength, cu	kPa	14	14	15
Mode of failure		Plastic		

Position within sample

Deviator Stress v Axial Strain



Mohr Circles



ϕu = 0

Average cu 14 kPa

Linear Regression

ϕu 0.3 °

cu 13 kPa

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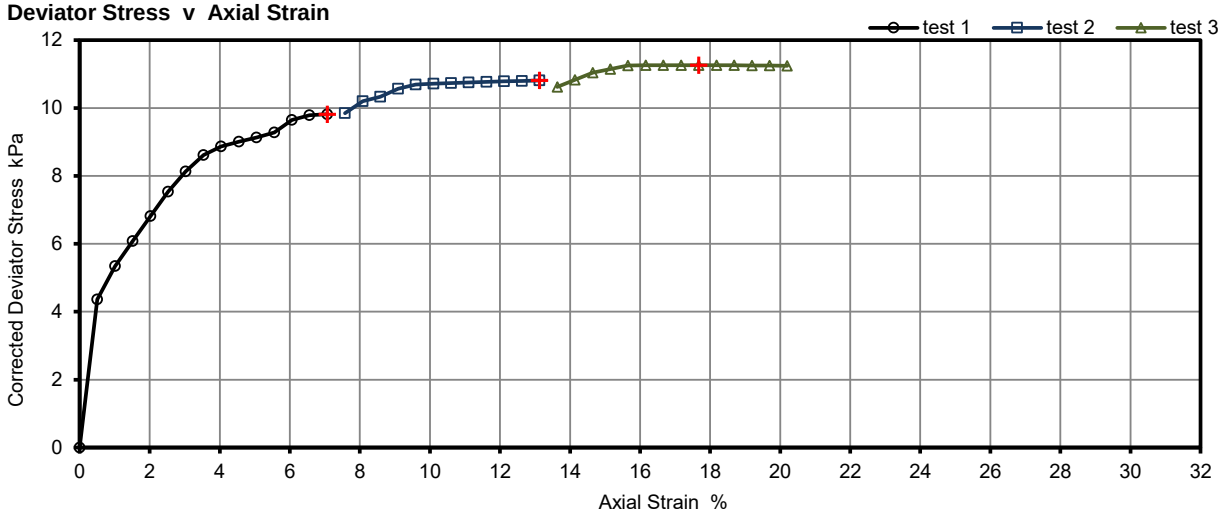
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - Multistage test			Job Ref	33432
				Borehole/Pit No.	BH114
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	8.00 m
Soil Description	Extremely low strength dark grey slightly fine sandy slightly peaty possibly organic silty CLAY			Depth Base	8.40 m
				Sample Type	U
				Samples received	10/05/2023
				Schedules received	09/05/2023
Test Method	BS1377:Part 7:1990, clause 9, multistage test on a single specimen			Date of test	24/05/2023

Remarks

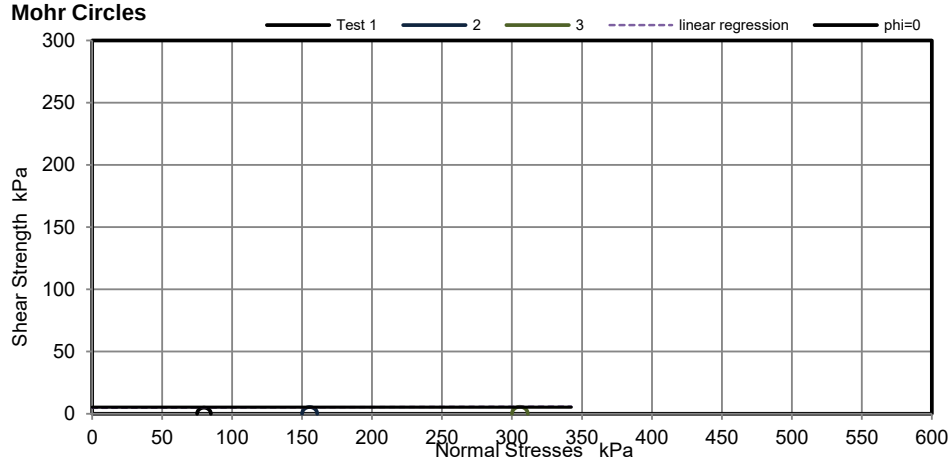
Length	mm	198.0		
Diameter	mm	103.0		
Bulk Density	Mg/m3	1.69		
Moisture Content	%	54		
Dry Density	Mg/m3	1.10		
Rate of Strain	%/min	2.00		
Stage Number		1	2	3
Cell Pressure	kPa	75	150	300
Axial Strain	%	7.1	13	18
Deviator Stress, (σ1 - σ3)f	kPa	9.8	11	11
Shear strength, cu	kPa	4.9	5.4	5.6
Mode of failure		Plastic		

Position within sample

Deviator Stress v Axial Strain



Mohr Circles



ϕu = 0

Average cu 5 kPa

Linear Regression

ϕu 0.2 °

cu 5 kPa

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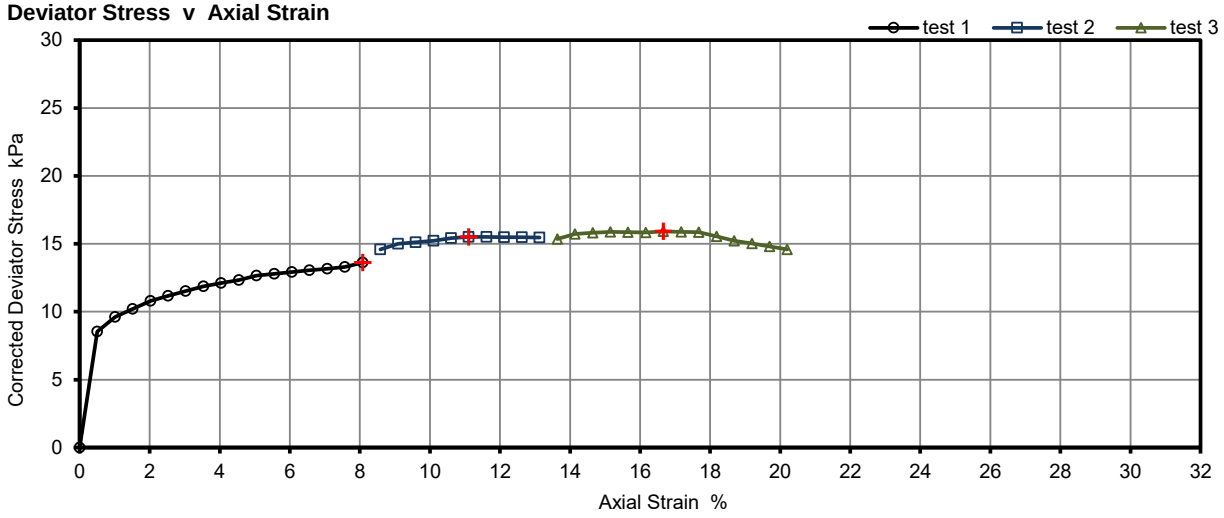
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - Multistage test			Job Ref	33432
				Borehole/Pit No.	BH114
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	9.50 m
Soil Description	Extremely low strength black and brown mottled clayey pseudo-fibrous PEAT with occasional lumps of grey slightly fine sandy silty clay			Depth Base	9.90 m
				Sample Type	U
				Samples received	10/05/2023
				Schedules received	09/05/2023
Test Method	BS1377:Part 7:1990, clause 9, multistage test on a single specimen			Date of test	24/05/2023

Remarks

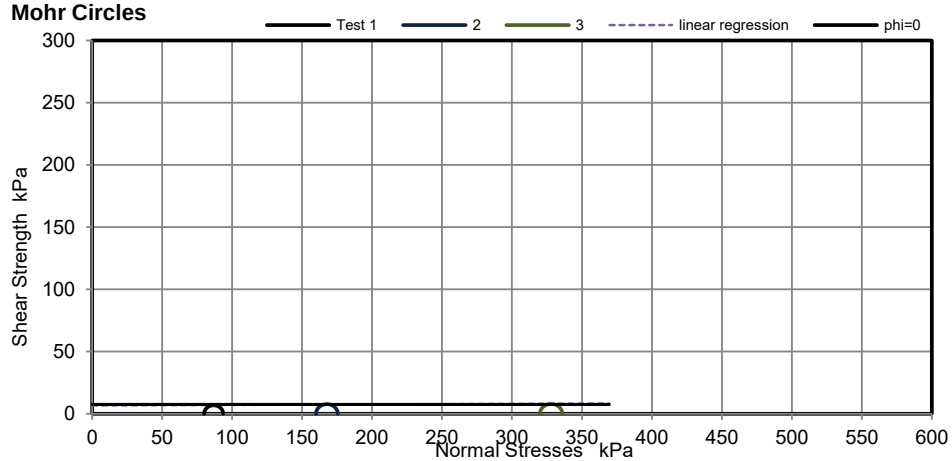
Length	mm	198.0		
Diameter	mm	103.0		
Bulk Density	Mg/m3	1.18		
Moisture Content	%	183		
Dry Density	Mg/m3	0.42		
Rate of Strain	%/min	2.00		
Stage Number		1	2	3
Cell Pressure	kPa	80	160	320
Axial Strain	%	8.1	11	17
Deviator Stress, (σ1 - σ3)f	kPa	14	16	16
Shear strength, cu	kPa	6.8	7.8	8.0
Mode of failure		Plastic		

Position within sample

Deviator Stress v Axial Strain



Mohr Circles



ϕu = 0

Average cu 8 kPa

Linear Regression

ϕu 0.2 °

cu 7 kPa

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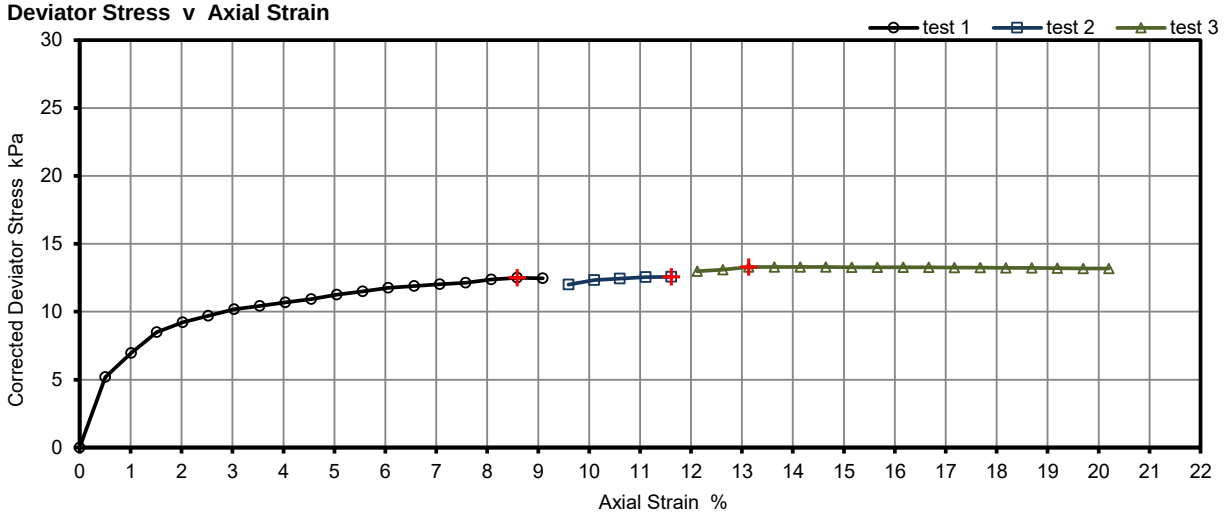
	Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - Multistage test			Job Ref	33432
				Borehole/Pit No.	BH115
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	6.00 m
Soil Description	Extremely low strength black slightly fine sandy peaty possibly organic silty CLAY with occasional decayed wood fragments			Depth Base	6.40 m
				Sample Type	U
				Samples received	10/05/2023
				Schedules received	09/05/2023
Test Method	BS1377:Part 7:1990, clause 9, multistage test on a single specimen			Date of test	25/05/2023

Remarks

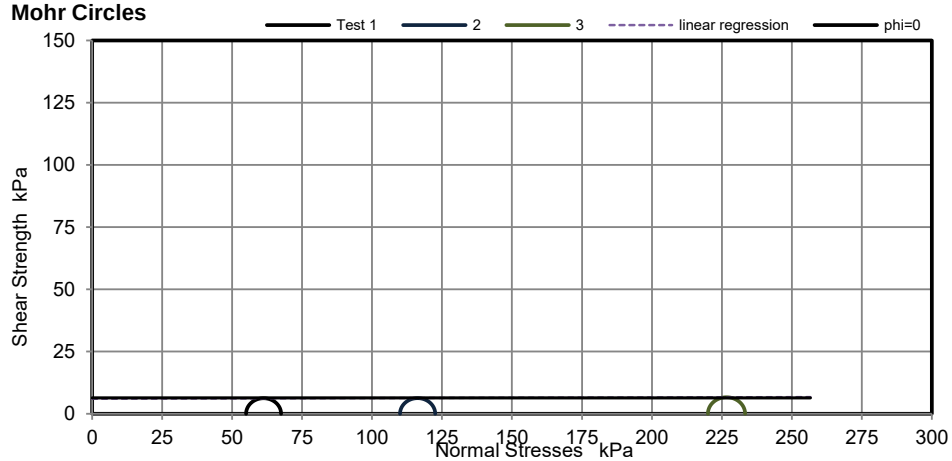
Length	mm	198.0		
Diameter	mm	103.0		
Bulk Density	Mg/m3	1.68		
Moisture Content	%	58		
Dry Density	Mg/m3	1.06		
Rate of Strain	%/min	2.00		
Stage Number		1	2	3
Cell Pressure	kPa	55	110	220
Axial Strain	%	8.6	12	13
Deviator Stress, (σ1 - σ3)f	kPa	12	13	13
Shear strength, cu	kPa	6.2	6.3	6.6
Mode of failure		Plastic		

Position within sample

Deviator Stress v Axial Strain



Mohr Circles



ϕu = 0

Average cu 6 kPa

Linear Regression

ϕu 0.1 °

cu 6 kPa

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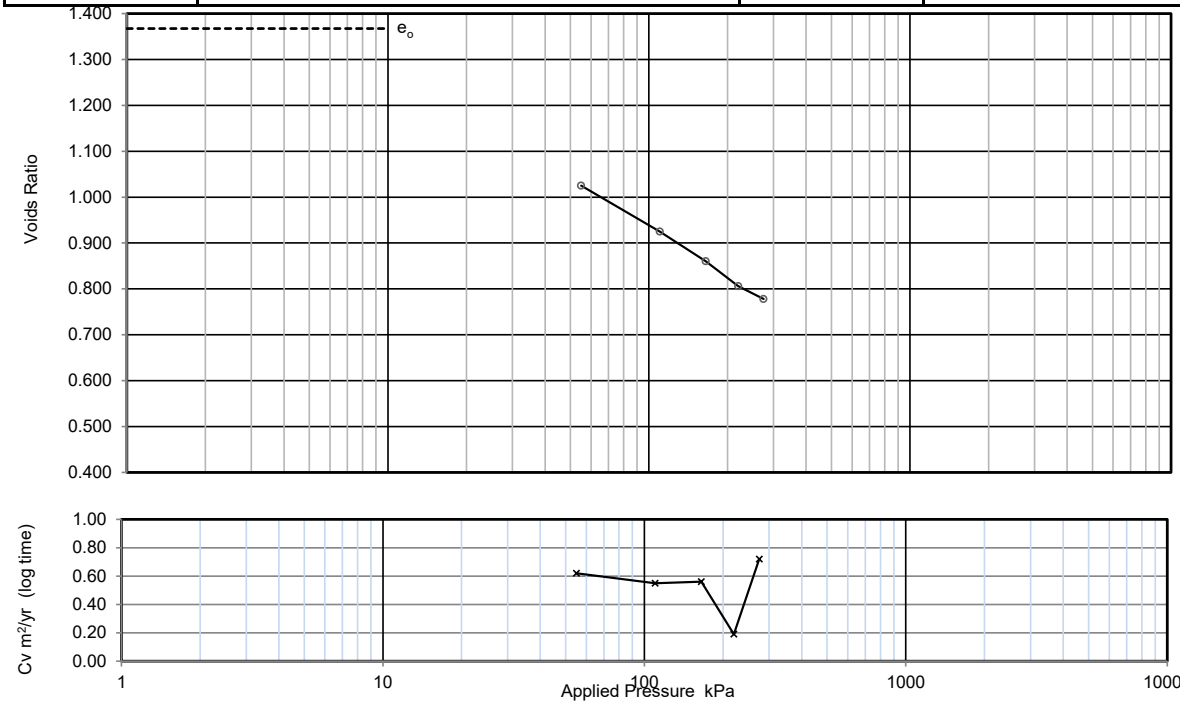
ONE DIMENSIONAL CONSOLIDATION TEST

				Job Ref	33432
				Borehole/Pit No.	BH115
				Sample No.	-
Site Name	Phoenix Wharf, Port Talbot			Depth Top	6.00 m
Project ID	2111006.005	Client	TEC	Depth Base	6.40 m
Soil Description	Extremely low strength black slightly fine sandy peaty possibly organic silty CLAY with occasional decayed wood fragments			Sample Type	U
				Sample Received	10/05/2023
				Schedule received	09/05/2023
				Project Started	11/05/2023
Test Method	BS1377:Part 5: 1990, clause 3			Date Test started	30/05/2023



Applied Pressure	Voids ratio	Mv	Cv (t50, log)	Cv (t90, root)
kPa		m2/MN	m2/yr	m2/yr
2.0	1.367	-	-	-
55	1.025	2.7	0.62	0.71
110	0.925	0.9	0.55	0.72
165	0.860	0.61	0.56	0.63
220	0.806	0.53	0.19	0.27
275	0.778	0.28	0.72	0.14

Preparation

Orientation wthin sample: Vertical

Particle density: measured 2.54 Mg/m3

Specimen details	Initial	Final	
Diameter	74.78	-	mm
Height	18.90	14.19	mm
Moisture Content	57	37	%
Bulk density	1.68	1.96	Mg/m3
Dry density	1.07	1.43	Mg/m3
Voids Ratio	1.367	0.778	
Saturation	106	121	%
Average temperature for test	20.0		oC
Swelling Pressure			kPa
Settlement on saturation			%

Remarks

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Initials K.P.

Date: 21/06/2023

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Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

Summary of Particle Density Test Results

Job No.	Project Name	Programme	
33432	Phoenix Wharf, Port Talbot	Samples received	10/05/2023
		Schedule received	09/05/2023
Project No.	Client	Project started	11/05/2023
2111006.005	TEC	Testing started	24/05/2023

Hole No.	Sample				Soil Description	Particle density	Method	Remarks
	Ref	Top m	Base m	Type		Mg/m3		
BH112	-	5.00	5.40	U	Very low strength black slightly mottled dark grey slightly fine sandy peaty possibly organic silty CLAY with rare decayed wood fragments	2.65	small pyknometer	
BH112	-	8.00	8.40	U	Very low strength grey mottled black sandy slightly peaty possibly organic silty CLAY with occasional decayed wood fragments	2.61	small pyknometer	
BH114	-	8.00	8.40	U	Extremely low strength dark grey slightly fine sandy slightly peaty possibly organic silty CLAY	2.64	small pyknometer	
BH114	-	9.50	9.90	U	Extremely low strength black and brown mottled clayey pseudo-fibrous PEAT with occasional lumps of grey slightly fine sandy silty clay	2.24	small pyknometer	
BH115	-	6.00	6.40	U	Extremely low strength black slightly fine sandy peaty possibly organic silty CLAY with occasional decayed wood fragments	2.54	small pyknometer	

UKAS TESTING

2519

Test Methods: BS1377: Part 2: 1990:
Particle Density: (gas jar) clause 8.2 (pyknometer) 8.
Density: (linear) clause 7.2 (immersion) clause 7.3

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Checked and Approved

Initials **K.P.**

Date: 21/06/2023

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

Summary of Point Load Test Results

Job No.	Project Name	Programme	
33432	Phoenix Wharf, Port Talbot	Samples received	10/05/2023
		Schedule received	09/05/2023
Project No.	Client	Project started	11/05/2023
2111006.005	TEC	Date started	30/05/2023

Hole No.	Sample				Description	Test Type	Sample Width W (mm)	Platen Separation D (mm)	Mositure Content %	Failure Load P (kN)	Equivalent Diameter De (mm)	P/De2 (Mpa)	Correction Factor F	Is (50)	Remarks
	Ref	Top m	Base m	Type											
BH104	-	32.65	32.79	C	Dark grey fractured SILTSTONE core	Diametral	72.00	72.00	2.6	1.72	81.24	0.26	1.24	0.32	
BH104	-	32.65	32.79	C	Dark grey fractured SILTSTONE core	Diametral	72.00	72.00	2.6	2.19	81.24	0.33	1.24	0.41	
BH104	-	32.65	32.79	C	Dark grey fractured SILTSTONE core	Axial	72.00	45.00	2.6	3.48	64.23	0.84	1.12	0.94	
BH104	-	32.65	32.79	C	Dark grey fractured SILTSTONE core	Axial	72.00	31.00	2.6	1.73	53.31	0.61	1.03	0.63	
BH104	-	32.65	32.79	C	Dark grey fractured SILTSTONE core	Axial	72.00	19.00	2.6	1.71	41.73	0.98	0.92	0.91	
BH104	-	34.70	34.80	C	Dark grey SILTSTONE core	Diametral	68.00	68.00	3.3	2.50	76.73	0.42	1.21	0.51	
BH104	-	34.70	34.80	C	Dark grey SILTSTONE core	Diametral	72.00	72.00	3.3	2.41	81.24	0.37	1.24	0.45	
BH104	-	34.70	34.80	C	Dark grey SILTSTONE core	Diametral	72.00	42.00	3.3	4.21	62.05	1.09	1.10	1.21	
BH104	-	34.70	34.80	C	Dark grey SILTSTONE core	Diametral	68.00	34.00	3.3	1.89	54.26	0.64	1.04	0.67	
BH104	-	34.70	34.80	C	Dark grey SILTSTONE core	Diametral	72.00	28.00	3.3	2.49	50.66	0.97	1.01	0.98	

Tested in accordance with ISRM 325-89 RTH Suggested Method for Determining Point Load Strength

Test Report by K4 SOILS LABORATORY
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Checked and Approved

Initials **J.P**

Date: 21/06/2023

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Project No.	Project Name
33432	Phoenix Wharf, Port Talbot
Client ID	Client
2111006.005	TEC
Test Method	International Society for Rock Mechanics, The complete ISRM suggested test method for Rock Characterization Testing and Monitoring 2007

Hole No.	Sample				Description	Specimen Dimensions			Bulk Density	Water Content	Uniaxial Compression			Remarks
	Ref	Top	Base	Type		Dia.	Length	H/D			Condition	Mode of failure	UCS	
		m	m			mm	mm		Mg/m3	%			MPa	
BH104	-	33.06	33.19	C	Dark grey mottled light grey SILTSTONE core	70.0	95.0	1.4	2.89	2.5	as received	F	12	
BH104	-	36.70	36.90	C	Dark grey mottled white SILTSTONE core	70.0	137.0	2.0	2.79	1.1	as received	F	8.3	

Notes

1 ISRM p87 test 1, water content at 105 ± 3 oC, specimen as tested for UCS
2 ISRM p86 clause (vii), Caliper method used for determination of bulk volume and derivation of bulk density
3 ISRM p153 part 1, determination of Uniaxial Compressive Strength (UCS) of Rock Materials
above notes apply unless annotated otherwise in the remarks

Mode of failure :
S - Single MS - multiple shear
AC - Axia F - Fragmented

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Initials: **J.P**

Date: 21/06/2023

Summary of Point Load Test Results

Job No.	Project Name	Programme	
33457	Phoenix Wharf, Port Talbot	Samples received	16/05/2023
		Schedule received	15/05/2023
Project No.	Client	Project started	16/05/2023
2111006.005	TEC	Date started	30/05/2023

Hole No.	Sample				Description	Test Type	Sample Width W (mm)	Platen Separation D (mm)	Mositure Content %	Failure Load P (kN)	Equivalent Diameter De (mm)	P/De2 (Mpa)	Correction Factor F	Is (50)	Remarks
	Ref	Top m	Base m	Type											
BH116	-	42.40	43.00	C	Dark grey SILTSTONE core	Diametral	71.00	71.00	2.8	1.68	80.11	0.26	1.24	0.32	
BH116	-	42.40	43.00	C	Dark grey SILTSTONE core	Axial	61.00	33.00	2.8	1.90	50.63	0.74	1.01	0.75	
BH116	-	42.40	43.00	C	Dark grey SILTSTONE core	Axial	60.00	25.00	2.8	1.03	43.70	0.54	0.94	0.51	
BH116	-	42.40	43.00	C	Dark grey SILTSTONE core	Axial	55.00	27.00	2.8	1.03	43.48	0.54	0.94	0.51	
BH116	-	42.40	43.00	C	Dark grey SILTSTONE core	Irregular lump	27.00	25.00	2.8	0.65	29.32	0.76	0.79	0.59	
BH116	-	44.70	44.90	C	Dark grey SILTSTONE cores (Top 1, 2, 3)	Diametral	72.00	72.00	2.5	5.65	81.24	0.86	1.24	1.06	Top 2
BH116	-	44.70	44.90	C	Dark grey SILTSTONE cores (Top 1, 2, 3)	Diametral	72.00	72.00	2.5	3.15	81.24	0.48	1.24	0.59	Top 1
BH116	-	44.70	44.90	C	Dark grey SILTSTONE cores (Top 1, 2, 3)	Axial	72.00	45.00	2.5	2.70	64.23	0.65	1.12	0.73	Top 2
BH116	-	44.70	44.90	C	Dark grey SILTSTONE cores (Top 1, 2, 3)	Axial	72.00	43.00	2.5	5.25	62.78	1.33	1.11	1.48	Top 1
BH116	-	44.70	44.90	C	Dark grey SILTSTONE cores (Top 1, 2, 3)	Axial	72.00	44.00	2.5	4.68	63.51	1.16	1.11	1.29	Top 3
BH117	-	27.60	27.85	C	Dark grey LIMESTONE core	Diametral	72.00	72.00	0.92	16.40	81.24	2.48	1.24	3.09	

Tested in accordance with ISRM 325-89 RTH Suggested Method for Determining Point Load Strength

Test Report by K4 SOILS LABORATORY
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Initials **J.P**

Date: 01/06/2023

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

Summary of Point Load Test Results

Job No.	Project Name	Programme	
33457	Phoenix Wharf, Port Talbot	Samples received	16/05/2023
		Schedule received	15/05/2023
Project No.	Client	Project started	16/05/2023
2111006.005	TEC	Date started	30/05/2023

Hole No.	Sample				Description	Test Type	Sample Width W (mm)	Platen Separation D (mm)	Mositure Content %	Failure Load P (kN)	Equivalent Diameter De (mm)	P/De2 (Mpa)	Correction Factor F	Is (50)	Remarks
	Ref	Top m	Base m	Type											
BH117	-	27.60	27.85	C	Dark grey LIMESTONE core	Diametral	72.00	72.00	0.92	21.00	81.24	3.18	1.24	3.96	
BH117	-	27.60	27.85	C	Dark grey LIMESTONE core	Diametral	72.00	72.00	0.92	15.00	81.24	2.27	1.24	2.83	
BH117	-	27.60	27.85	C	Dark grey LIMESTONE core	Axial	72.00	46.00	0.92	27.20	64.94	6.45	1.12	7.26	
BH117	-	27.60	27.85	C	Dark grey LIMESTONE core	Axial	72.00	42.00	0.92	22.70	62.05	5.90	1.10	6.50	
BH117	-	37.50	37.80	C	Dark grey slightly mottled light grey slightly fissured LIMESTONE core	Diametral	72.00	72.00	2.1	3.99	81.24	0.60	1.24	0.75	
BH117	-	37.50	37.80	C	Dark grey slightly mottled light grey slightly fissured LIMESTONE core	Diametral	72.00	72.00	2.1	3.50	81.24	0.53	1.24	0.66	
BH117	-	37.50	37.80	C	Dark grey slightly mottled light grey slightly fissured LIMESTONE core	Diametral	72.00	72.00	2.1	6.00	81.24	0.91	1.24	1.13	
BH117	-	37.50	37.80	C	Dark grey slightly mottled light grey slightly fissured LIMESTONE core	Axial	72.00	39.00	2.1	3.39	59.79	0.95	1.08	1.03	
BH117	-	37.50	37.80	C	Dark grey slightly mottled light grey slightly fissured LIMESTONE core	Axial	72.00	47.00	2.1	3.50	65.64	0.81	1.13	0.92	
BH117	-	40.20	40.35	C	Light grey mottled dark grey LIMESTONE core	Diametral	72.00	72.00	2.0	17.20	81.24	2.61	1.24	3.24	
BH117	-	40.20	40.35	C	Light grey mottled dark grey LIMESTONE core	Diametral	72.00	72.00	2.0	18.50	81.24	2.80	1.24	3.49	

Tested in accordance with ISRM 325-89 RTH Suggested Method for Determining Point Load Strength

Test Report by K4 SOILS LABORATORY
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Summary of Point Load Test Results

Job No.	Project Name	Programme	
33457	Phoenix Wharf, Port Talbot	Samples received	16/05/2023
		Schedule received	15/05/2023
Project No.	Client	Project started	16/05/2023
2111006.005	TEC	Date started	30/05/2023

Hole No.	Sample				Description	Test Type	Sample Width W (mm)	Platen Separation D (mm)	Mositure Content %	Failure Load P (kN)	Equivalent Diameter De (mm)	P/De2 (Mpa)	Correction Factor F	Is (50)	Remarks
	Ref	Top m	Base m	Type											
BH117	-	40.20	40.35	C	Light grey mottled dark grey LIMESTONE core	Diametral	72.00	72.00	2.0	11.50	81.24	1.74	1.24	2.17	
BH117	-	40.20	40.35	C	Light grey mottled dark grey LIMESTONE core	Axial	72.00	48.00	2.0	14.50	66.33	3.30	1.14	3.74	
BH117	-	40.20	40.35	C	Light grey mottled dark grey LIMESTONE core	Axial	72.00	22.00	2.0	9.00	44.91	4.46	0.95	4.25	

Tested in accordance with ISRM 325-89 RTH Suggested Method for Determining Point Load Strength

Test Report by K4 SOILS LABORATORY
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UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Project No.	Project Name
33457	Phoenix Wharf, Port Talbot
Client ID	Client
2111006.005	TEC
Test Method	International Society for Rock Mechanics, The complete ISRM suggested test method for Rock Characterization Testing and Monitoring 2007

Hole No.	Sample				Description	Specimen Dimensions			Bulk Density	Water Content	Uniaxial Compression			Remarks
	Ref	Top	Base	Type		Dia.	Length	H/D			Condition	Mode of failure	UCS	
		m	m			mm	mm		Mg/m3	%			MPa	
BH116	-	44.00	44.15	C	Dark grey fractured SILTSTONE core	72.0	95.0	1.3	2.49	3.2	as received	F	3.1	
BH117	-	27.30	27.56	C	Grey mottled light grey SANDSTONE fragments	72.0	205.0	2.8	2.66	1.2	as received	F	31	
BH117	-	38.30	38.70	C	Grey mottled light grey SANDSTONE core	72.0	224.0	3.1	2.64	1.9	as received	S	33	Sample 1
BH117	-	38.30	38.70	C	Grey mottled light grey SANDSTONE core	72.0	130.0	1.8	2.63	1.9	as received	F	24	Sample 2
BH117	-	39.40	39.60	C	Grey mottled light grey SANDSTONE core	72.0	227.0	3.2	2.62	2.1	as received	AC	42	

Notes

1 ISRM p87 test 1, water content at 105 ± 3 oC, specimen as tested for UCS

2 ISRM p86 clause (vii), Caliper method used for determination of bulk volume and derivation of bulk density

3 ISRM p153 part 1, determination of Uniaxial Compressive Strength (UCS) of Rock Materials

above notes apply unless annotated otherwise in the remarks

Mode of failure :
S - Single MS - multiple shear
AC - Axia F - Fragmented

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Summary of Point Load Test Results

Job No.	Project Name	Programme	
33480	Phoenix Wharf, Port Talbot	Samples received	22/05/2023
		Schedule received	19/05/2023
Project No.	Client	Project started	22/05/2023
2111006.005	TEC	Date started	05/06/2023

Hole No.	Sample				Description	Test Type	Sample Width W (mm)	Platen Separation D (mm)	Mositure Content %	Failure Load P (kN)	Equivalent Diameter De (mm)	P/De2 (Mpa)	Correction Factor F	Is (50)	Remarks
	Ref	Top m	Base m	Type											
BH113	-	34.00	34.20	C	Dark grey SILTSTONE core	Diametral	72.00	72.00	1.4	9.50	81.24	1.44	1.24	1.79	
BH113	-	34.00	34.20	C	Dark grey SILTSTONE core	Diametral	72.00	72.00	1.4	2.50	81.24	0.38	1.24	0.47	
BH113	-	34.00	34.20	C	Dark grey SILTSTONE core	Diametral	72.00	72.00	1.4	5.55	81.24	0.84	1.24	1.05	
BH113	-	34.00	34.20	C	Dark grey SILTSTONE core	Axial	72.00	34.00	1.4	5.60	55.83	1.80	1.05	1.89	
BH113	-	34.00	34.20	C	Dark grey SILTSTONE core	Axial	72.00	37.00	1.4	8.20	58.24	2.42	1.07	2.59	
BH113	-	40.00	40.15	C	Dark grey SILTSTONE cores	Axial	72.00	41.00	3.1	2.10	61.31	0.56	1.10	0.61	
BH113	-	40.00	40.15	C	Dark grey SILTSTONE cores	Axial	73.00	42.00	3.1	1.49	62.48	0.38	1.11	0.42	
BH113	-	40.00	40.15	C	Dark grey SILTSTONE cores	Axial	72.00	37.00	3.1	3.85	58.24	1.14	1.07	1.22	
BH113	-	40.00	40.15	C	Dark grey SILTSTONE cores	Irregular lump	45.00	45.00	3.1	1.35	50.78	0.52	1.01	0.53	
BH113	-	40.00	40.15	C	Dark grey SILTSTONE cores	Irregular lump	40.00	33.00	3.1	1.02	41.00	0.61	0.91	0.56	
BH113	-	41.50	41.70	C	Dark grey SILTSTONE fragments	Irregular lump	72.00	50.00	3.1	1.69	67.70	0.37	1.15	0.42	

Tested in accordance with ISRM 325-89 RTH Suggested Method for Determining Point Load Strength

Test Report by K4 SOILS LABORATORY
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Summary of Point Load Test Results

Job No.	Project Name	Programme	
33480	Phoenix Wharf, Port Talbot	Samples received	22/05/2023
		Schedule received	19/05/2023
Project No.	Client	Project started	22/05/2023
2111006.005	TEC	Date started	05/06/2023

Hole No.	Sample				Description	Test Type	Sample Width W (mm)	Platen Separation D (mm)	Mositure Content %	Failure Load P (kN)	Equivalent Diameter De (mm)	P/De2 (Mpa)	Correction Factor F	Is (50)	Remarks
	Ref	Top m	Base m	Type											
BH113	-	41.50	41.70	C	Dark grey SILTSTONE fragments	Irregular lump	74.00	55.00	3.1	2.52	71.99	0.49	1.18	0.57	
BH113	-	41.50	41.70	C	Dark grey SILTSTONE fragments	Irregular lump	50.00	34.00	3.1	2.15	46.52	0.99	0.97	0.96	
BH113	-	41.50	41.70	C	Dark grey SILTSTONE fragments	Irregular lump	49.00	42.00	3.1	2.50	51.19	0.95	1.01	0.96	
BH113	-	41.50	41.70	C	Dark grey SILTSTONE fragments	Irregular lump	56.00	28.00	3.1	2.30	44.68	1.15	0.95	1.10	
BH119	-	24.90	25.00	C	Dark grey SILTSTONE core	Diametral	72.00	72.00	1.5	7.00	81.24	1.06	1.24	1.32	
BH119	-	24.90	25.00	C	Dark grey SILTSTONE core	Diametral	72.00	72.00	1.5	8.50	81.24	1.29	1.24	1.60	
BH119	-	24.90	25.00	C	Dark grey SILTSTONE core	Diametral	72.00	72.00	1.5	4.20	81.24	0.64	1.24	0.79	
BH119	-	24.90	25.00	C	Dark grey SILTSTONE core	Axial	72.00	39.00	1.5	8.90	59.79	2.49	1.08	2.70	
BH119	-	24.90	25.00	C	Dark grey SILTSTONE core	Axial	72.00	39.00	1.5	7.90	59.79	2.21	1.08	2.39	
BH119	-	31.00	31.20	C	Black possibly carbonaceous SILTSTONE/LIGNITE core	Diametral	72.00	72.00	3.0	0.75	81.24	0.11	1.24	0.14	
BH119	-	31.00	31.20	C	Black possibly carbonaceous SILTSTONE/LIGNITE core	Diametral	72.00	72.00	3.0	1.60	81.24	0.24	1.24	0.30	

Tested in accordance with ISRM 325-89 RTH Suggested Method for Determining Point Load Strength

Test Report by K4 SOILS LABORATORY
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Summary of Point Load Test Results

Job No.	Project Name	Programme	
33480	Phoenix Wharf, Port Talbot	Samples received	22/05/2023
		Schedule received	19/05/2023
Project No.	Client	Project started	22/05/2023
2111006.005	TEC	Date started	05/06/2023

Hole No.	Sample Ref	Sample Top m	Sample Base m	Sample Type	Description	Test Type	Sample Width W (mm)	Platen Separation D (mm)	Mositure Content %	Failure Load P (kN)	Equivalent Diameter De (mm)	P/De2 (Mpa)	Correction Factor F	Is (50)	Remarks
BH119	-	31.00	31.20	C	Black possibly carbonaceous SILTSTONE/LIGNITE core	Axial	72.00	42.00	3.0	3.25	62.05	0.84	1.10	0.93	
BH119	-	31.00	31.20	C	Black possibly carbonaceous SILTSTONE/LIGNITE core	Axial	72.00	44.00	3.0	3.30	63.51	0.82	1.11	0.91	
BH119	-	31.00	31.20	C	Black possibly carbonaceous SILTSTONE/LIGNITE core	Axial	72.00	37.00	3.0	2.85	58.24	0.84	1.07	0.90	
BH119	-	32.00	32.15	C	Dark grey mottled black SILTSTONE core	Diametral	72.00	72.00	2.3	3.65	81.24	0.55	1.24	0.69	
BH119	-	32.00	32.15	C	Dark grey mottled black SILTSTONE core	Diametral	72.00	72.00	2.3	3.20	81.24	0.48	1.24	0.60	
BH119	-	32.00	32.15	C	Dark grey mottled black SILTSTONE core	Axial	72.00	58.00	2.3	4.30	72.92	0.81	1.19	0.96	
BH119	-	32.00	32.15	C	Dark grey mottled black SILTSTONE core	Axial	72.00	48.00	2.3	5.20	66.33	1.18	1.14	1.34	
BH119	-	32.00	32.15	C	Dark grey mottled black SILTSTONE core	Axial	72.00	38.00	2.3	3.30	59.02	0.95	1.08	1.02	
BH119	-	34.30	34.50	C	Black SILTSTONE/LIGNITE core	Diametral	72.00	72.00	1.7	4.95	81.24	0.75	1.24	0.93	
BH119	-	34.30	34.50	C	Black SILTSTONE/LIGNITE core	Diametral	72.00	72.00	1.7	4.90	81.24	0.74	1.24	0.92	
BH119	-	34.30	34.50	C	Black SILTSTONE/LIGNITE core	Diametral	72.00	72.00	1.7	3.05	81.24	0.46	1.24	0.57	

Tested in accordance with ISRM 325-89 RTH Suggested Method for Determining Point Load Strength

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Summary of Point Load Test Results

Job No.	Project Name	Programme	
33480	Phoenix Wharf, Port Talbot	Samples received	22/05/2023
		Schedule received	19/05/2023
Project No.	Client	Project started	22/05/2023
2111006.005	TEC	Date started	05/06/2023

Hole No.	Sample Ref	Sample Top m	Sample Base m	Sample Type	Description	Test Type	Sample Width W (mm)	Platen Separation D (mm)	Mositure Content %	Failure Load P (kN)	Equivalent Diameter De (mm)	P/De2 (Mpa)	Correction Factor F	Is (50)	Remarks
BH119	-	34.30	34.50	C	Black SILTSTONE/LIGNITE core	Axial	72.00	38.00	1.7	4.55	59.02	1.31	1.08	1.41	
BH119	-	34.30	34.50	C	Black SILTSTONE/LIGNITE core	Axial	72.00	32.00	1.7	5.35	54.16	1.82	1.04	1.89	

Tested in accordance with ISRM 325-89 RTH Suggested Method for Determining Point Load Strength

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UNIAXIAL COMPRESSION TEST ON ROCK - SUMMARY OF RESULTS

Project No.	Project Name
33480	Phoenix Wharf, Port Talbot
Client ID	Client
2111006.005	TEC
Test Method	International Society for Rock Mechanics, The complete ISRM suggested test method for Rock Characterization Testing and Monitoring 2007

Hole No.	Sample				Description	Specimen Dimensions			Bulk Density	Water Content	Uniaxial Compression			Remarks
	Ref	Top m	Base m	Type		Dia. mm	Length mm	H/D	Mg/m3	%	Condition	Mode of failure	UCS MPa	
BH113	-	31.00	31.20	C	Grey SANDSTONE core	72.0	145.0	2.0	2.68	1.8	as received	F	43	
BH113	-	38.00	38.20	C	Dark grey laminated light grey fractured SILTSTONE core	72.0	178.0	2.5	2.66	1.8	as received	F	12	
BH119	-	32.80	33.00	C	Dark grey fractured SILTSTONE core	72.0	166.0	2.3	2.71	1.8	as received	S	11	

Notes

1 ISRM p87 test 1, water content at 105 ± 3 oC, specimen as tested for UCS
2 ISRM p86 clause (vii), Caliper method used for determination of bulk volume and derivation of bulk density
3 ISRM p153 part 1, determination of Uniaxial Compressive Strength (UCS) of Rock Materials
above notes apply unless annotated otherwise in the remarks

Mode of failure :
S - Single MS - multiple shear
AC - Axia F - Fragmented

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Summary of Natural Moisture Content, Liquid Limit and Plastic Limit Results

Job No.	Project Name	Programme	
33610	Phoenix Wharf, Port Talbot	Samples received	14/06/2023
		Schedule received	19/06/2023
Project No.	Client	Project started	19/06/2023
2111006.005	TEC	Testing Started	28/06/2023

Hole No.	Sample				Soil Description	NMC	Passing 425µm	LL	PL	PI	Remarks
	Ref	Top m	Base m	Type		%	%	%	%	%	
BH101	-	0.50	1.00	B	Black clayey gravelly very silty SAND with occasional fmc and cobble sized brick, concrete and tarmac fragments (gravel is fmc and angular to sub-angular)	28	51	38	25	13	Sample washed to obtain test fraction
BH101	-	1.50	2.00	B	Grey slightly sandy slightly gravelly silty CLAY (gravel is fmc and angular)	48	98	57	25	32	
BH101	-	2.50	3.00	B	Bluish grey slightly sandy silty CLAY with rare coarse sub-angular gravel and traces of rootlets	32	81	43	21	22	
BH103	-	0.50	1.00	B	Dark greyish brown clayey silty very gravelly SAND with occasional roots (gravel is fmc and angular to sub-rounded)	17					
BH103	-	1.50	2.00	B	Dark greyish brown clayey silty very sandy GRAVEL (gravel is fmc and sub-angular to sub-rounded)	17	34	31	17	14	Sample washed to obtain test fraction
BH103	-	2.50	3.00	B	Black slightly clayey sandy GRAVEL (gravel is fmc and sub-angular to sub-rounded)	12					
BH103	-	4.60	5.00	B	Brown and grey slightly sandy slightly gravelly silty CLAY (gravel is fm and angular to sub-angular)	42	97	54	20	34	
BH103	-	9.00	9.80	B	Brownish grey silty CLAY	52	100	52	21	31	
BH104	-	10.50	11.00	B	Grey sandy silty CLAY	31	100	31	16	15	
BH105	-	0.00	0.30	B	Dark grey and black slightly clayey silty very sandy GRAVEL with numerous roots (gravel is fmc and sub-angular to sub-rounded)	28					
BH105	-	7.00	10.00	B	Dark grey slightly sandy alluvial silty CLAY with rare fine sub-angular gravel	37	98	51	19	32	
BH105	-	9.00	13.00	B	Dark grey peaty silty CLAY	231	100	184	111	73	

UKAS TESTING
2519

Test Methods: BS1377: Part 2: 1990:
Natural Moisture Content : clause 3.2
Atterberg Limits: clause 4.3, 4.4 and 5.0
These results only apply to the items tested

NOTE: The report shall not be reproduced except in full without authority of the laboratory

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Summary of Natural Moisture Content, Liquid Limit and Plastic Limit Results

Job No.	Project Name	Programme	
33610	Phoenix Wharf, Port Talbot	Samples received	14/06/2023
		Schedule received	19/06/2023
Project No.	Client	Project started	19/06/2023
2111006.005	TEC	Testing Started	28/06/2023

Hole No.	Sample				Soil Description	NMC	Passing 425µm	LL	PL	PI	Remarks
	Ref	Top m	Base m	Type		%	%	%	%	%	
BH106	-	4.00	-	B	Dark grey slightly gravelly clayey very silty SAND (gravel is fm and sub-angular)	36	95	37	19	18	
BH106	-	9.00	10.00	B	Dark brownish grey sandy silty CLAY with traces of peat pockets	66	100	59	31	28	
BH107	-	0.50	1.00	B	Black slightly clayey silty very gravelly SAND with fmc brick and tarmac fragments (gravel is fmc and sub-angular to sub-rounded)	16					
BH107	-	10.50	11.00	B	Brownish grey, grey and black slightly sandy slightly peaty silty CLAY with rare rootlets	50	100	65	32	33	
BH108	-	8.00	9.00	B	Grey slightly sandy slightly peaty silty CLAY with occasional decayed wood fragments	39	100	39	22	17	
BH109	-	2.50	3.00	B	Greyish brown slightly silty fm SAND	23	-	-	-	-	Non-plastic
BH110	-	2.50	3.00	B	Dark grey slightly gravelly slightly organic silty CLAY (gravel is fmc and sub-angular)	45	94	59	26	33	
BH110	-	3.50	4.00	B	Grey slightly gravelly silty CLAY (gravel is fmc and sub-angular to sub-rounded)	46	82	55	26	29	
BH110	-	4.50	5.00	B	Greyish brown and brownish grey slightly sandy silty CLAY	33	100	45	20	25	
BH111	-	3.50	4.00	B	Grey and dark grey slightly gravelly slightly sandy organic silty CLAY with occasional wood fragments and roots (gravel is fm and angular to sub-angular)	46	93	51	21	30	
BH111	-	7.50	8.00	B	Brownish grey silty CLAY	44	100	50	22	28	
BH112	-	3.00	3.50	B	Grey slightly sandy silty CLAY with rare fine gravel	40	97	46	23	23	

Test Methods: BS1377: Part 2: 1990:
Natural Moisture Content : clause 3.2
Atterberg Limits: clause 4.3, 4.4 and 5.0
These results only apply to the items tested

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Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
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Checked and Approved

Initials **J.p**

Date: 30/08/2023

Summary of Natural Moisture Content, Liquid Limit and Plastic Limit Results

Job No.	Project Name	Programme	
33610	Phoenix Wharf, Port Talbot	Samples received	14/06/2023
		Schedule received	19/06/2023
Project No.	Client	Project started	19/06/2023
2111006.005	TEC	Testing Started	28/06/2023

Hole No.	Sample				Soil Description	NMC	Passing 425µm	LL	PL	PI	Remarks
	Ref	Top m	Base m	Type		%	%	%	%	%	
BH113	-	2.50	3.00	B	Grey sandy gravelly silty CLAY (gravel is fmc and sub-angular to rounded)	28	57	46	24	22	Sample washed to obtain test fraction
BH113	-	9.50	10.00	B	Dark grey slightly sandy alluvial silty CLAY with rare fine sub-angular gravel	50	99	44	21	23	
BH114	-	6.90	8.50	B	Dark grey and brown slightly sandy organic silty CLAY with rare fm sub-angular gravel	52	98	58	24	34	
BH116	-	0.50	1.00	B	Dark grey clayey silty very gravelly SAND (gravel is fmc and angular to sub-angular)	16	38	32	19	13	Sample washed to obtain test fraction
BH116	-	7.50	8.00	B	Greyish brown slightly sandy silty CLAY	48	100	51	22	29	
BH120	-	4.50	5.00	B	Dark grey slightly sandy slightly gravelly organic silty CLAY (gravel is fmc and sub-angular to sub-rounded)	37	80	43	18	25	
BH120	-	12.00	12.50	B	Dark grey slightly gravelly peaty silty CLAY (gravel is fmc and sub-rounded to rounded)	76	80	112	49	63	
CHST102A	-	1.60	2.40	B	Brown SAND with rare fm angular gravel	22					
TP101	-	0.20	0.60	B	Dark grey slightly clayey silty gravelly SAND with occasional rootlets (gravel is fmc and sub-angular to rounded)	13					
TP102	-	0.60	1.00	B	Brown clayey gravelly silty SAND (gravel is fmc and angular to sub-angular)	20					
TP103A	-	1.20	1.80	B	Black slightly clayey silty very gravelly SAND with clinker fragments (gravel is fmc and angular to sub-angular)	18					
TP104	-	0.30	0.60	B	Brown gravelly sandy silty CLAY with clinker fragments (gravel is fmc and angular to sub-rounded)	24					

Test Methods: BS1377: Part 2: 1990:
Natural Moisture Content : clause 3.2
Atterberg Limits: clause 4.3, 4.4 and 5.0
These results only apply to the items tested

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Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

Summary of Natural Moisture Content, Liquid Limit and Plastic Limit Results

Job No.	Project Name	Programme	
33610	Phoenix Wharf, Port Talbot	Samples received	14/06/2023
		Schedule received	19/06/2023
Project No.	Client	Project started	19/06/2023
2111006.005	TEC	Testing Started	28/06/2023

Hole No.	Sample				Soil Description	NMC	Passing 425µm	LL	PL	PI	Remarks
	Ref	Top m	Base m	Type		%	%	%	%	%	
TP104	-	1.00	1.40	B	Greyish brown slightly gravelly sandy silty CLAY with occasional roots (gravel is fmc and angular to sub-angular)	25					
TP105	-	1.00	1.40	B	Dark greyish brown slightly clayey silty very sandy GRAVEL with rare cobbles and coal fragments (gravel is fmc and angular to sub-rounded)	13					
TP111	-	1.00	1.40	B	Brown slightly clayey slightly silty SAND	21					
TP114	-	0.80	1.20	B	Brown slightly clayey slightly silty SAND with rare fine gravel	20					
TP116	-	1.40	1.80	B	Bluish grey sandy silty CLAY	29	99	40	20	20	

Test Methods: BS1377: Part 2: 1990:
Natural Moisture Content : clause 3.2
Atterberg Limits: clause 4.3, 4.4 and 5.0
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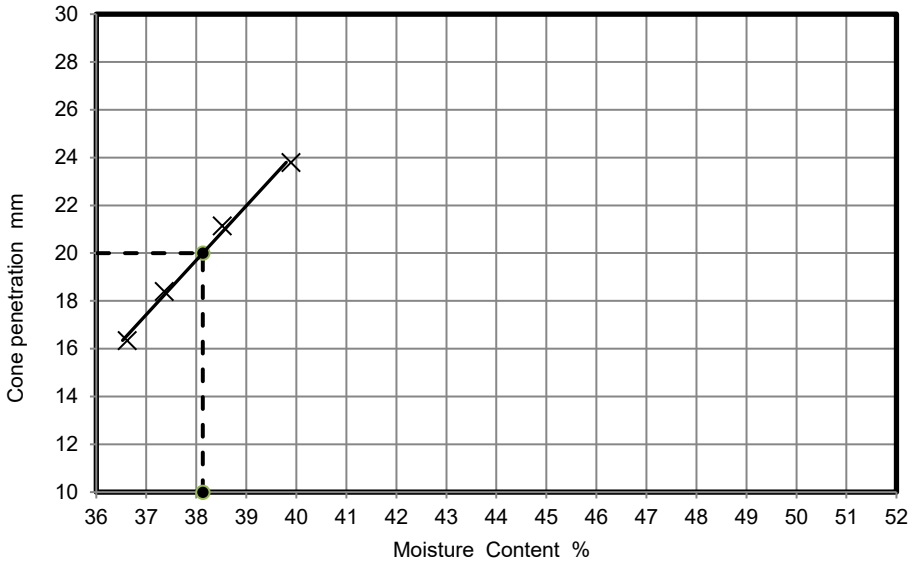
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	0.50 m
Soil Description	Black clayey gravelly very silty SAND with occasional fmc and cobble sized brick, concrete and tarmac fragments (gravel is fmc and angular to sub-angular)			Depth Base	1.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
				Project Started	19/06/2023
				Date Tested	29/06/2023
				Job No.	33610
				Borehole/Pit No.	BH101

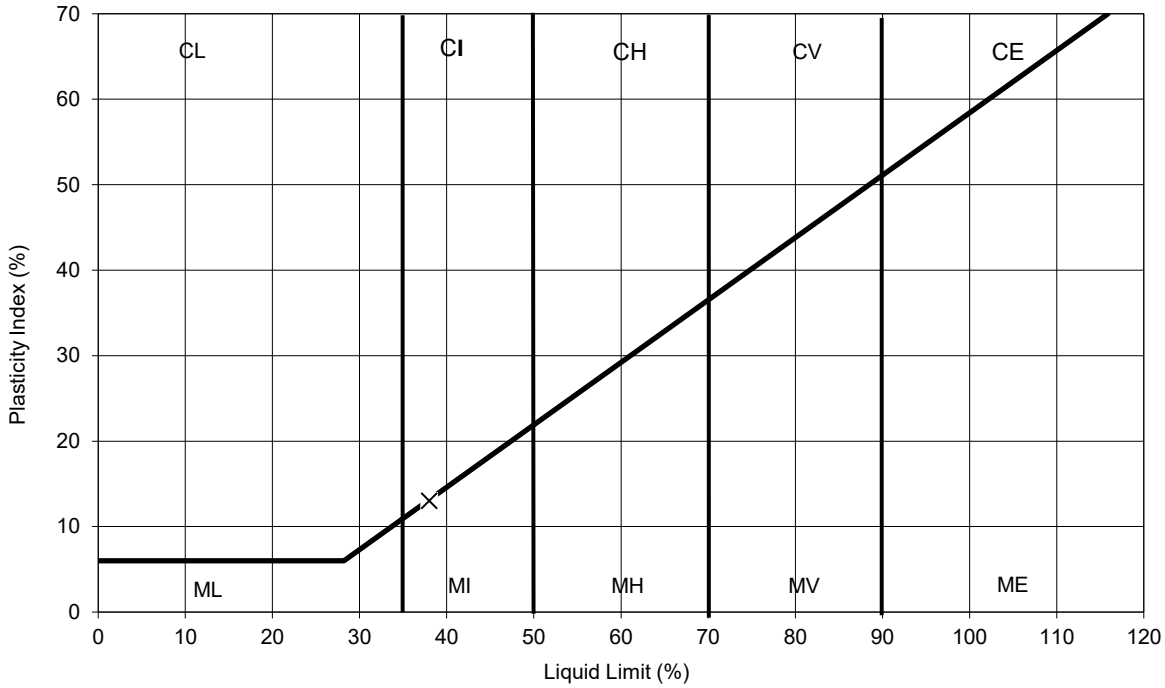


NATURAL MOISTURE CONTENT	**28**	**%**
% PASSING 425µm SIEVE	**51**	**%**
LIQUID LIMIT	**38**	**%**
PLASTIC LIMIT	**25**	**%**
PLASTICITY INDEX	**13**	**%**

Remarks

Sample washed to obtain test fraction

PLASTICITY INDEX



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TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Checked and Approved

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Date: 30/08/2023

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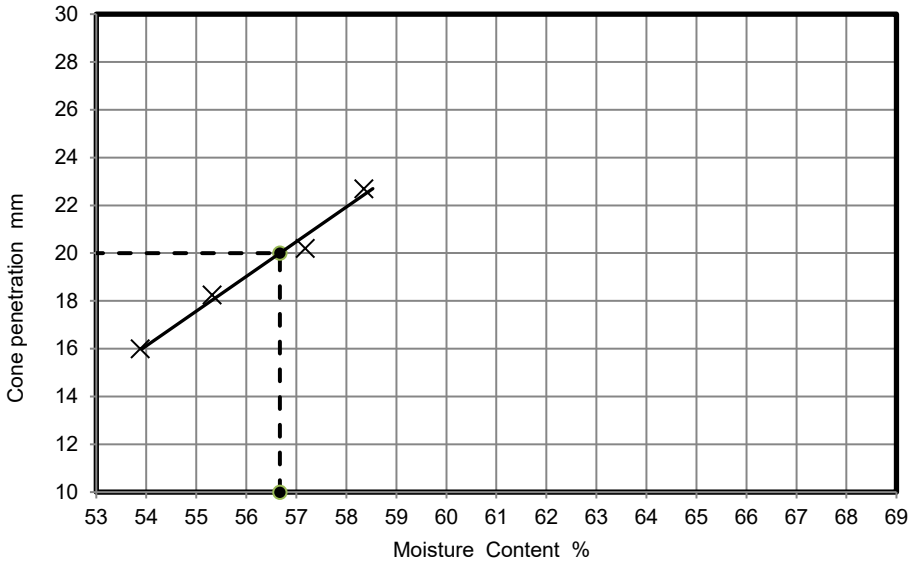
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	1.50 m
Soil Description	Grey slightly sandy slightly gravelly silty CLAY (gravel is fmc and angular)			Depth Base	2.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
				Project Started	19/06/2023
				Date Tested	05/07/2023

Job No. 33610

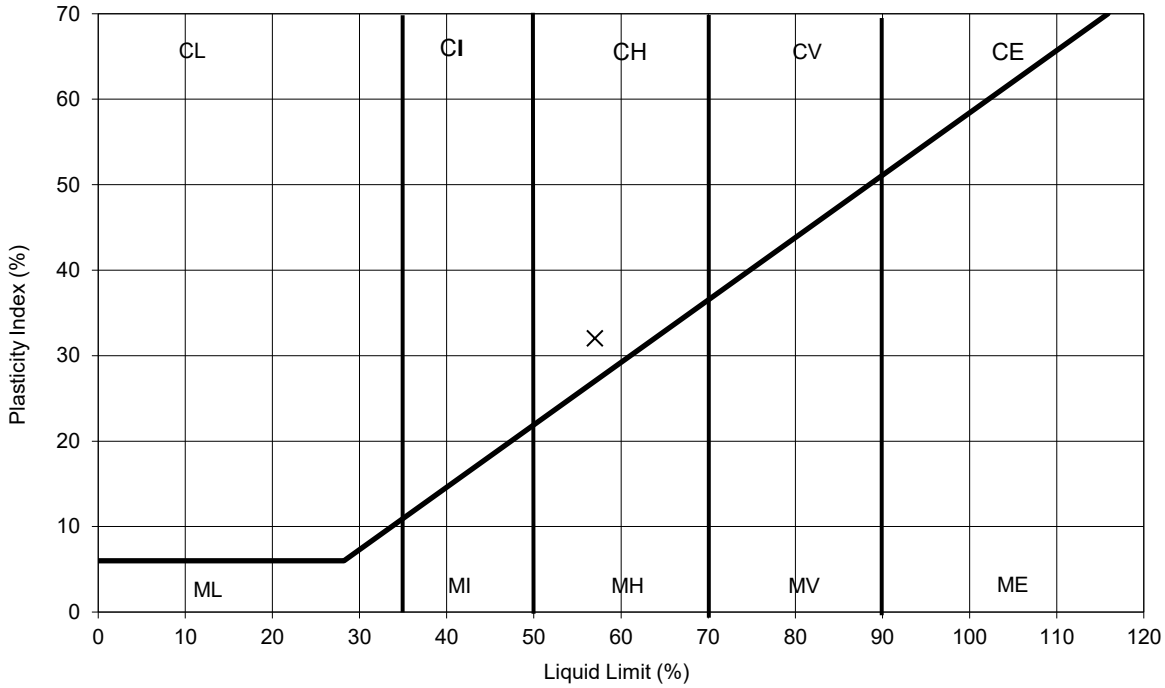
Borehole/Pit No. BH101



NATURAL MOISTURE CONTENT	**48**	**%**
% PASSING 425µm SIEVE	**98**	**%**
LIQUID LIMIT	**57**	**%**
PLASTIC LIMIT	**25**	**%**
PLASTICITY INDEX	**32**	**%**

Remarks

PLASTICITY INDEX



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TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Checked and Approved

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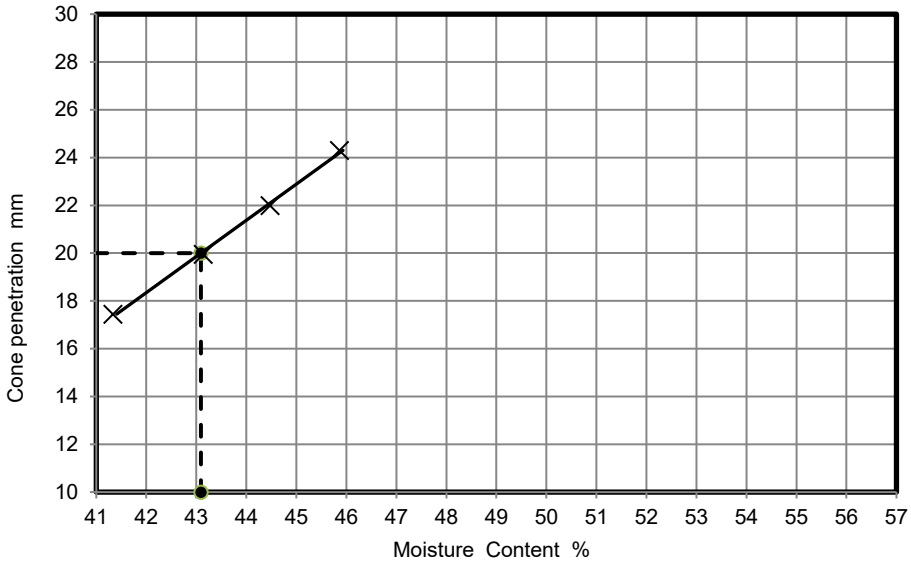
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

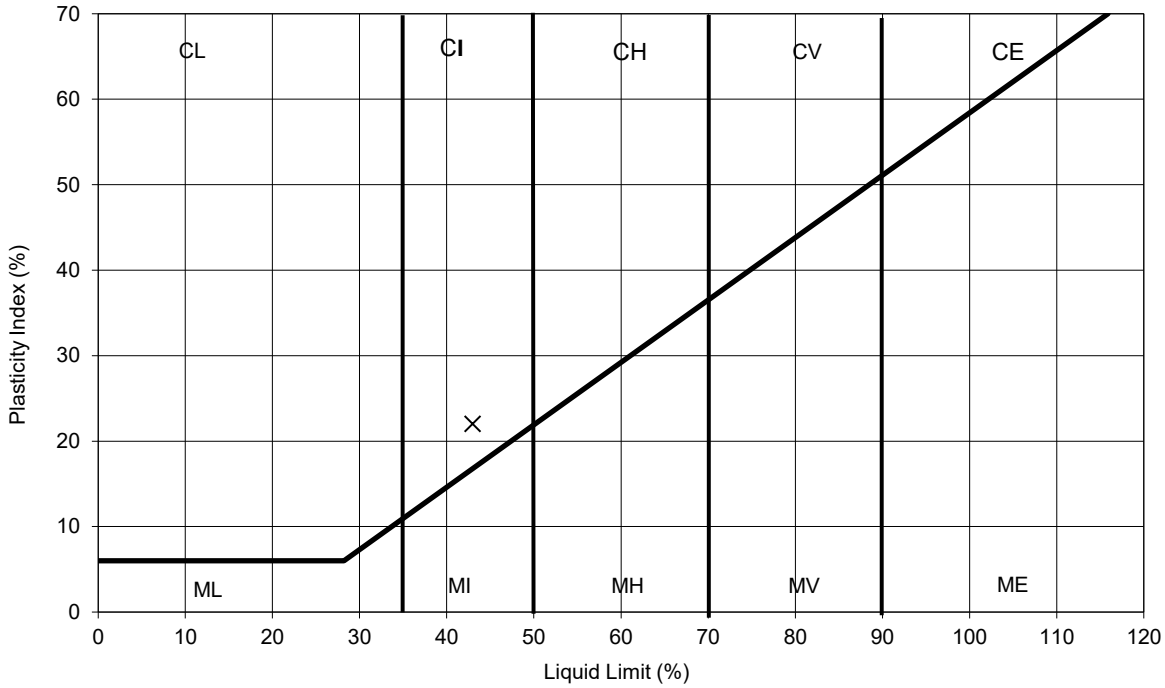
Job No.	33610				
Borehole/Pit No.	BH101				
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	2.50 m
Soil Description	Bluish grey slightly sandy silty CLAY with rare coarse sub-angular gravel and traces of rootlets			Depth Base	3.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
				Project Started	19/06/2023
				Date Tested	04/07/2023



NATURAL MOISTURE CONTENT	**32**	**%**
% PASSING 425µm SIEVE	**81**	**%**
LIQUID LIMIT	**43**	**%**
PLASTIC LIMIT	**21**	**%**
PLASTICITY INDEX	**22**	**%**

Remarks

PLASTICITY INDEX



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TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

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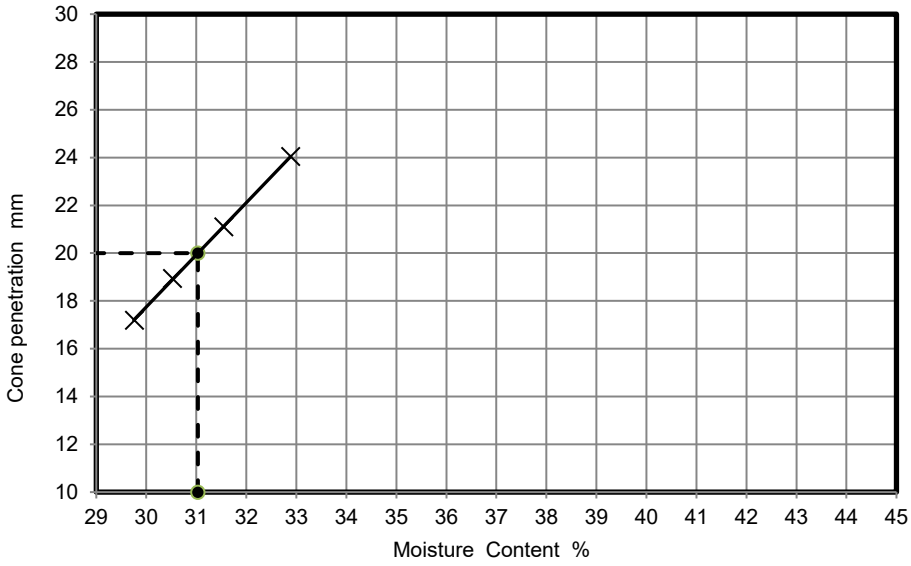
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

				Job No.	33610
				Borehole/Pit No.	BH103
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	1.50 m
Soil Description	Dark greyish brown clayey silty very sandy GRAVEL (gravel is fmc and sub-angular to sub-rounded)			Depth Base	2.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
				Project Started	19/06/2023
				Date Tested	29/06/2023

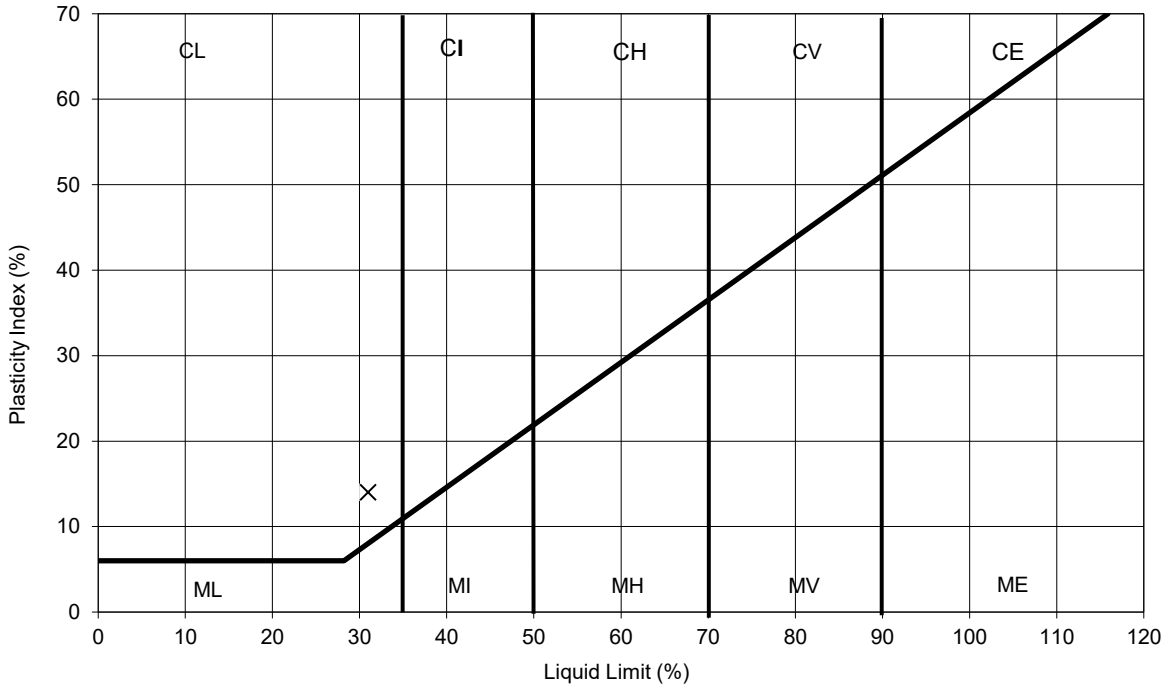


NATURAL MOISTURE CONTENT	**17**	**%**
% PASSING 425µm SIEVE	**34**	**%**
LIQUID LIMIT	**31**	**%**
PLASTIC LIMIT	**17**	**%**
PLASTICITY INDEX	**14**	**%**

Remarks

Sample washed to obtain test fraction

PLASTICITY INDEX



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TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

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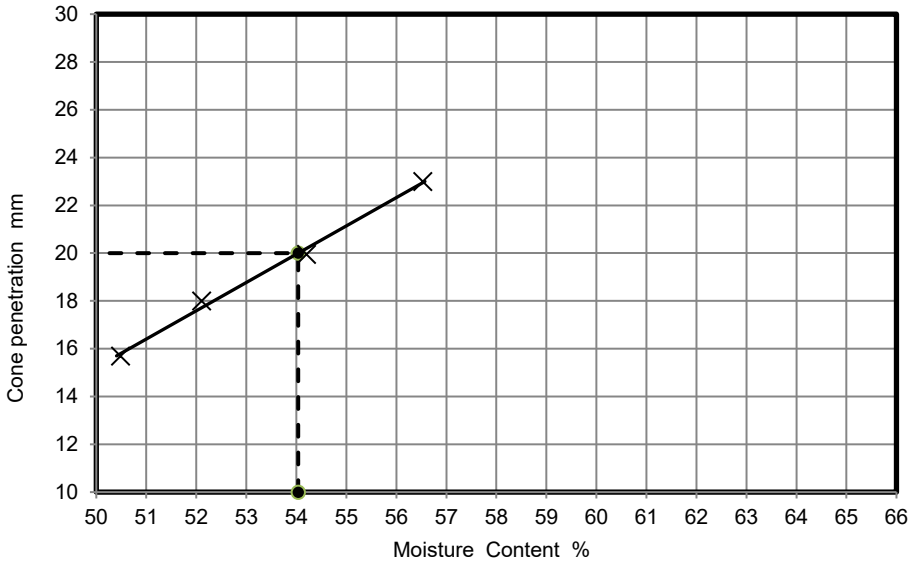
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

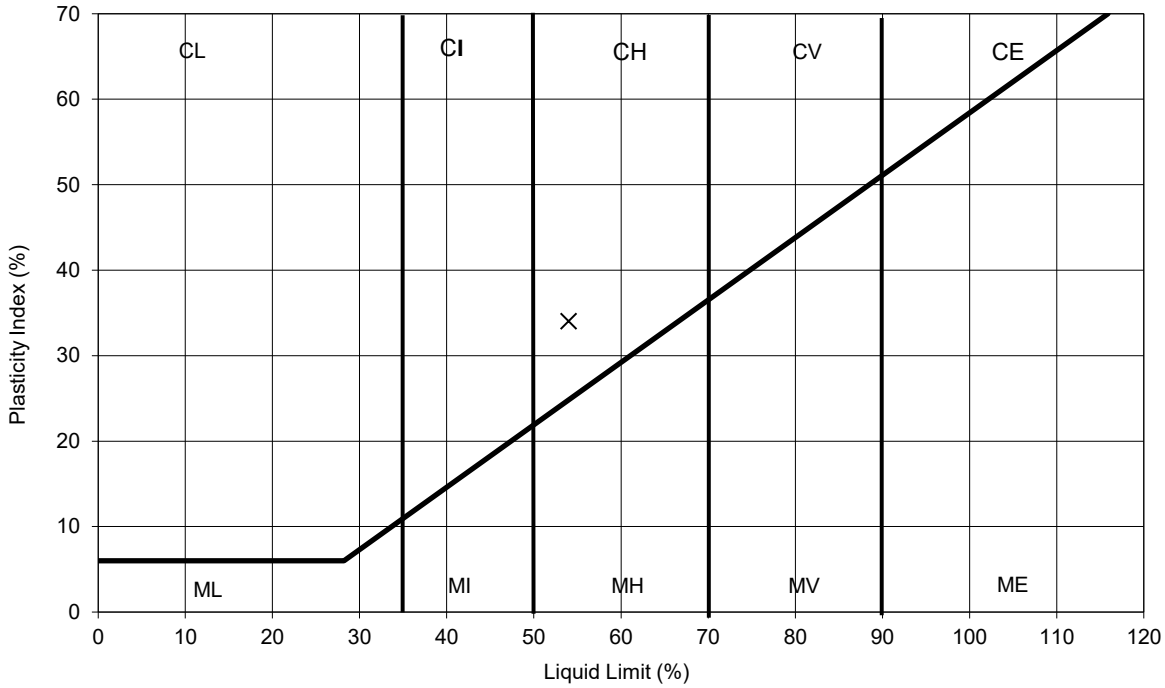
				Job No.	33610
				Borehole/Pit No.	BH103
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	4.60 m
Soil Description	Brown and grey slightly sandy slightly gravelly silty CLAY (gravel is fm and angular to sub-angular)			Depth Base	5.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
				Project Started	19/06/2023
				Date Tested	04/07/2023



NATURAL MOISTURE CONTENT	**42**	**%**
% PASSING 425µm SIEVE	**97**	**%**
LIQUID LIMIT	**54**	**%**
PLASTIC LIMIT	**20**	**%**
PLASTICITY INDEX	**34**	**%**

Remarks

PLASTICITY INDEX



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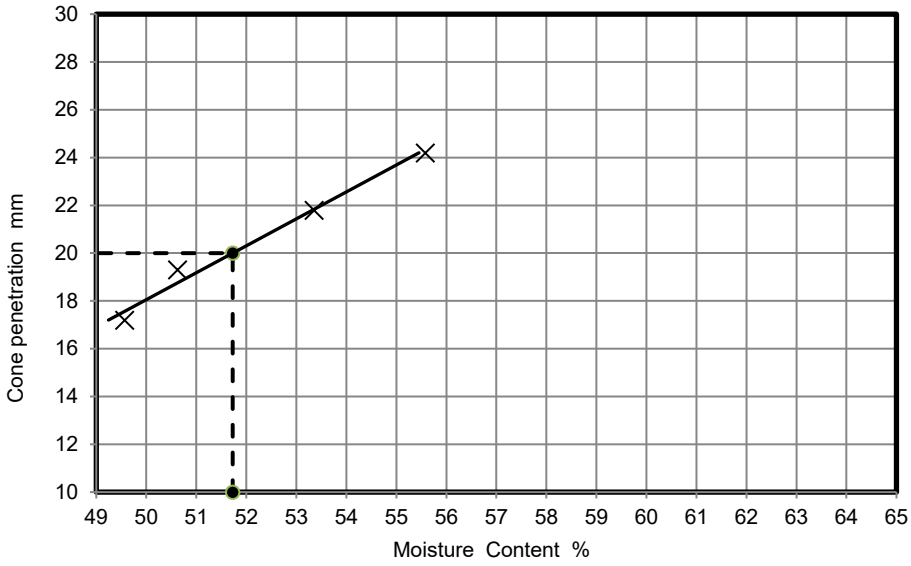
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

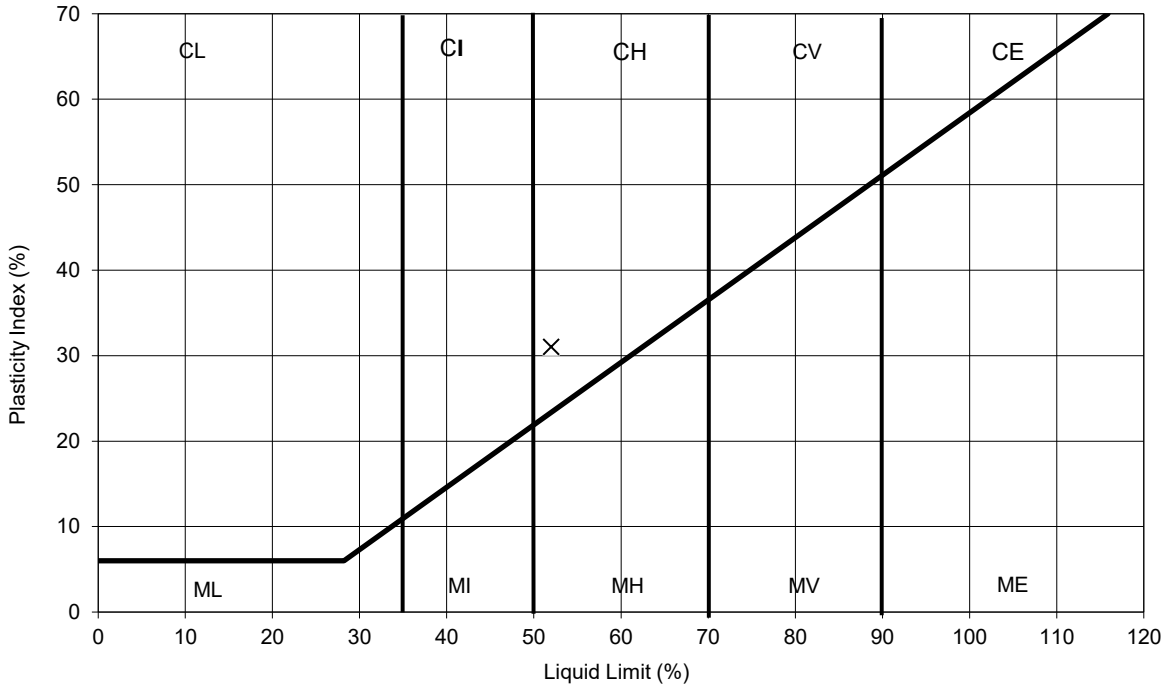
				Job No.	33610
				Borehole/Pit No.	BH103
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	9.00 m
Soil Description	Brownish grey silty CLAY			Depth Base	9.80 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
				Project Started	19/06/2023
				Date Tested	03/07/2023



NATURAL MOISTURE CONTENT	**52**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**52**	**%**
PLASTIC LIMIT	**21**	**%**
PLASTICITY INDEX	**31**	**%**

Remarks

PLASTICITY INDEX



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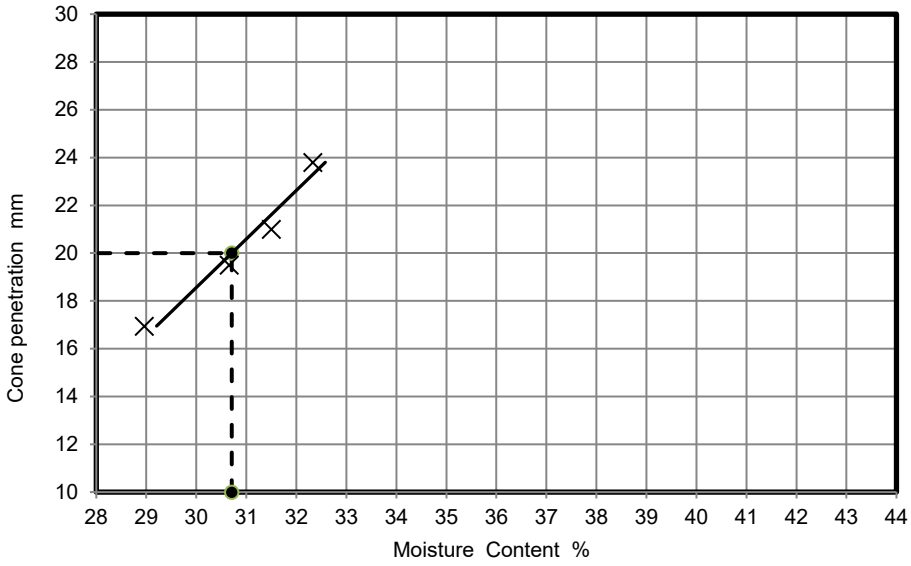
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

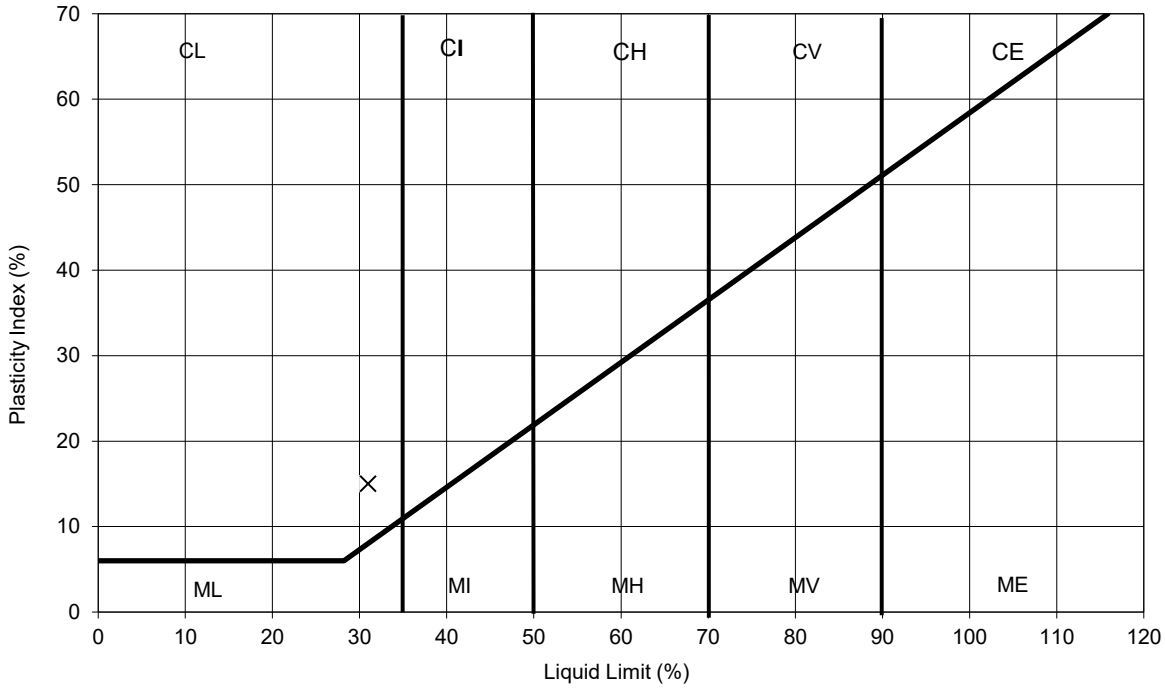
				Job No.	33610
				Borehole/Pit No.	BH104
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	10.50 m
Soil Description	Grey sandy silty CLAY			Depth Base	11.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
				Project Started	19/06/2023
				Date Tested	03/07/2023



NATURAL MOISTURE CONTENT	**31**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**31**	**%**
PLASTIC LIMIT	**16**	**%**
PLASTICITY INDEX	**15**	**%**

Remarks

PLASTICITY INDEX



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TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

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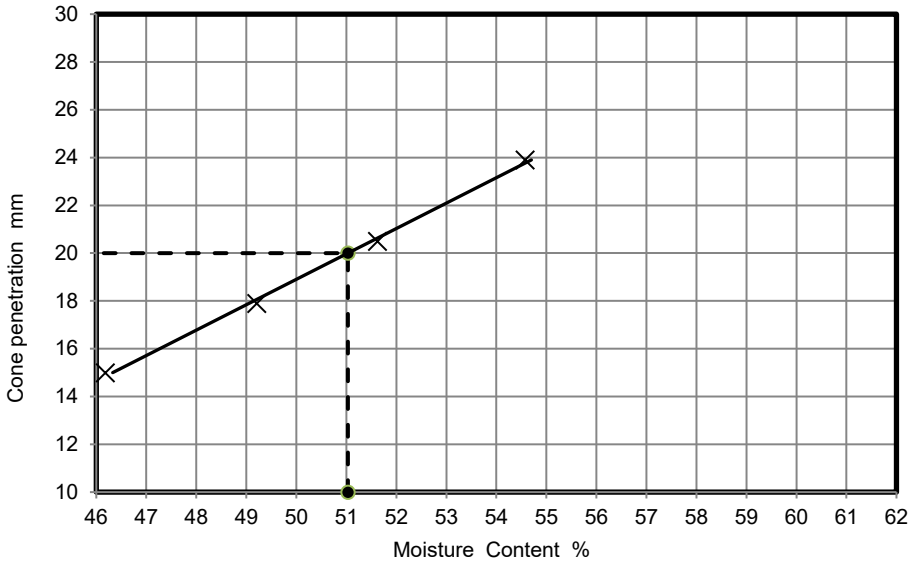
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

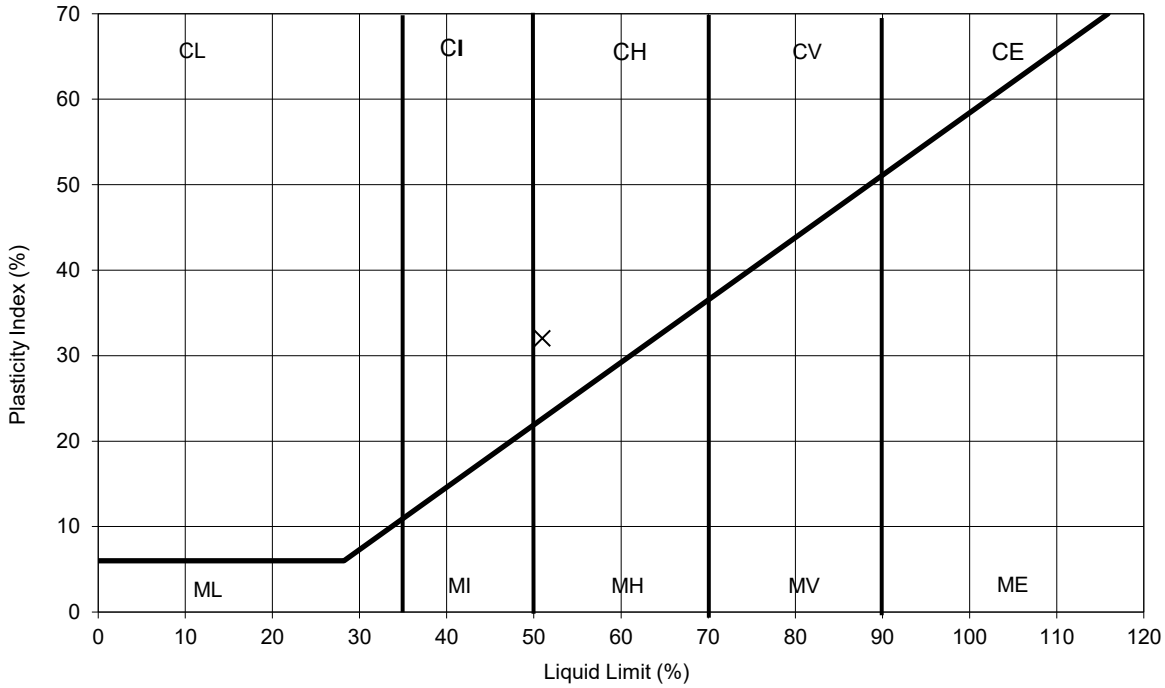
Site Name	Phoenix Wharf, Port Talbot			Job No.	33610
				Borehole/Pit No.	BH105
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	7.00 m
Soil Description	Dark grey slightly sandy alluvial silty CLAY with rare fine sub-angular gravel			Depth Base	10.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
				Project Started	19/06/2023
				Date Tested	28/06/2023



NATURAL MOISTURE CONTENT	**37**	**%**
% PASSING 425µm SIEVE	**98**	**%**
LIQUID LIMIT	**51**	**%**
PLASTIC LIMIT	**19**	**%**
PLASTICITY INDEX	**32**	**%**

Remarks

PLASTICITY INDEX



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TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Checked and Approved

Initials: J.P
Date: 30/08/2023

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

UKAS TESTING

2519

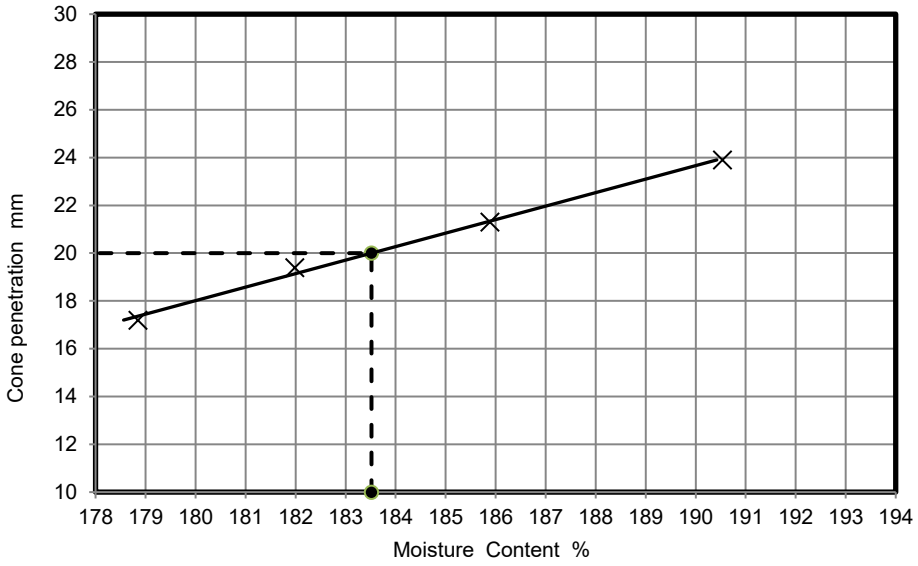
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	9.00 m
Soil Description	Dark grey peaty silty CLAY			Depth Base	13.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
				Project Started	19/06/2023
				Date Tested	03/07/2023

Job No. 33610

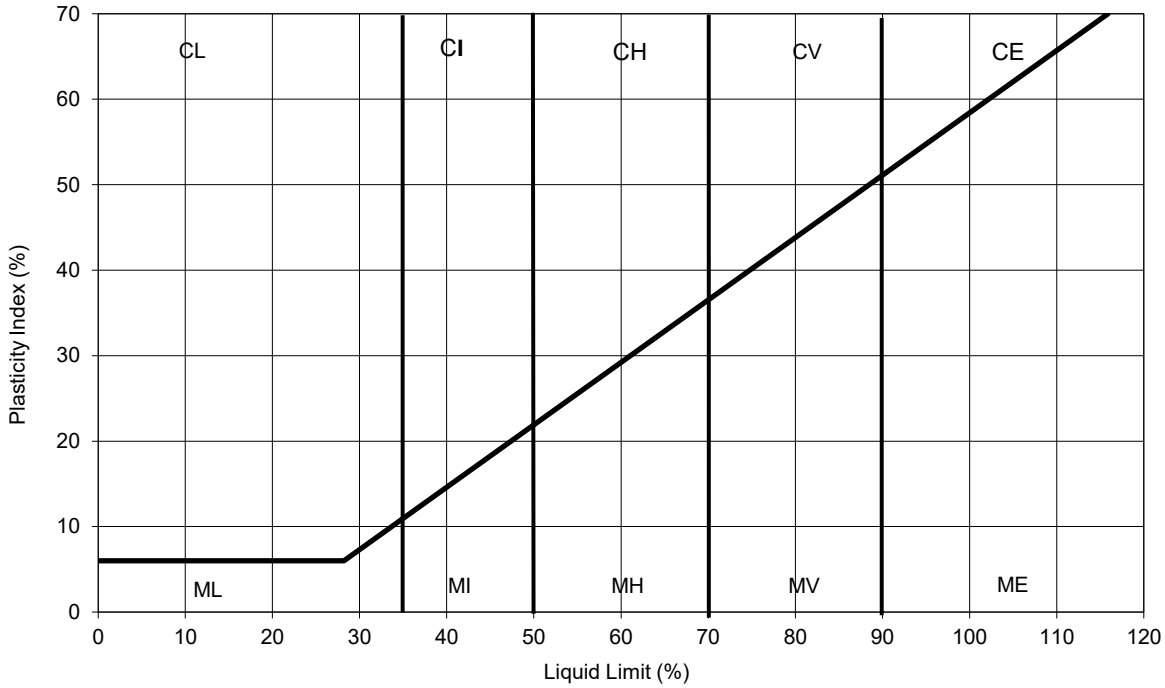
Borehole/Pit No. BH105



NATURAL MOISTURE CONTENT	**231**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**184**	**%**
PLASTIC LIMIT	**111**	**%**
PLASTICITY INDEX	**73**	**%**

Remarks

PLASTICITY INDEX



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TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Checked and Approved

Initials: J.P

Date: 30/08/2023

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UKAS TESTING

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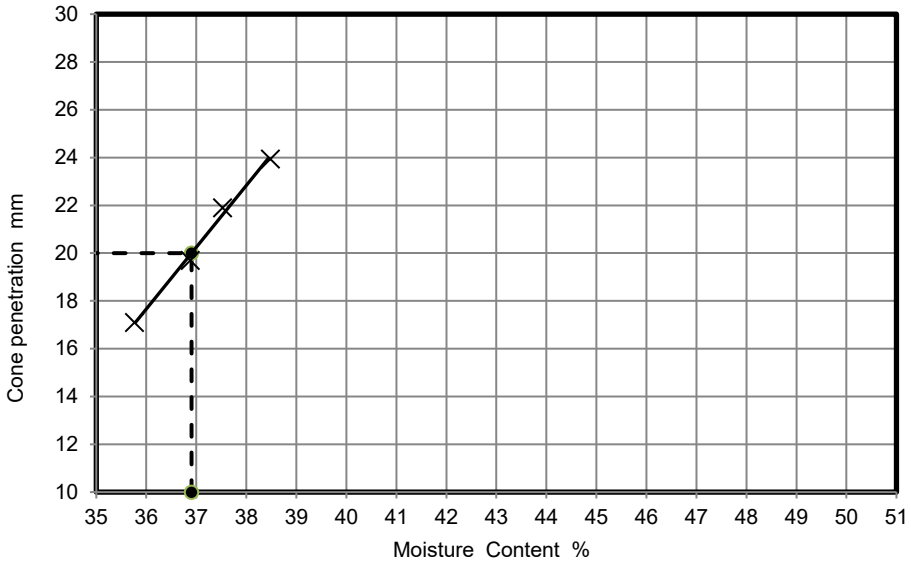
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	4.00 m
Soil Description	Dark grey slightly gravelly clayey very silty SAND (gravel is fm and sub-angular)			Depth Base	- m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
				Project Started	19/06/2023
				Date Tested	03/07/2023

Job No. 33610

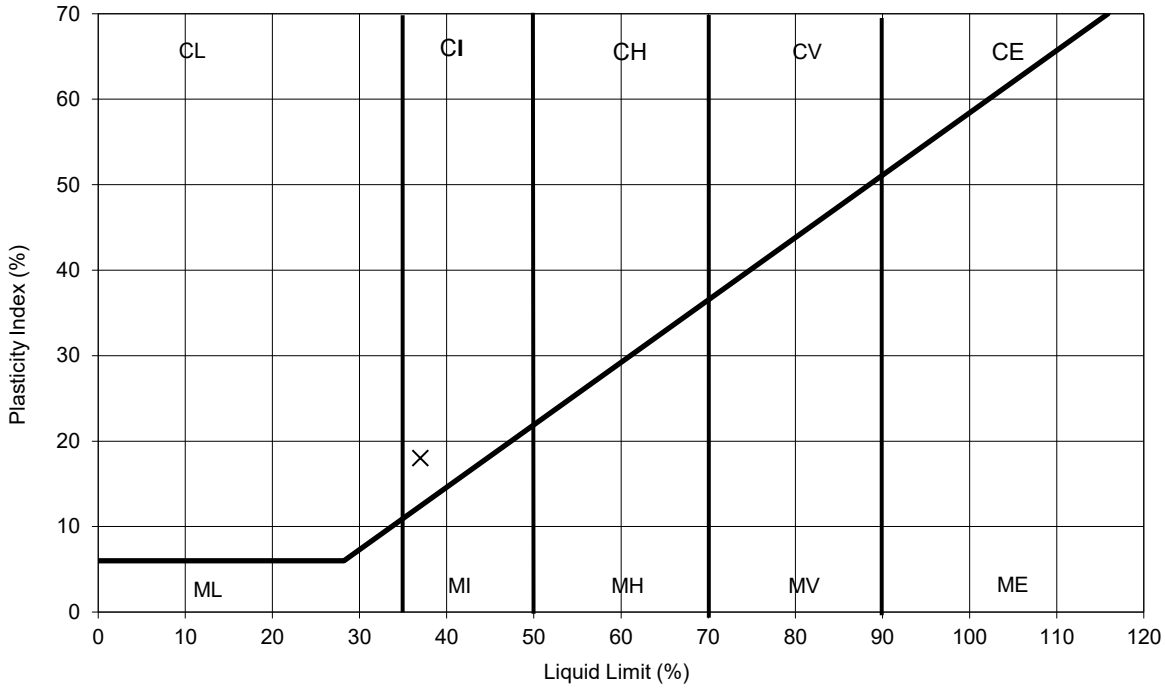
Borehole/Pit No. BH106



NATURAL MOISTURE CONTENT	**36**	**%**
% PASSING 425µm SIEVE	**95**	**%**
LIQUID LIMIT	**37**	**%**
PLASTIC LIMIT	**19**	**%**
PLASTICITY INDEX	**18**	**%**

Remarks

PLASTICITY INDEX



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TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Checked and Approved

Initials: J.P

Date: 30/08/2023

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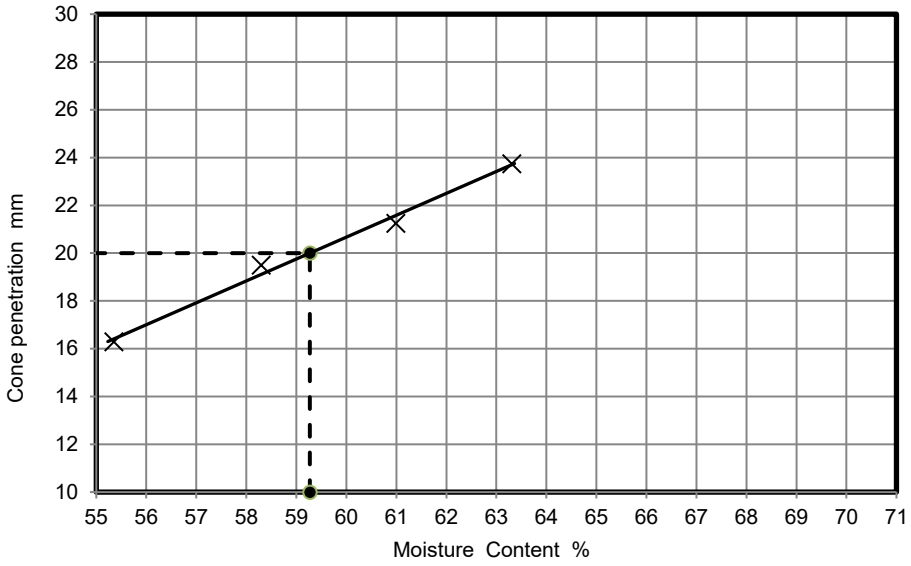
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

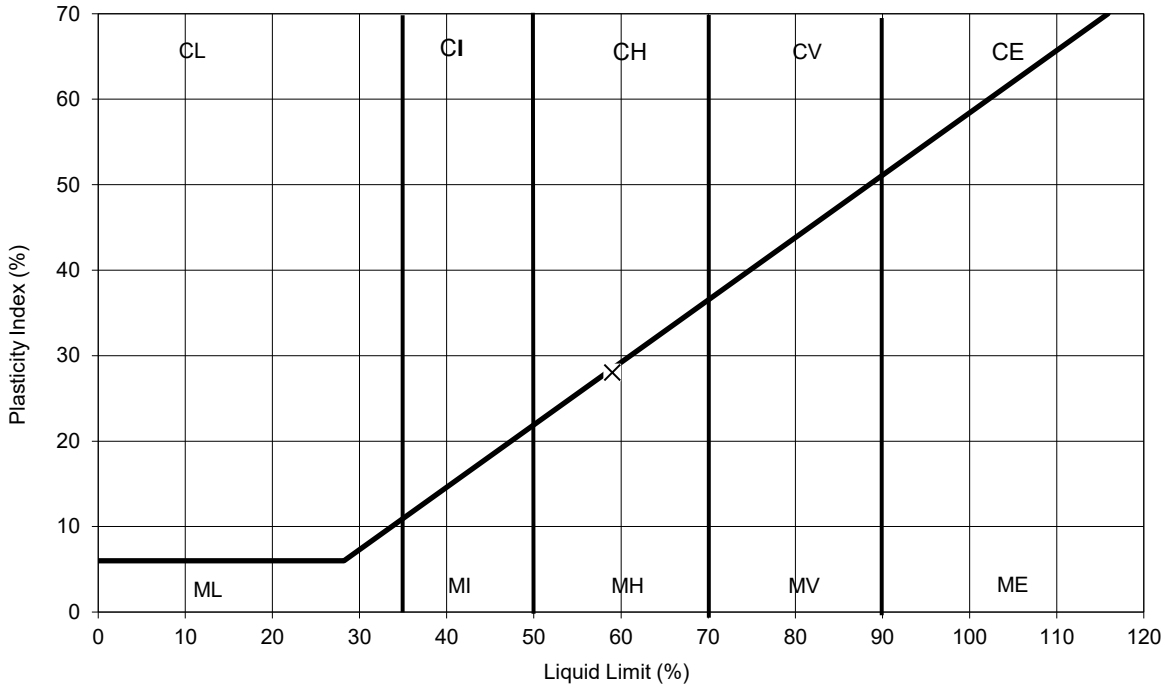
				Job No.	33610
				Borehole/Pit No.	BH106
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	9.00 m
Soil Description	Dark brownish grey sandy silty CLAY with traces of peat pockets			Depth Base	10.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
				Project Started	19/06/2023
				Date Tested	04/07/2023



NATURAL MOISTURE CONTENT	**66**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**59**	**%**
PLASTIC LIMIT	**31**	**%**
PLASTICITY INDEX	**28**	**%**

Remarks

PLASTICITY INDEX



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TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Checked and Approved

Initials: J.P
Date: 30/08/2023

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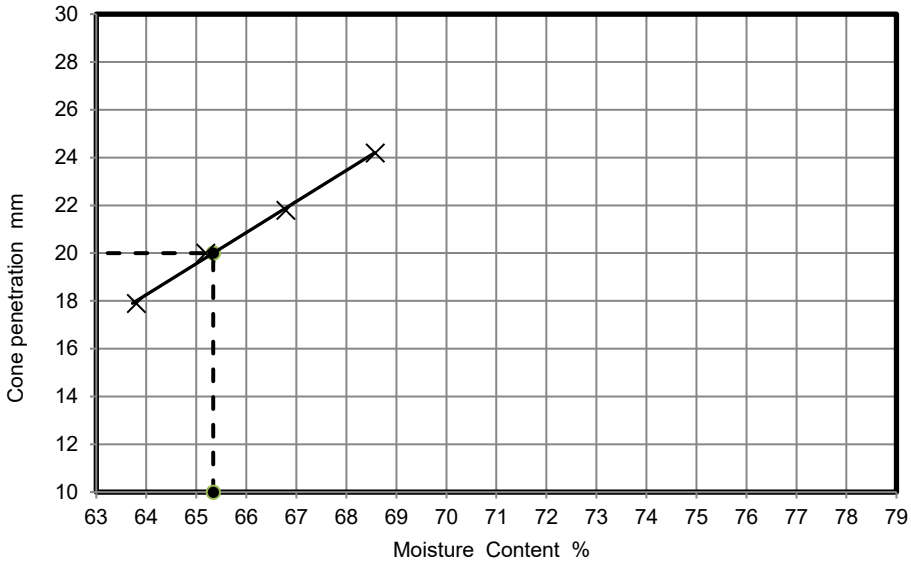
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

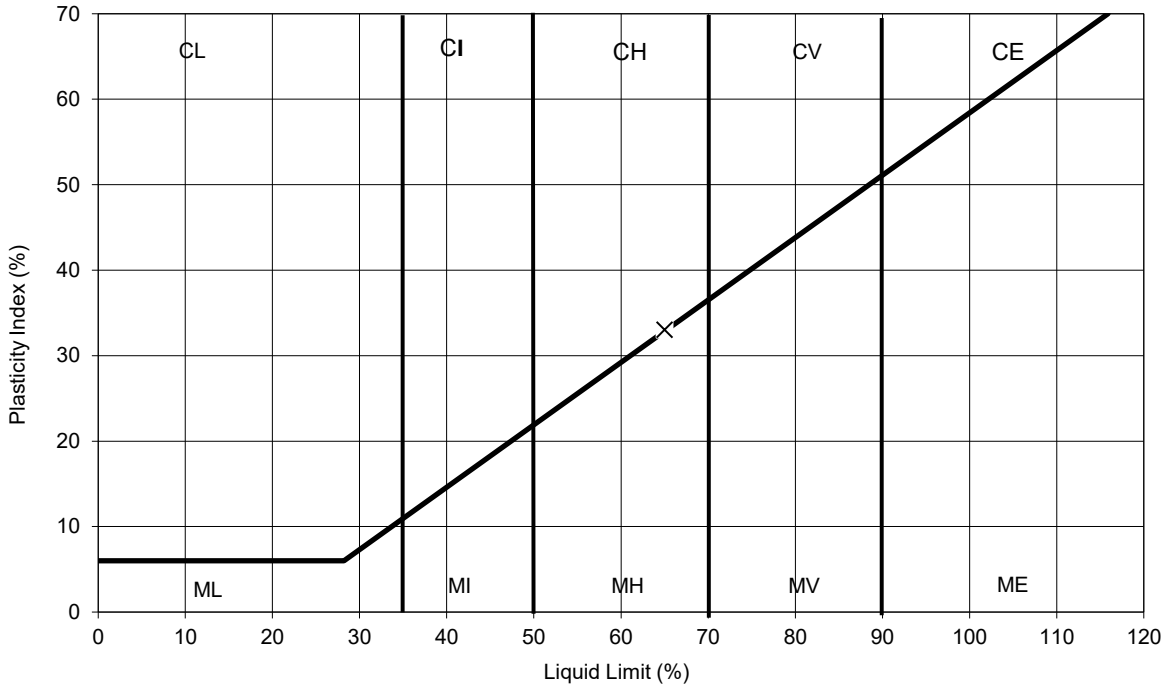
				Job No.	33610
				Borehole/Pit No.	BH107
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	10.50 m
Soil Description	Brownish grey, grey and black slightly sandy slightly peaty silty CLAY with rare rootlets			Depth Base	11.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
				Project Started	19/06/2023
				Date Tested	03/07/2023



NATURAL MOISTURE CONTENT	**50**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**65**	**%**
PLASTIC LIMIT	**32**	**%**
PLASTICITY INDEX	**33**	**%**

Remarks

PLASTICITY INDEX



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BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Checked and Approved

Initials: J.P
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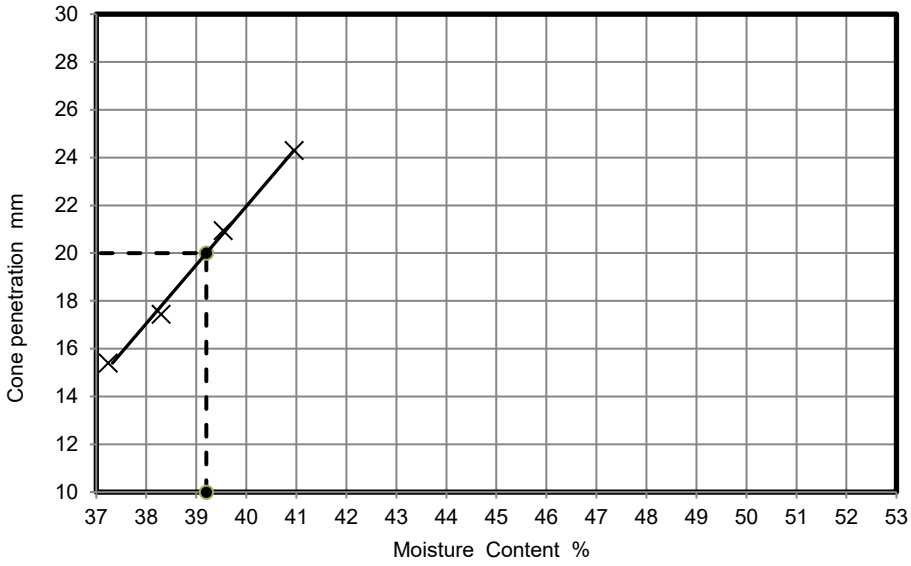
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	8.00 m
Soil Description	Grey slightly sandy slightly peaty silty CLAY with occasional decayed wood fragments			Depth Base	9.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
				Project Started	19/06/2023
				Date Tested	03/07/2023

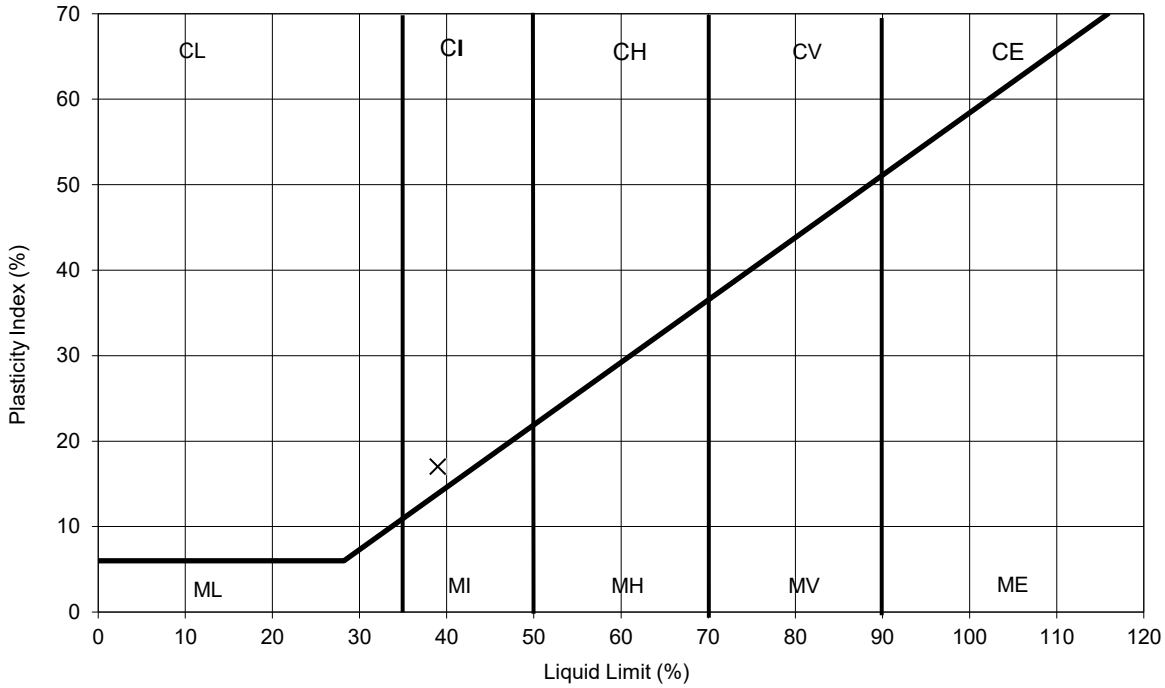
Job No.	33610
Borehole/Pit No.	BH108



NATURAL MOISTURE CONTENT	**39**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**39**	**%**
PLASTIC LIMIT	**22**	**%**
PLASTICITY INDEX	**17**	**%**

Remarks

PLASTICITY INDEX



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TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
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BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Checked and Approved

Initials: J.P
Date: 30/08/2023

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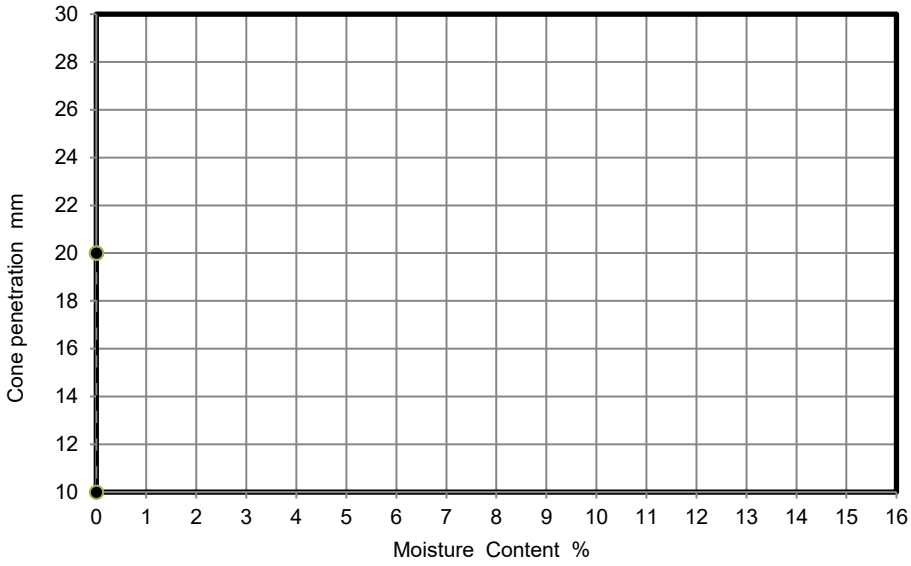
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

K4 SOILS	**LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX**			Job No.	33610
				Borehole/Pit No.	BH109
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	2.50 m
Soil Description	Greyish brown slightly silty fm SAND			Depth Base	3.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
				Project Started	19/06/2023
				Date Tested	07/07/2023

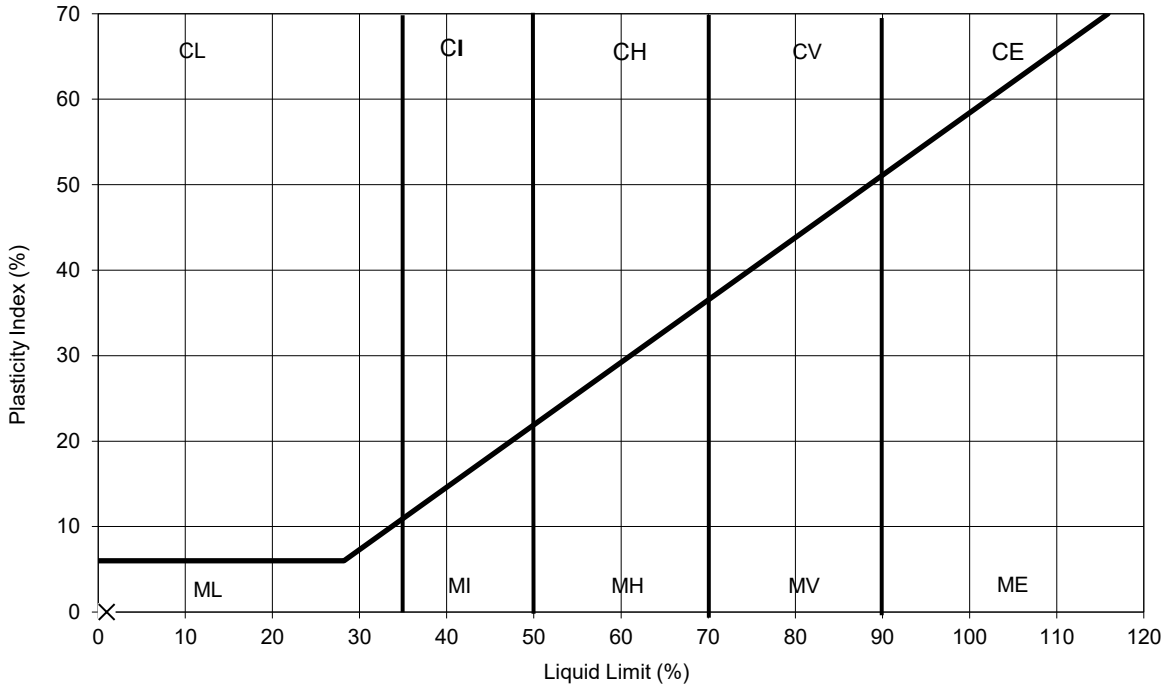


NATURAL MOISTURE CONTENT	**23**	**%**
% PASSING 425µm SIEVE	**-**	**%**
LIQUID LIMIT	**-**	**%**
PLASTIC LIMIT	**-**	**%**
PLASTICITY INDEX	**-**	**%**

Remarks

Non-plastic

PLASTICITY INDEX



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UKAS TESTING

TEST METHOD

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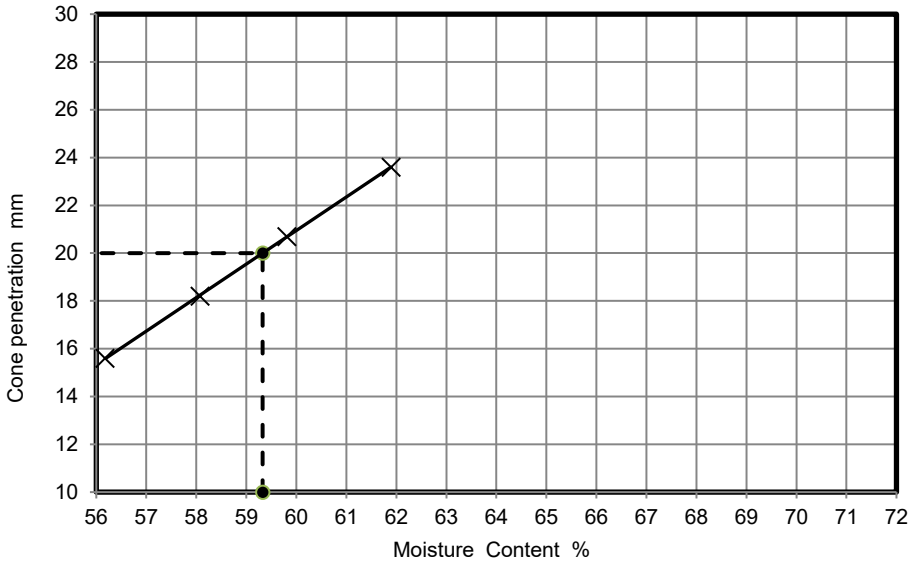
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

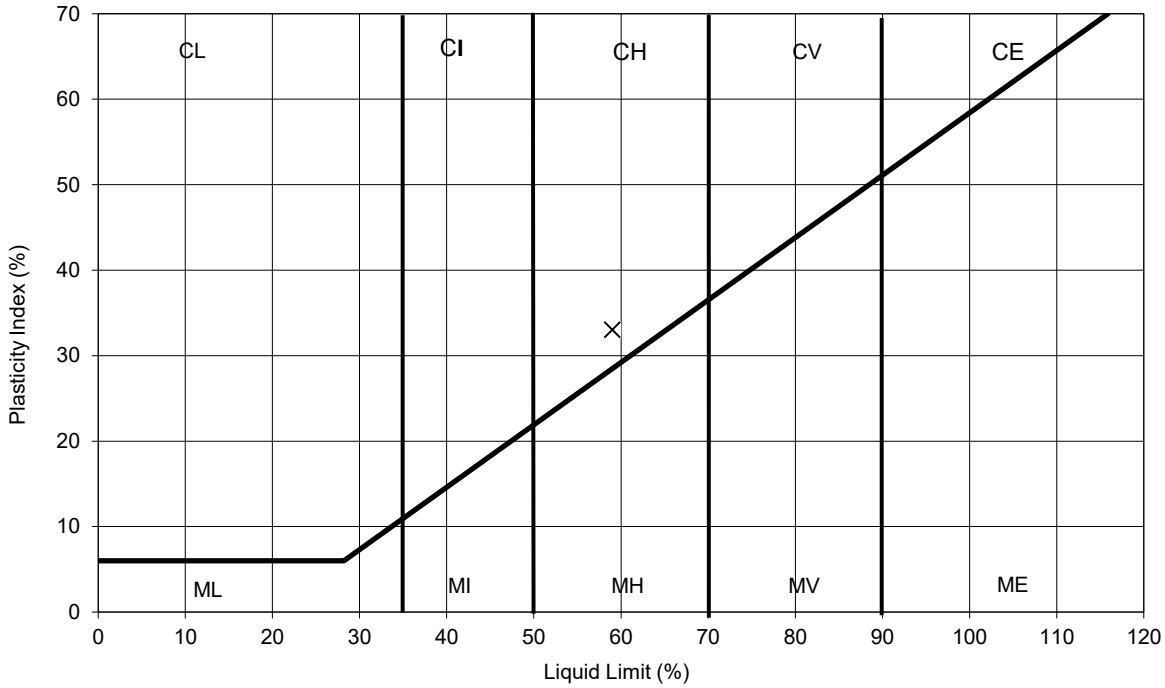
				Job No.	33610
				Borehole/Pit No.	BH110
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	2.50 m
Soil Description	Dark grey slightly gravelly slightly organic silty CLAY (gravel is fmc and sub-angular)			Depth Base	3.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
				Project Started	19/06/2023
				Date Tested	11/07/2023



NATURAL MOISTURE CONTENT	**45**	**%**
% PASSING 425µm SIEVE	**94**	**%**
LIQUID LIMIT	**59**	**%**
PLASTIC LIMIT	**26**	**%**
PLASTICITY INDEX	**33**	**%**

Remarks

PLASTICITY INDEX



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TEST METHOD

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BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Checked and Approved

Initials: J.P
Date: 30/08/2023

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UKAS TESTING

2519

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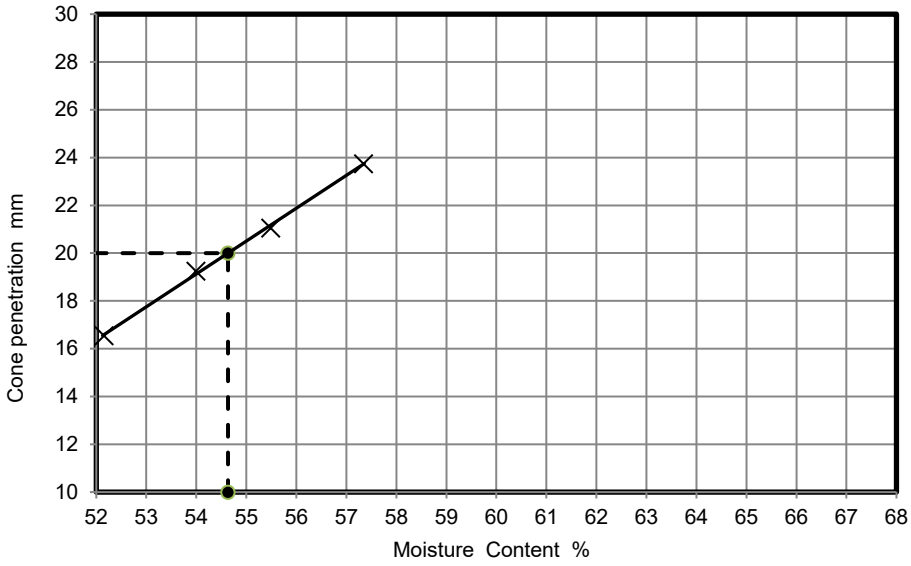
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	3.50 m
Soil Description	Grey slightly gravelly silty CLAY (gravel is fmc and sub-angular to sub-rounded)			Depth Base	4.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
				Project Started	19/06/2023
				Date Tested	04/07/2023

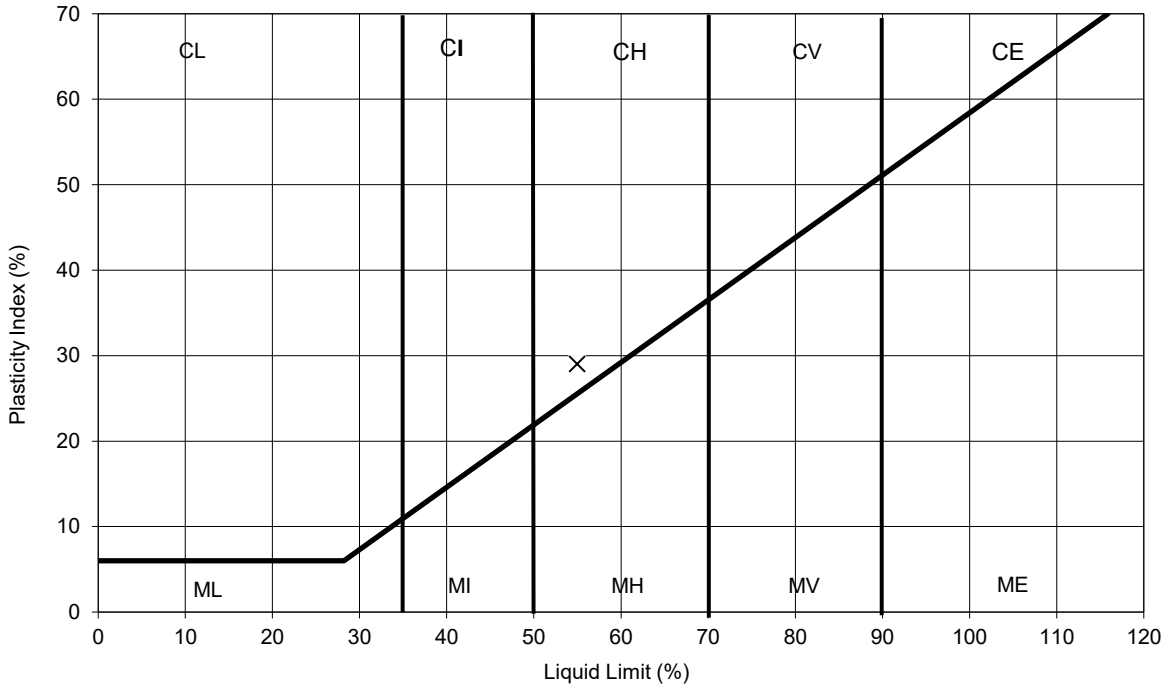
Job No.	33610
Borehole/Pit No.	BH110



NATURAL MOISTURE CONTENT	**46**	**%**
% PASSING 425µm SIEVE	**82**	**%**
LIQUID LIMIT	**55**	**%**
PLASTIC LIMIT	**26**	**%**
PLASTICITY INDEX	**29**	**%**

Remarks

PLASTICITY INDEX



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TEST METHOD

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BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

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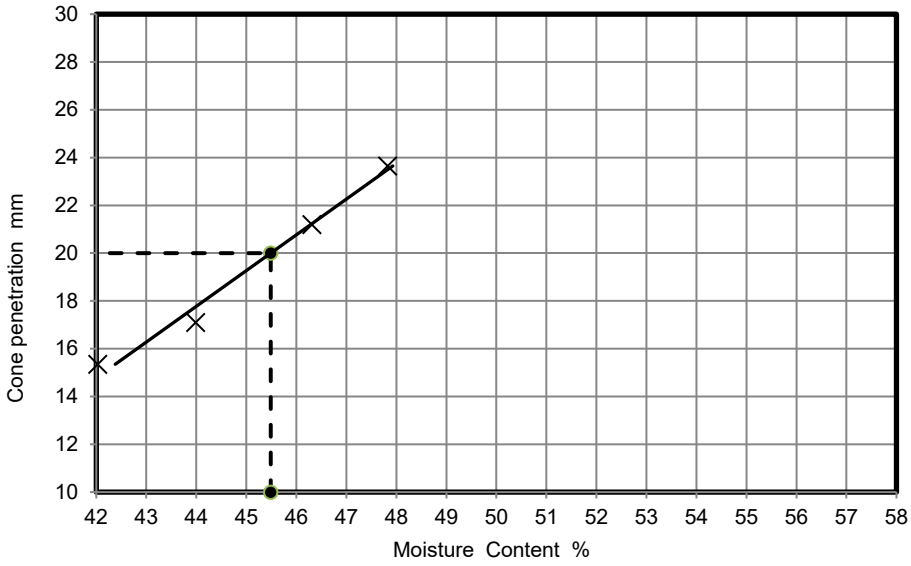
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

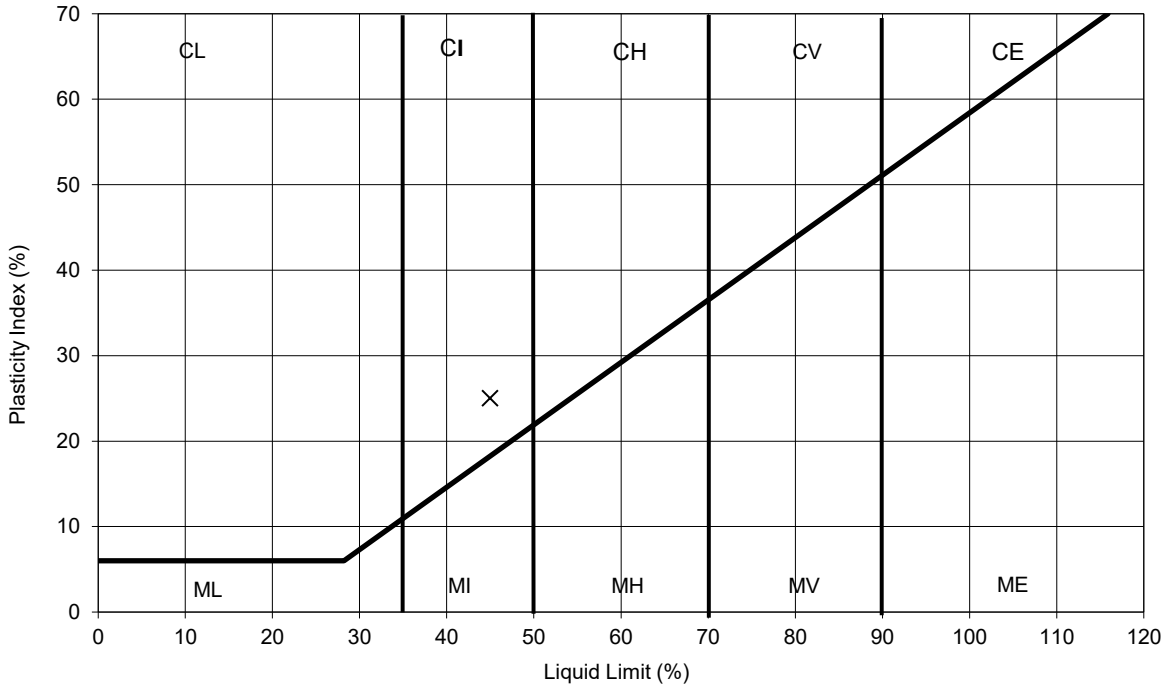
				Job No.	33610
				Borehole/Pit No.	BH110
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	4.50 m
Soil Description	Greyish brown and brownish grey slightly sandy silty CLAY			Depth Base	5.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
				Project Started	19/06/2023
				Date Tested	03/07/2023



NATURAL MOISTURE CONTENT	**33**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**45**	**%**
PLASTIC LIMIT	**20**	**%**
PLASTICITY INDEX	**25**	**%**

Remarks

PLASTICITY INDEX



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TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

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UKAS TESTING

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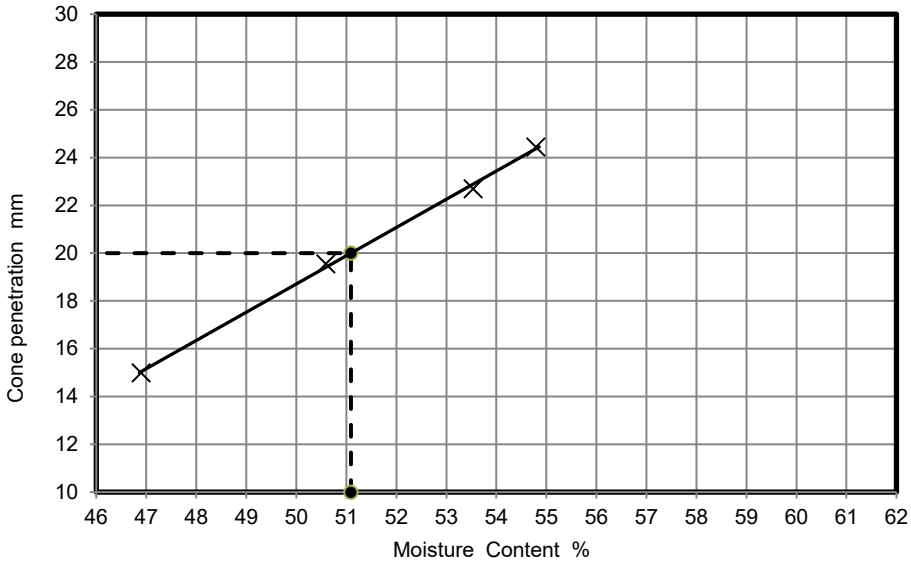
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

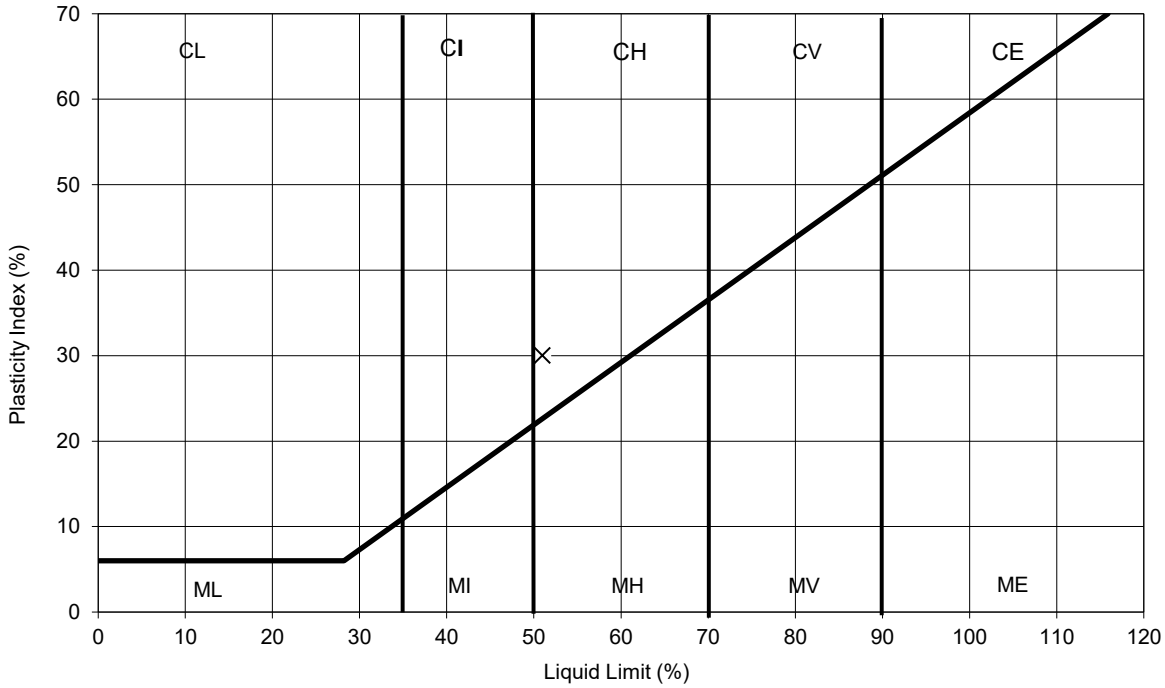
Site Name	Phoenix Wharf, Port Talbot			Job No.	33610
				Borehole/Pit No.	BH111
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	3.50 m
Soil Description	Grey and dark grey slightly gravelly slightly sandy organic silty CLAY with occasional wood fragments and roots (gravel is fm and angular to sub-angular)			Depth Base	4.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
				Project Started	19/06/2023
				Date Tested	11/07/2023



NATURAL MOISTURE CONTENT	**46**	**%**
% PASSING 425µm SIEVE	**93**	**%**
LIQUID LIMIT	**51**	**%**
PLASTIC LIMIT	**21**	**%**
PLASTICITY INDEX	**30**	**%**

Remarks

PLASTICITY INDEX



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TEST METHOD

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BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Checked and Approved

Initials: J.P
Date: 30/08/2023

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

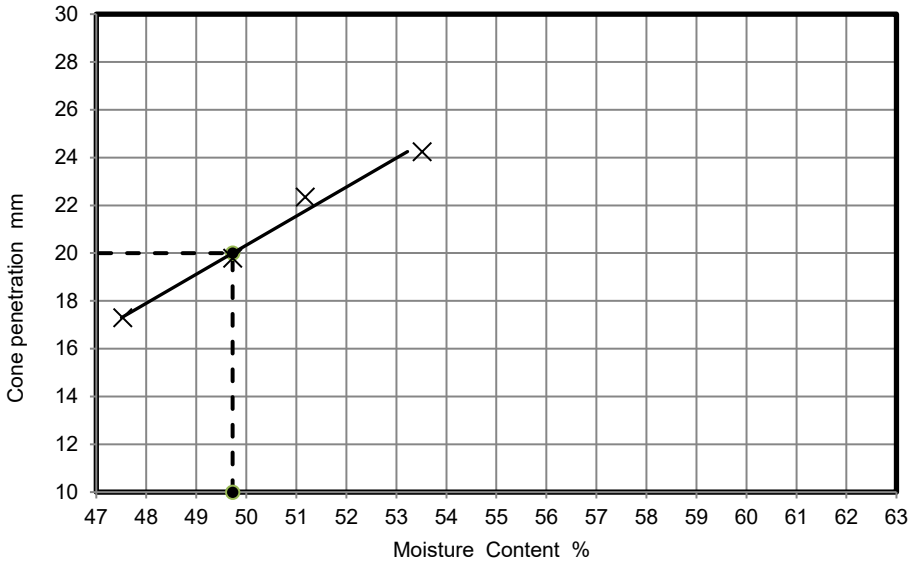
UKAS TESTING

2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

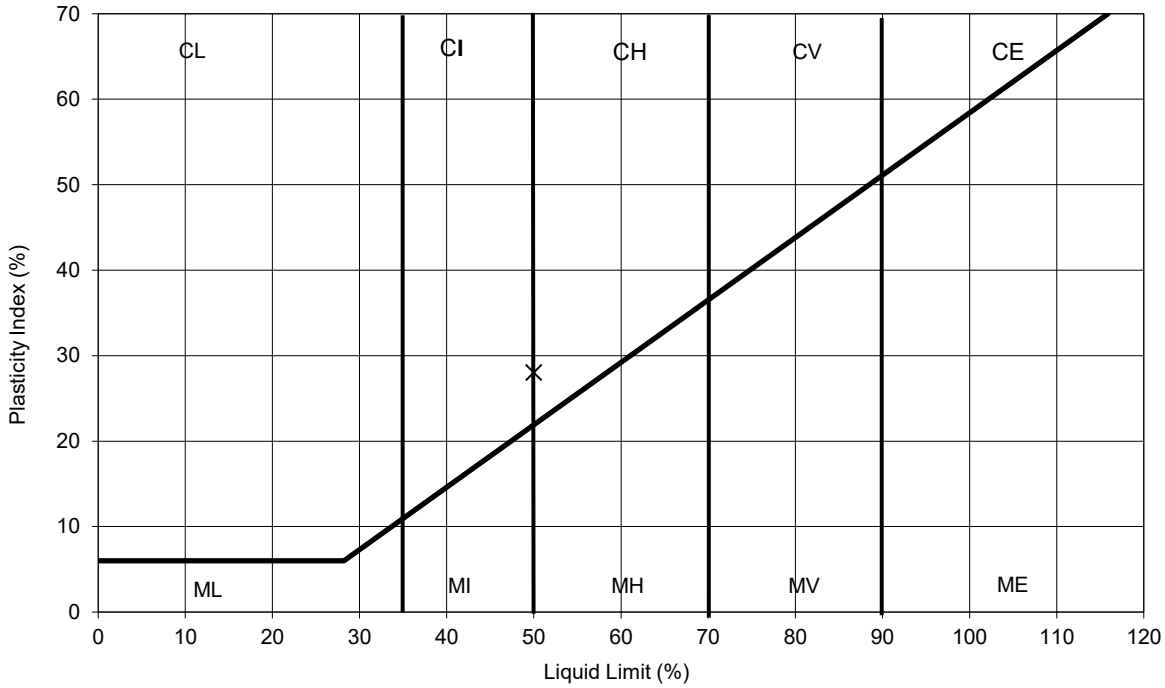
Job No.	33610				
Borehole/Pit No.	BH111				
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	7.50 m
Soil Description	Brownish grey silty CLAY			Depth Base	8.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
				Project Started	19/06/2023
				Date Tested	03/07/2023



NATURAL MOISTURE CONTENT	**44**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**50**	**%**
PLASTIC LIMIT	**22**	**%**
PLASTICITY INDEX	**28**	**%**

Remarks

PLASTICITY INDEX



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TEST METHOD

BS1377: Part 2 :Clause 4.3 : 1990 Determination of the liquid limit by the cone penetrometer method
BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

Checked and Approved

Initials: J.P
Date: 30/08/2023

Test Report by K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU
Tel: 01923 711 288 Email: James@k4soils.com

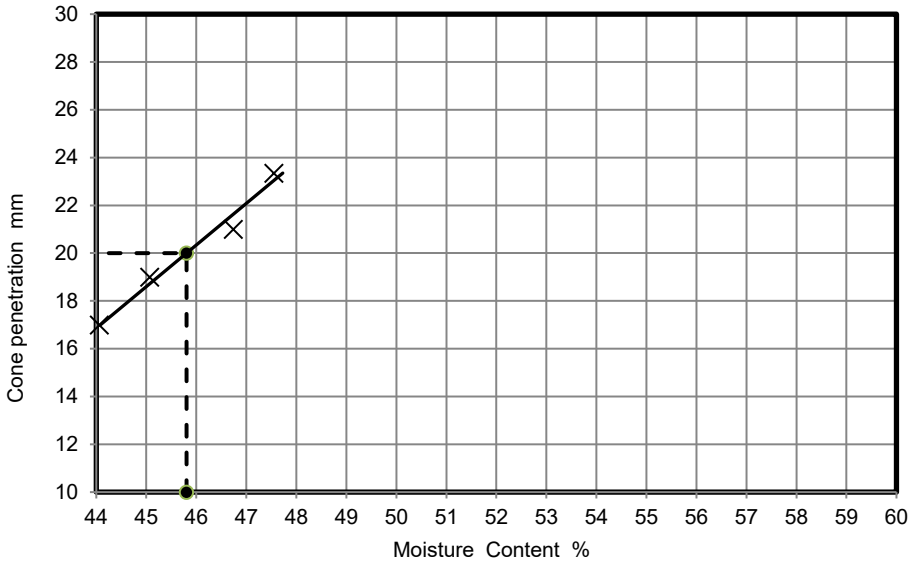
UKAS TESTING

2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

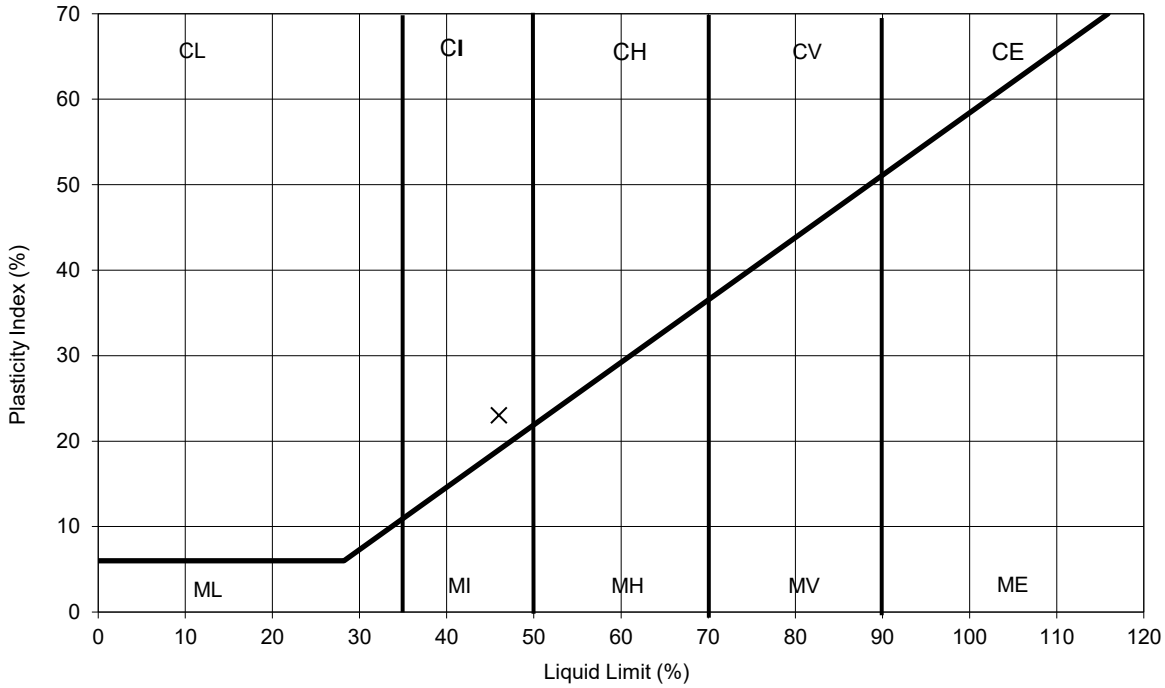
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	3.00 m
Soil Description	Grey slightly sandy silty CLAY with rare fine gravel			Depth Base	3.50 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
				Project Started	19/06/2023
				Date Tested	04/07/2023
				Job No.	33610
				Borehole/Pit No.	BH112



NATURAL MOISTURE CONTENT	**40**	**%**
% PASSING 425µm SIEVE	**97**	**%**
LIQUID LIMIT	**46**	**%**
PLASTIC LIMIT	**23**	**%**
PLASTICITY INDEX	**23**	**%**

Remarks

PLASTICITY INDEX



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BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

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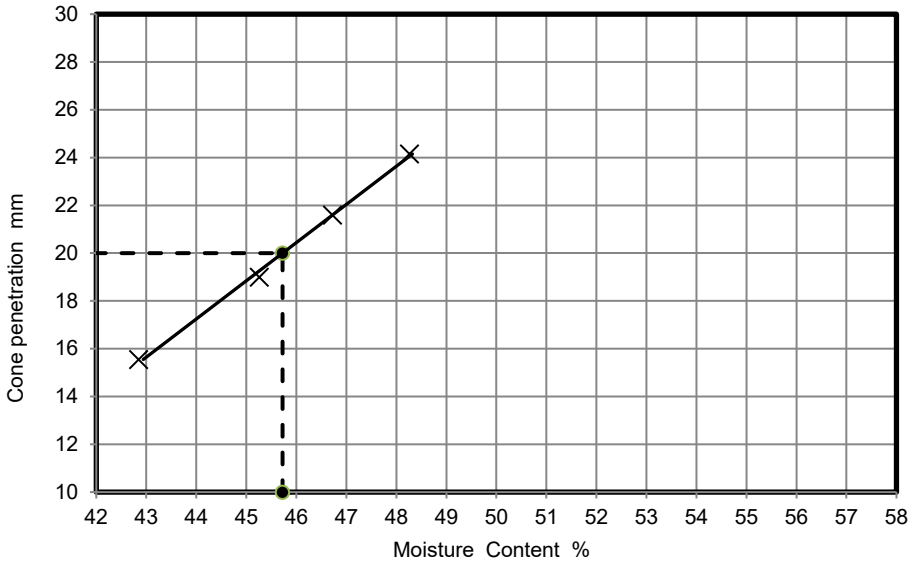
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

				Job No.	33610
				Borehole/Pit No.	BH113
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	2.50 m
Soil Description	Grey sandy gravelly silty CLAY (gravel is fmc and sub-angular to rounded)			Depth Base	3.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
				Project Started	19/06/2023
				Date Tested	26/07/2023

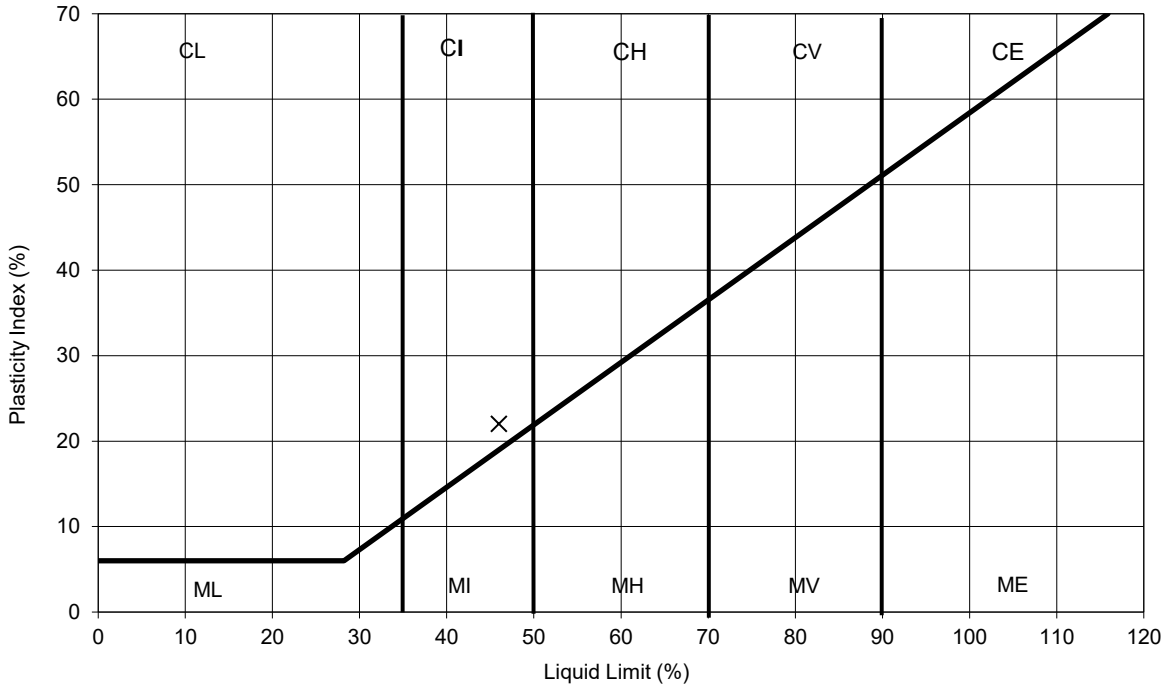


NATURAL MOISTURE CONTENT	**28**	**%**
% PASSING 425µm SIEVE	**57**	**%**
LIQUID LIMIT	**46**	**%**
PLASTIC LIMIT	**24**	**%**
PLASTICITY INDEX	**22**	**%**

Remarks

Sample washed to obtain test fraction

PLASTICITY INDEX



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BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

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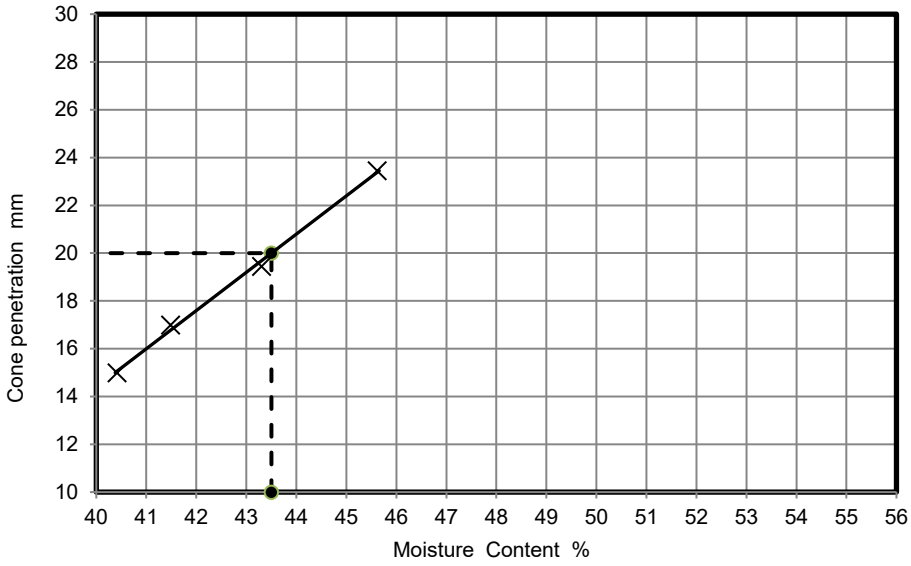
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

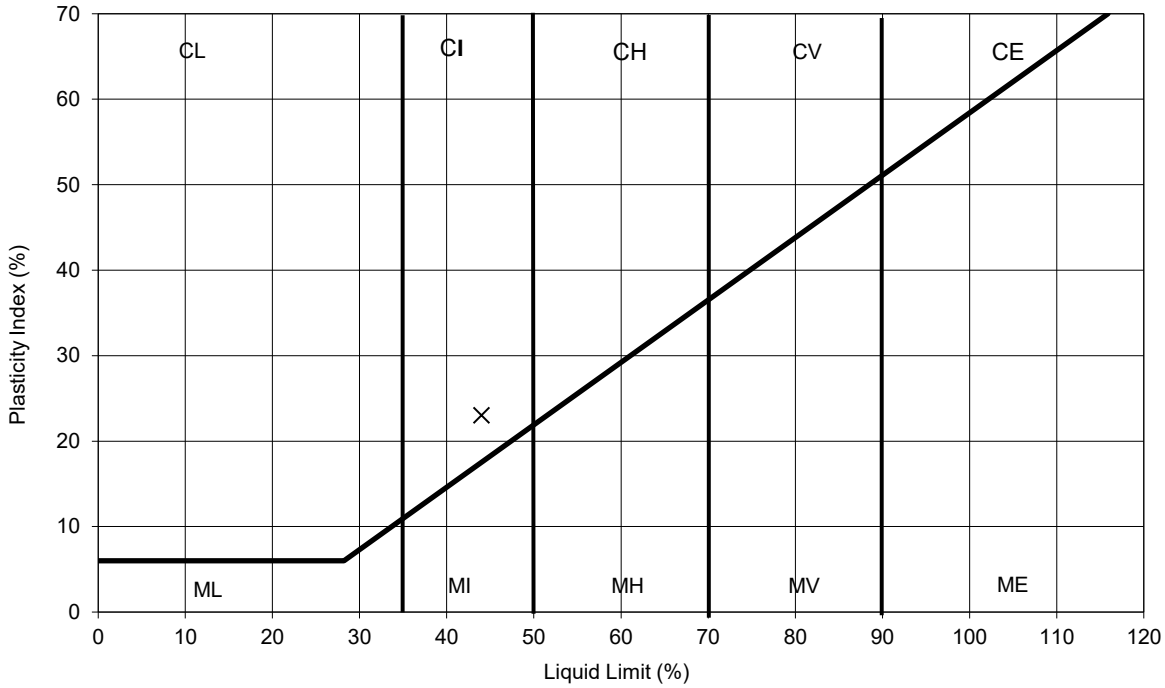
				Job No.	33610
				Borehole/Pit No.	BH113
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	9.50 m
Soil Description	Dark grey slightly sandy alluvial silty CLAY with rare fine sub-angular gravel			Depth Base	10.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
				Project Started	19/06/2023
				Date Tested	28/06/2023



NATURAL MOISTURE CONTENT	**50**	**%**
% PASSING 425µm SIEVE	**99**	**%**
LIQUID LIMIT	**44**	**%**
PLASTIC LIMIT	**21**	**%**
PLASTICITY INDEX	**23**	**%**

Remarks

PLASTICITY INDEX



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BS1377: Part 2 :Clause 5.0 : 1990: Determination of the plastic limit and plasticity index
BS1377: Part 2 :Clause 3.2 : 1990:Determination of the moisture content by the oven drying

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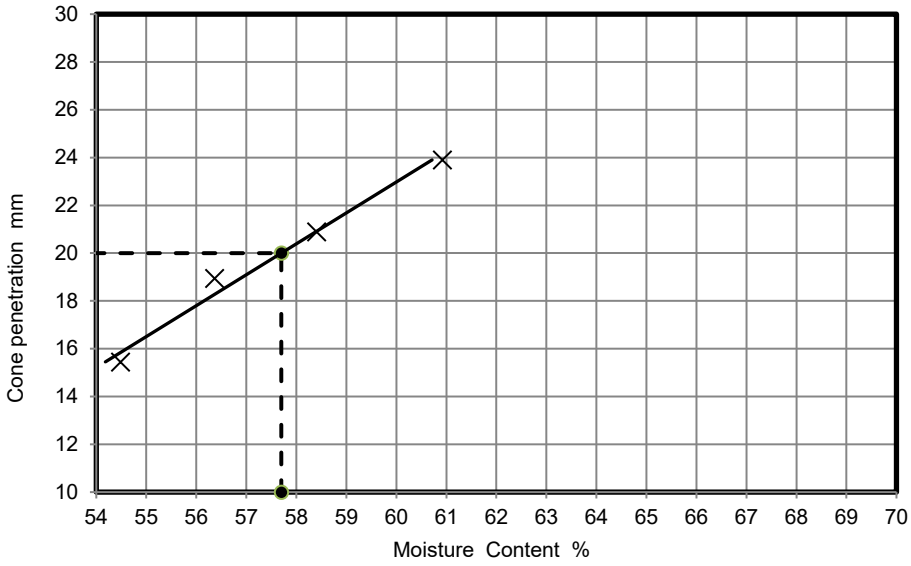
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	6.90 m
Soil Description	Dark grey and brown slightly sandy organic silty CLAY with rare fm sub-angular gravel			Depth Base	8.50 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
				Project Started	19/06/2023
				Date Tested	04/07/2023

Job No. 33610

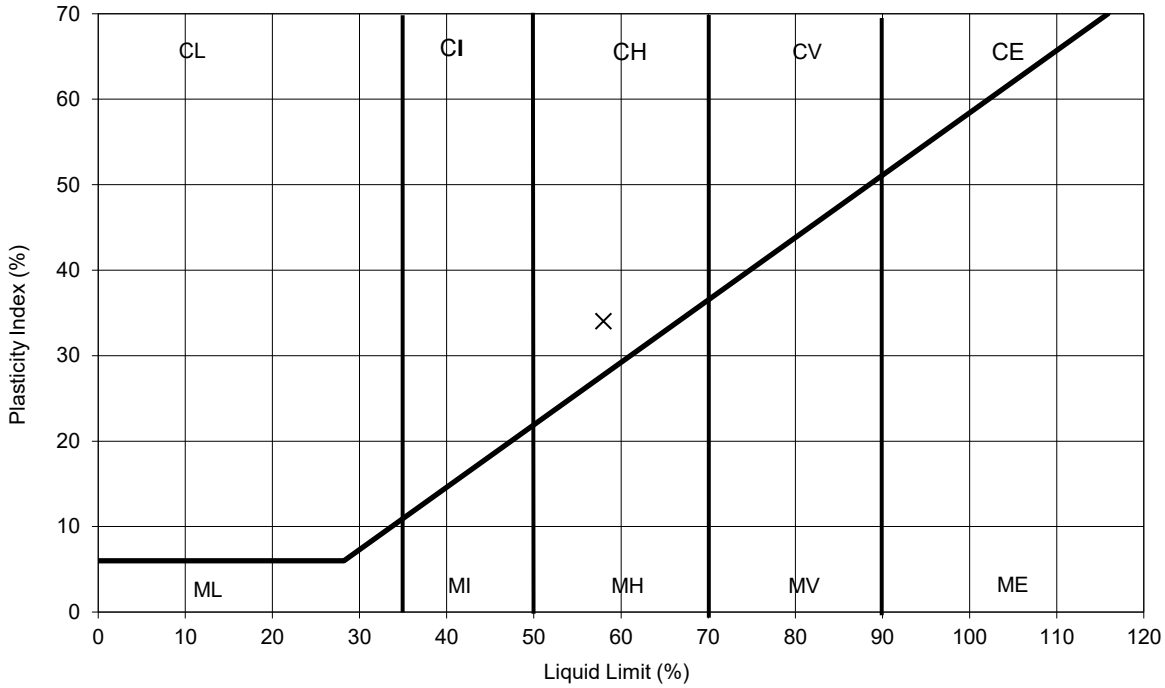
Borehole/Pit No. BH114



NATURAL MOISTURE CONTENT	**52**	**%**
% PASSING 425µm SIEVE	**98**	**%**
LIQUID LIMIT	**58**	**%**
PLASTIC LIMIT	**24**	**%**
PLASTICITY INDEX	**34**	**%**

Remarks

PLASTICITY INDEX



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TEST METHOD

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Checked and Approved

Initials: J.P

Date: 30/08/2023

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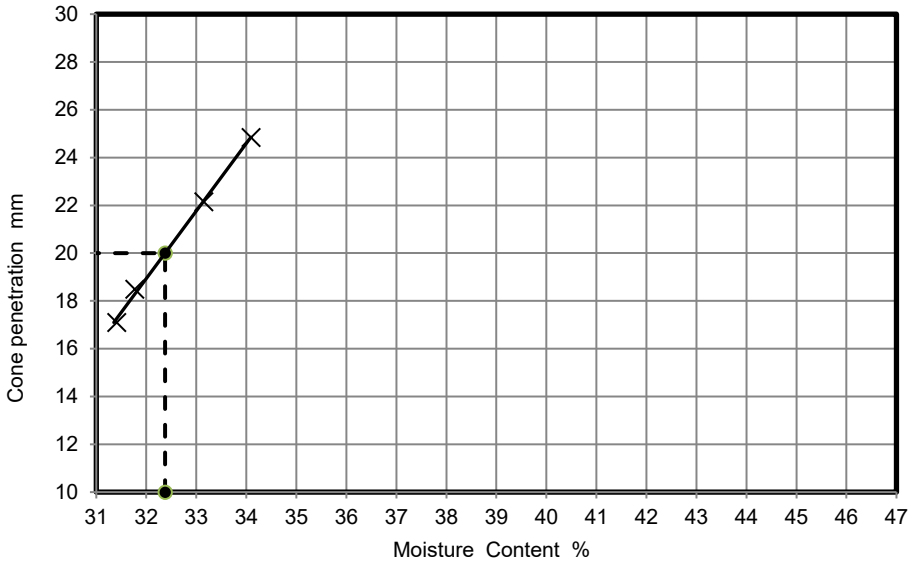
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

				Job No.	33610
				Borehole/Pit No.	BH116
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	0.50 m
Soil Description	Dark grey clayey silty very gravelly SAND (gravel is fmc and angular to sub-angular)			Depth Base	1.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
				Project Started	19/06/2023
				Date Tested	07/07/2023

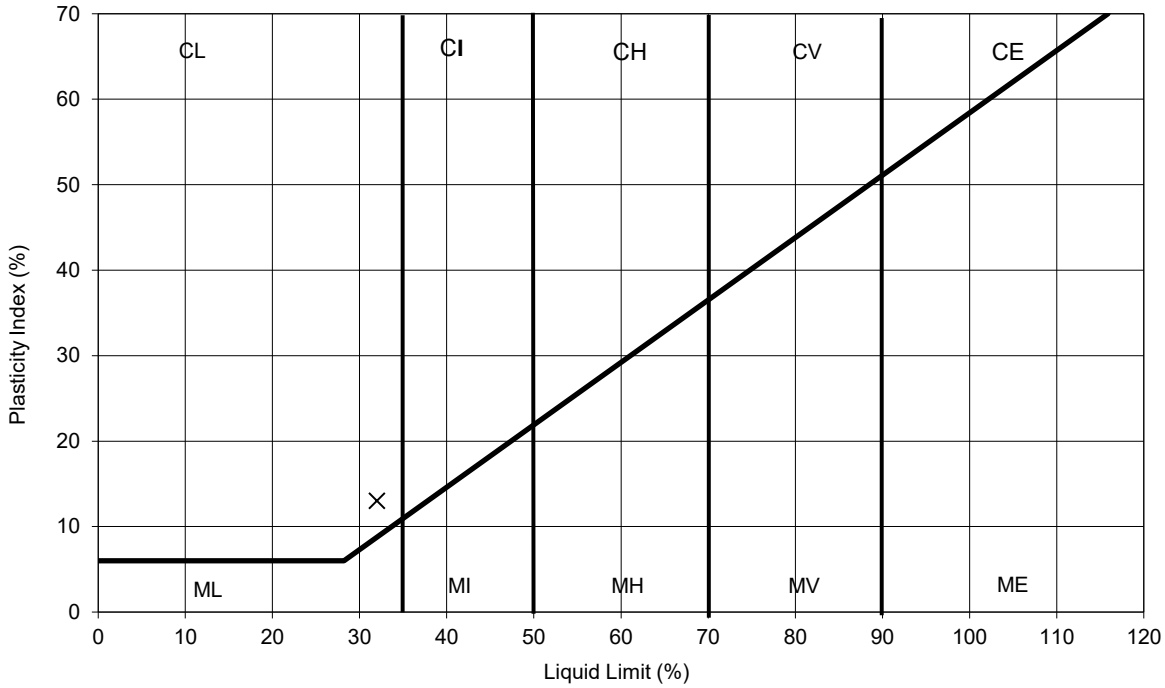


NATURAL MOISTURE CONTENT	**16**	**%**
% PASSING 425µm SIEVE	**38**	**%**
LIQUID LIMIT	**32**	**%**
PLASTIC LIMIT	**19**	**%**
PLASTICITY INDEX	**13**	**%**

Remarks

Sample washed to obtain test fraction

PLASTICITY INDEX



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TEST METHOD

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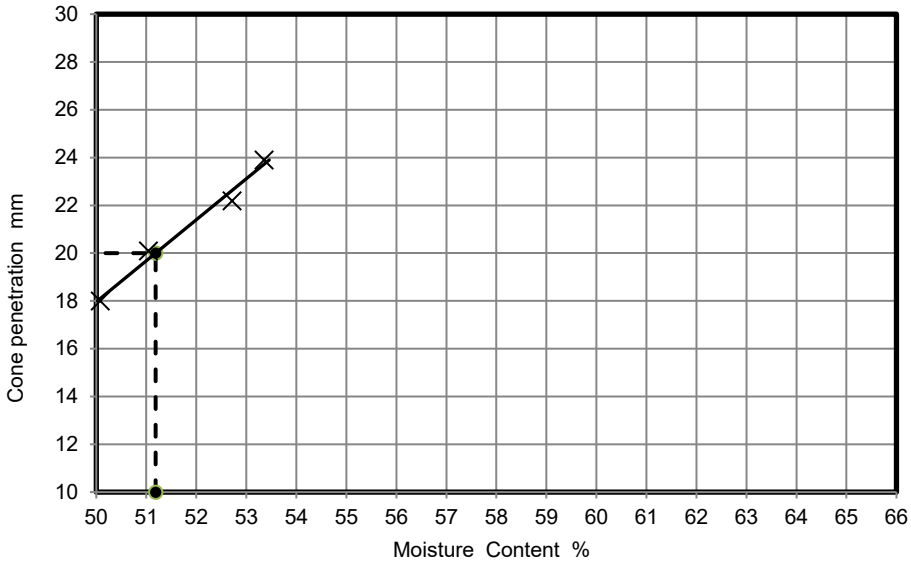
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

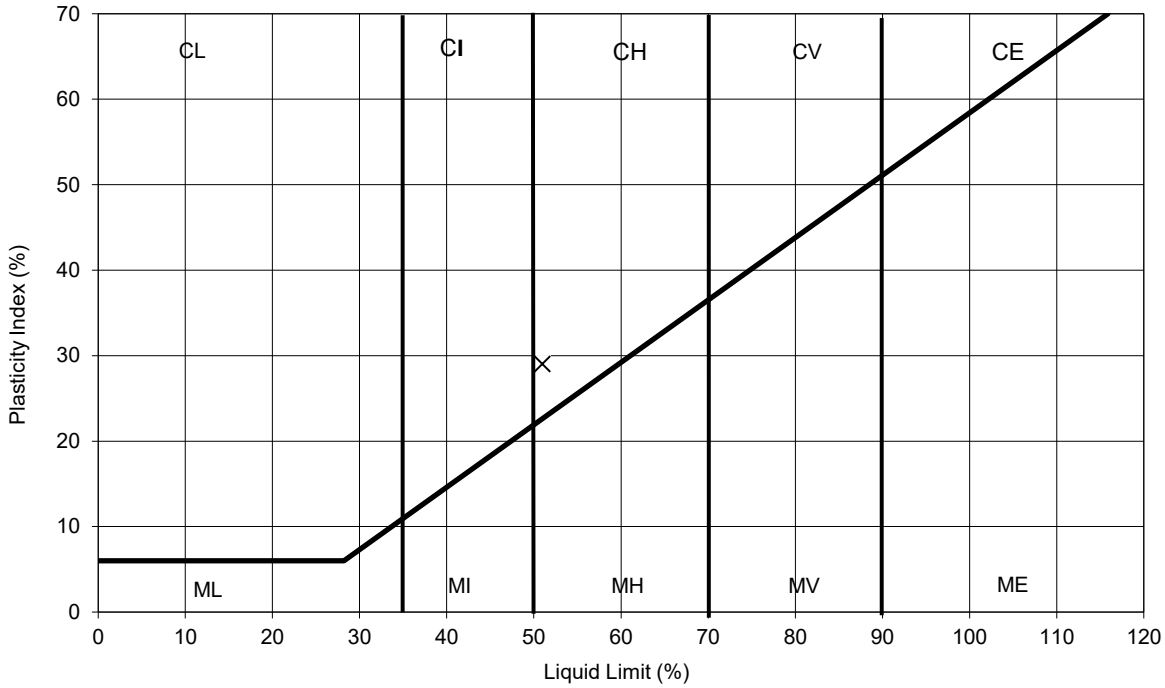
				Job No.	33610
				Borehole/Pit No.	BH116
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	7.50 m
Soil Description	Greyish brown slightly sandy silty CLAY			Depth Base	8.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
				Project Started	19/06/2023
				Date Tested	04/07/2023



NATURAL MOISTURE CONTENT	**48**	**%**
% PASSING 425µm SIEVE	**100**	**%**
LIQUID LIMIT	**51**	**%**
PLASTIC LIMIT	**22**	**%**
PLASTICITY INDEX	**29**	**%**

Remarks

PLASTICITY INDEX



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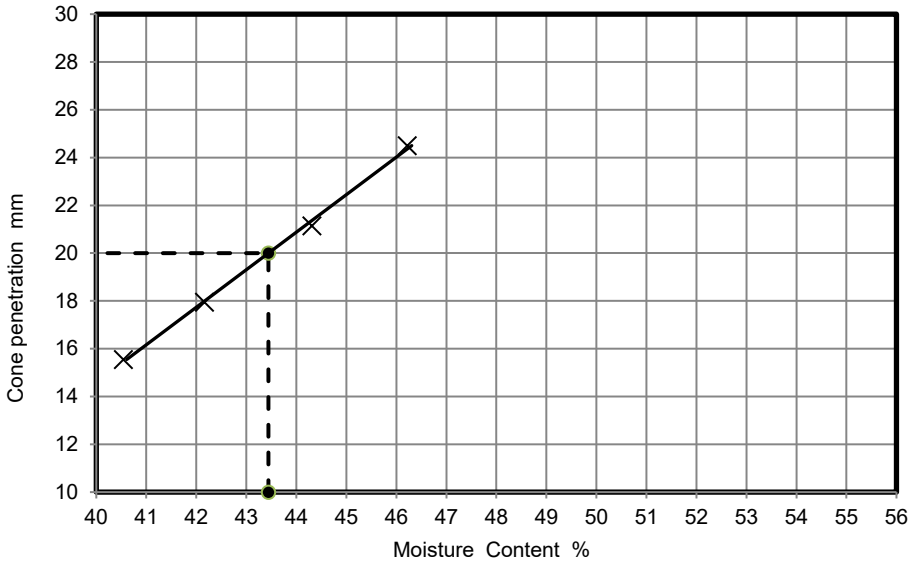
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

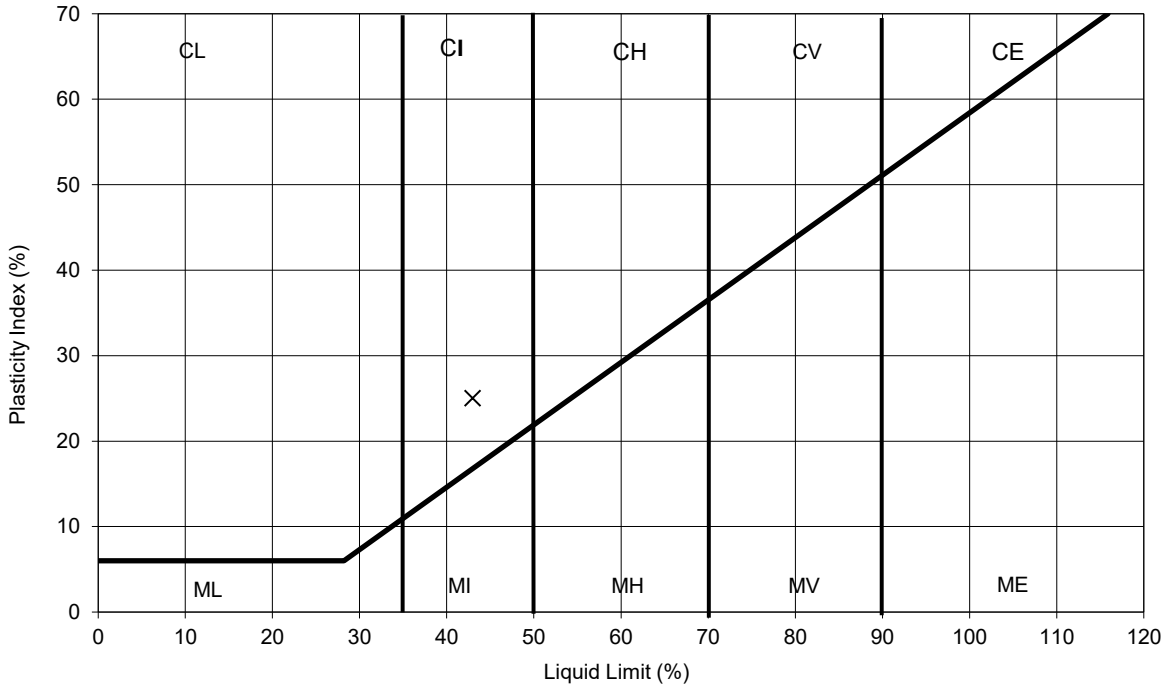
Site Name	Phoenix Wharf, Port Talbot			Job No.	33610
				Borehole/Pit No.	BH120
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	4.50 m
Soil Description	Dark grey slightly sandy slightly gravelly organic silty CLAY (gravel is fmc and sub-angular to sub-rounded)			Depth Base	5.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
				Project Started	19/06/2023
				Date Tested	03/07/2023



NATURAL MOISTURE CONTENT	**37**	**%**
% PASSING 425µm SIEVE	**80**	**%**
LIQUID LIMIT	**43**	**%**
PLASTIC LIMIT	**18**	**%**
PLASTICITY INDEX	**25**	**%**

Remarks

PLASTICITY INDEX



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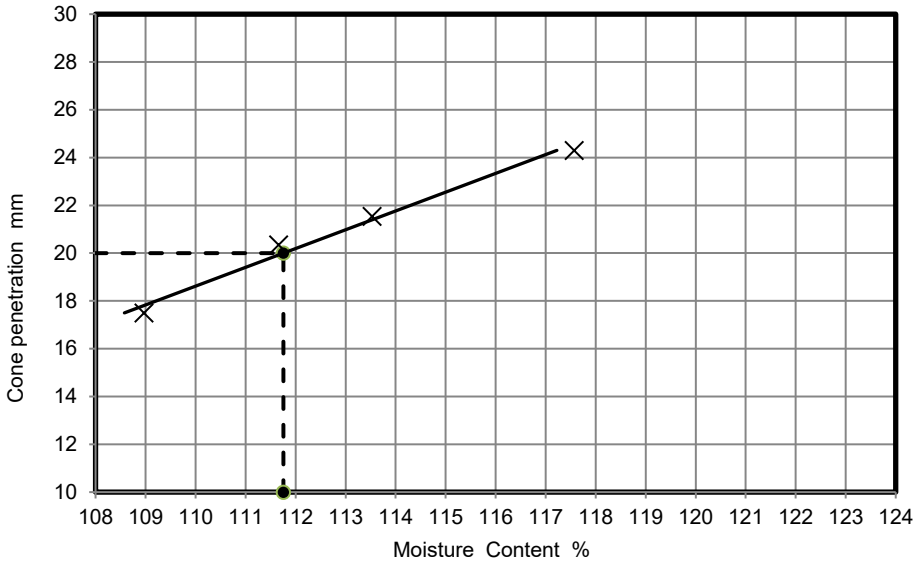
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

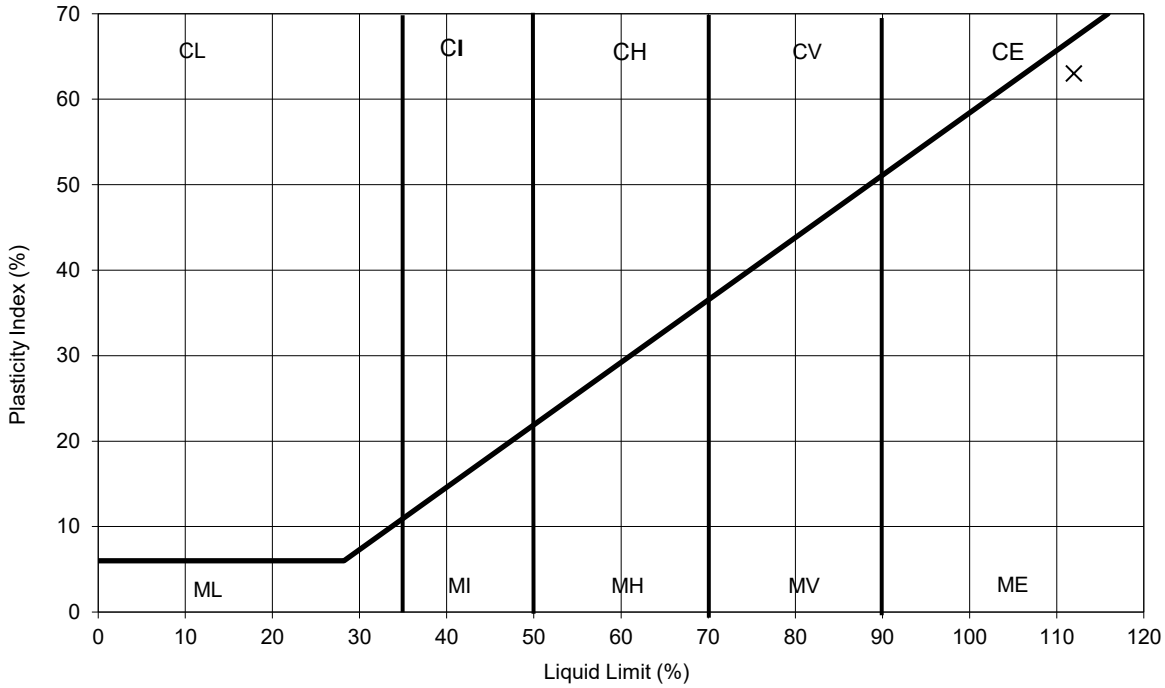
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	12.00 m
Soil Description	Dark grey slightly gravelly peaty silty CLAY (gravel is fmc and sub-rounded to rounded)			Depth Base	12.50 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
				Project Started	19/06/2023
				Date Tested	04/07/2023
				Job No.	33610
				Borehole/Pit No.	BH120



NATURAL MOISTURE CONTENT	**76**	**%**
% PASSING 425µm SIEVE	**80**	**%**
LIQUID LIMIT	**112**	**%**
PLASTIC LIMIT	**49**	**%**
PLASTICITY INDEX	**63**	**%**

Remarks

PLASTICITY INDEX



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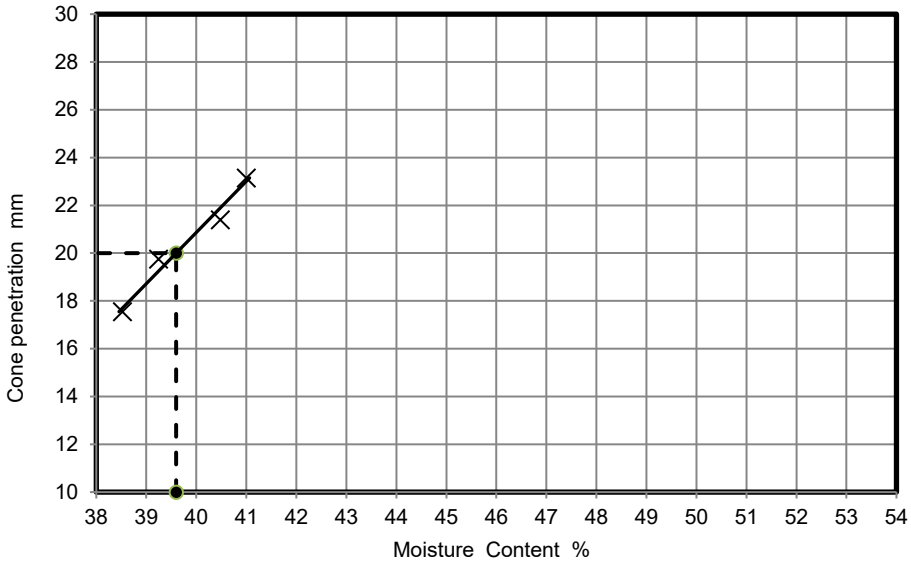
LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX

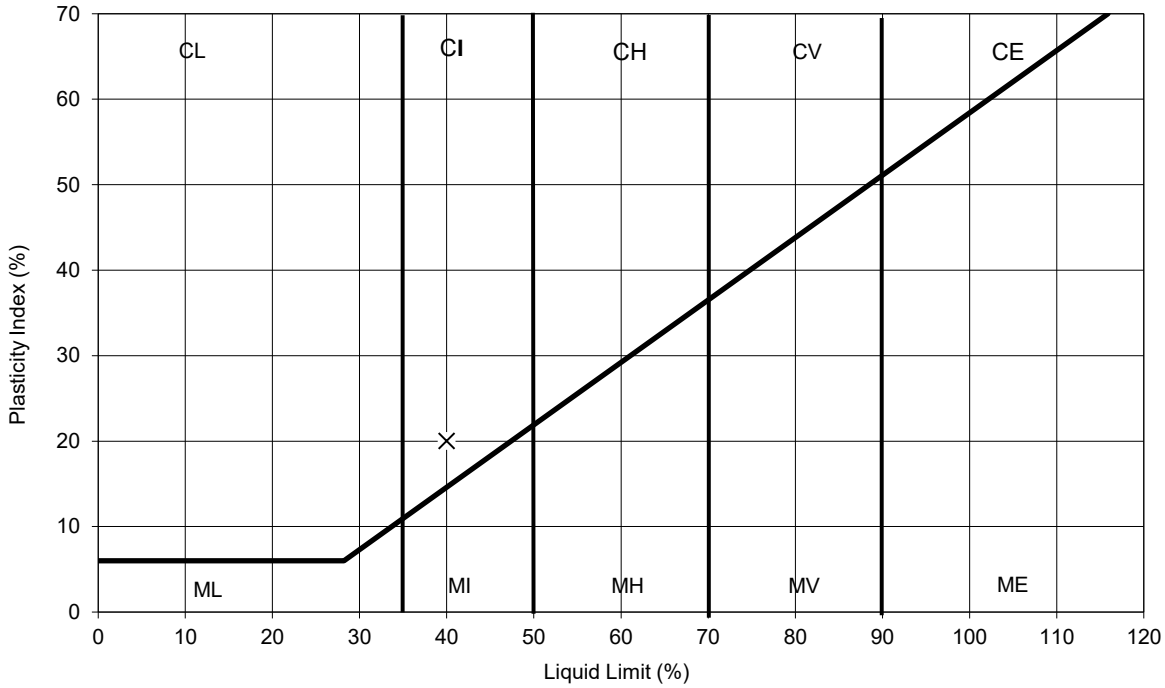
				Job No.	33610
				Borehole/Pit No.	TP116
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	1.40 m
Soil Description	Bluish grey sandy silty CLAY			Depth Base	1.80 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
				Project Started	19/06/2023
				Date Tested	04/07/2023



NATURAL MOISTURE CONTENT	**29**	**%**
% PASSING 425µm SIEVE	**99**	**%**
LIQUID LIMIT	**40**	**%**
PLASTIC LIMIT	**20**	**%**
PLASTICITY INDEX	**20**	**%**

Remarks

PLASTICITY INDEX



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Summary of Bulk and Dry Density Test Results

Job Ref.	Project Name
33610	Phoenix Wharf, Port Talbot
Project ID	**Client**
2111006.005	TEC

Hole No.	Sample				Soil Description	Density		NMC	Remarks/Method
	Ref	Top m	Base m	Type		bulk Mg/m3	dry Mg/m3	%	
BH101	-	2.50	3.00	B	Bluish grey slightly sandy silty CLAY with rare coarse sub-angular gravel and traces of rootlets	1.77	1.27	40	
BH102	-	18.00	18.50	B	Grey sandy GRAVEL with numerous cobbles (gravel is fmc and angular to rounded)	1.92	1.84	4.3	
BH103	-	9.00	9.80	B	Brownish grey silty CLAY	1.62	1.07	52	
BH103	-	19.50	20.00	B	Brownish grey sandy GRAVEL (gravel is fmc and sub-angular to rounded)	1.98	1.88	5.4	
BH104	-	2.50	3.00	B	Brown sandy silty CLAY	1.89	1.49	27	
BH105	-	7.00	10.00	B	Dark grey slightly sandy alluvial silty CLAY with rare fine sub-angular gravel	1.87	1.41	33	
BH105	-	13.50	17.00	B	Grey slightly clayey silty very sandy GRAVEL (gravel is fmc and sub-angular to rounded)	2.18	1.91	14	
BH108	-	15.00	15.50	B	Greyish brown sandy GRAVEL (gravel is fmc and angular to rounded)	2.31	2.07	12	
BH110	-	2.50	3.00	B	Dark grey slightly gravelly slightly organic silty CLAY (gravel is fmc and sub-angular)	1.59	1.10	45	
BH111	-	3.50	4.00	B	Grey and dark grey slightly gravelly slightly sandy organic silty CLAY with occasional wood fragments and roots (gravel is fm and angular to sub-angular)	1.75	1.16	51	
BH112	-	4.00	8.40	B	Dark grey silty SAND	1.83	1.37	34	

Test Method: BS EN 17892-2:2014
Buk Density Linear Measurement Method

These results only apply to the items tested

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K4 SOILS LABORATORY Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU

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Checked and Approved

Initials J.P

Date: 30/08/2023

Summary of Bulk and Dry Density Test Results

Job Ref.	Project Name
33610	Phoenix Wharf, Port Talbot
Project ID	**Client**
2111006.005	TEC

Hole No.	Sample				Soil Description	Density		NMC	Remarks/Method
	Ref	Top m	Base m	Type		bulk Mg/m3	dry Mg/m3	%	
BH114	-	11.50	15.00	B	Brown slightly clayey sandy GRAVEL with rare cobbles (gravel is fmc and sub-angular to rounded)	1.96	1.76	11	
BH114	-	15.00	18.00	B	Brown gravelly SAND (gravel is fmc and sub-angular to rounded)	2.12	1.85	15	
BH115	-	15.00	17.20	B	Grey gravelly sandy silty CLAY (gravel is fmc and sub-angular to sub-rounded)	2.09	1.96	6.7	
BH120	-	12.00	12.50	B	Dark grey slightly gravelly peaty silty CLAY (gravel is fmc and sub-rounded to rounded)	1.40	0.69	104	
BH120	-	18.00	18.50	B	Grey slightly clayey sandy GRAVEL with cobbles (gravel is fmc and sub-angular to rounded)	2.03	1.91	6.6	
CHST102A	-	1.60	2.40	B	Brown SAND with rare fm angular gravel	1.87	1.51	24	
TP102	-	0.60	1.00	B	Brown clayey gravelly silty SAND (gravel is fmc and angular to sub-angular)	1.95	1.58	24	
TP104	-	0.30	0.60	B	Brown gravelly sandy silty CLAY with clinker fragments (gravel is fmc and angular to sub-rounded)	1.81	1.45	25	
TP111	-	1.00	1.40	B	Brown slightly clayey slightly silty SAND	1.91	1.59	20	

Test Method: BS EN 17892-2:2014
Buk Density Linear Measurement Method

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Date: 30/08/2023

UKAS TESTING

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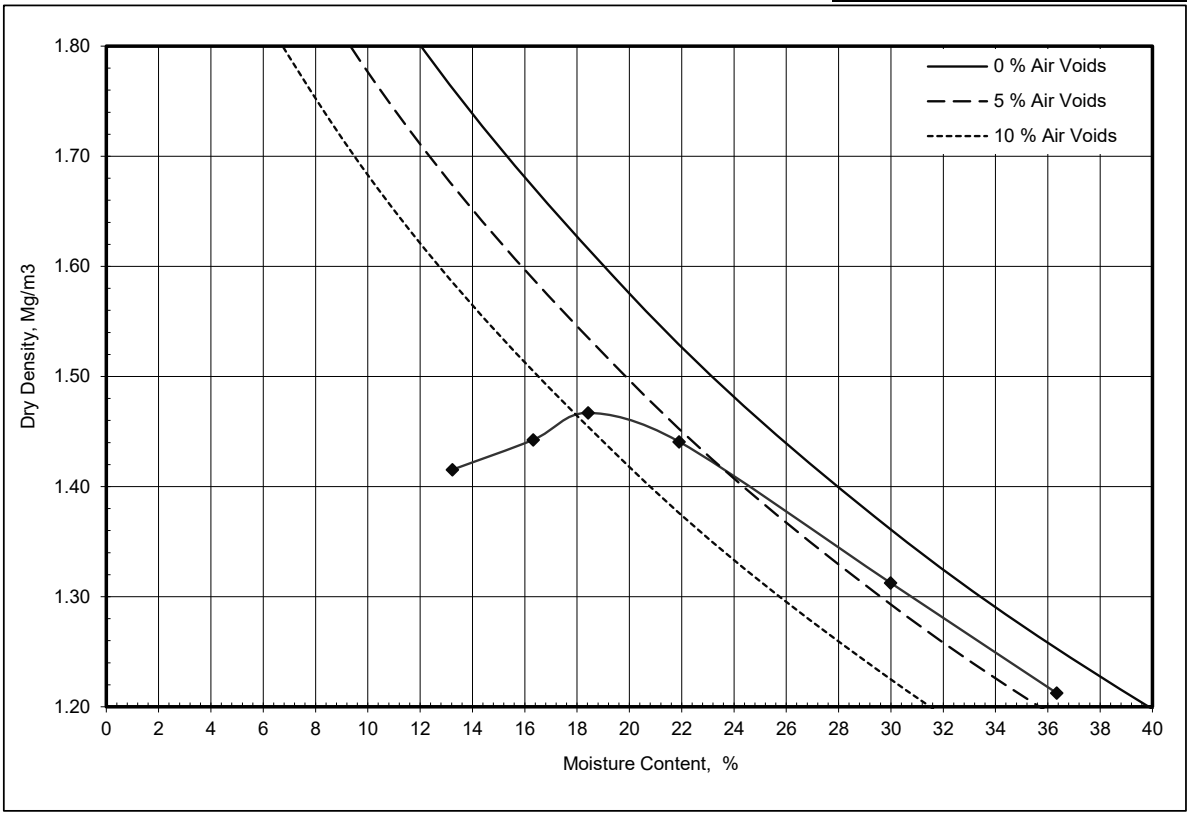
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

	Dry Density / Moisture Content Relationship **Light Compaction**			Job Ref	33610
				Borehole / Pit No	BH101
Site Name	Phoenix Wharf, Port Talbot			Sample No	-
Project No.	2111006.005	Client	TEC	Depth Top	0.50 m
Soil Description	Black clayey gravelly very silty SAND with occasional fmc and cobble sized brick, concrete and tarmac fragments (gravel is fmc and angular to sub-angular)			Depth Base	1.00 m
				Sample Type	B
Test Method	BS1377:Part 4:1990, clause 3.3, 2.5kg rammer			Samples received	14/06/2023
				Schedule received	19/06/2023
				Project Started	19/06/2023



Test Started		27/06/2023
Preparation		Material used was natural
Mould Type		One Litre
Samples Used		Single sample tested
Material Retained on 37.5 mm Sieve	%	3.2
Material Retained on 20.0 mm Sieve	%	5.1
Particle Density - Assumed	Mg/m³	2.30

Maximum Dry Density	Mg/m³	**1.47**
Optimum Moisture Content	%	**18**

Remarks	

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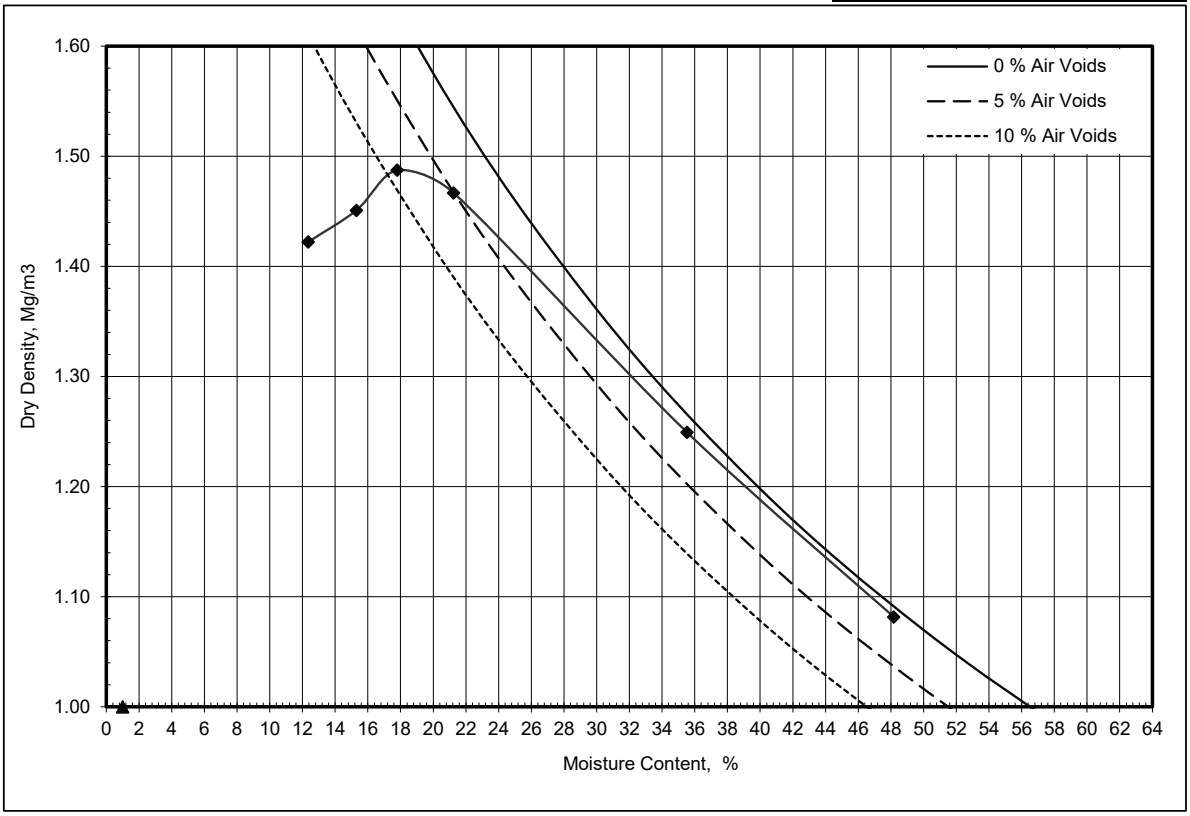
	Dry Density / Moisture Content Relationship **Light Compaction**			Job Ref	33610
				Borehole / Pit No	BH101
Site Name	Phoenix Wharf, Port Talbot			Sample No	-
Project No.	2111006.005	Client	TEC	Depth Top	1.50 m
Soil Description	Grey slightly sandy slightly gravelly silty CLAY (gravel is fmc and angular)			Depth Base	2.00 m
				Sample Type	B
Test Method	BS1377:Part 4:1990, clause 3.3, 2.5kg rammer			Samples received	14/06/2023
				Schedule received	19/06/2023
				Project Started	19/06/2023



Test Started		27/06/2023
Preparation		Material used was natural
Mould Type		One Litre
Samples Used		Single sample tested
Material Retained on 37.5 mm Sieve	%	0.0
Material Retained on 20.0 mm Sieve	%	3.7
Particle Density - Assumed	Mg/m³	2.30

Maximum Dry Density	Mg/m³	**1.49**
Optimum Moisture Content	%	**18**

Remarks	

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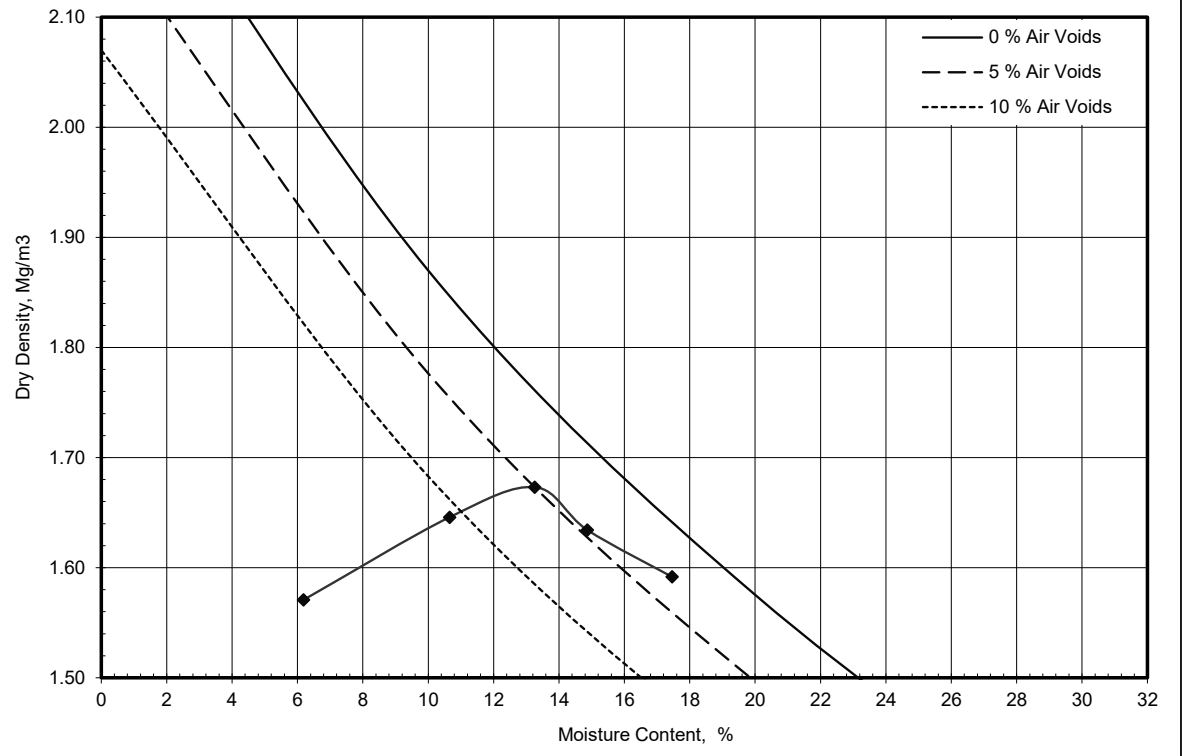
Date: 26/07/2023

	Dry Density / Moisture Content Relationship **Light Compaction**			Job Ref	33610
				Borehole / Pit No	BH103
Site Name	Phoenix Wharf, Port Talbot			Sample No	-
Project No.	2111006.005	Client	TEC	Depth Top	0.50 m
Soil Description	Dark greyish brown clayey silty very gravelly SAND with occasional roots (gravel is fmc and angular to sub-rounded)			Depth Base	1.00 m
				Sample Type	B
Test Method	BS1377:Part 4:1990, clause 3.3, 2.5kg rammer			Samples received	14/06/2023
				Schedule received	19/06/2023
				Project Started	19/06/2023



Test Started		27/06/2023
Preparation		Material used was natural
Mould Type		One Litre
Samples Used		Single sample tested
Material Retained on 37.5 mm Sieve	%	0.0
Material Retained on 20.0 mm Sieve	%	3.9
Particle Density - Assumed	Mg/m³	2.30

Maximum Dry Density	Mg/m³	**1.67**
Optimum Moisture Content	%	**13**

Remarks	

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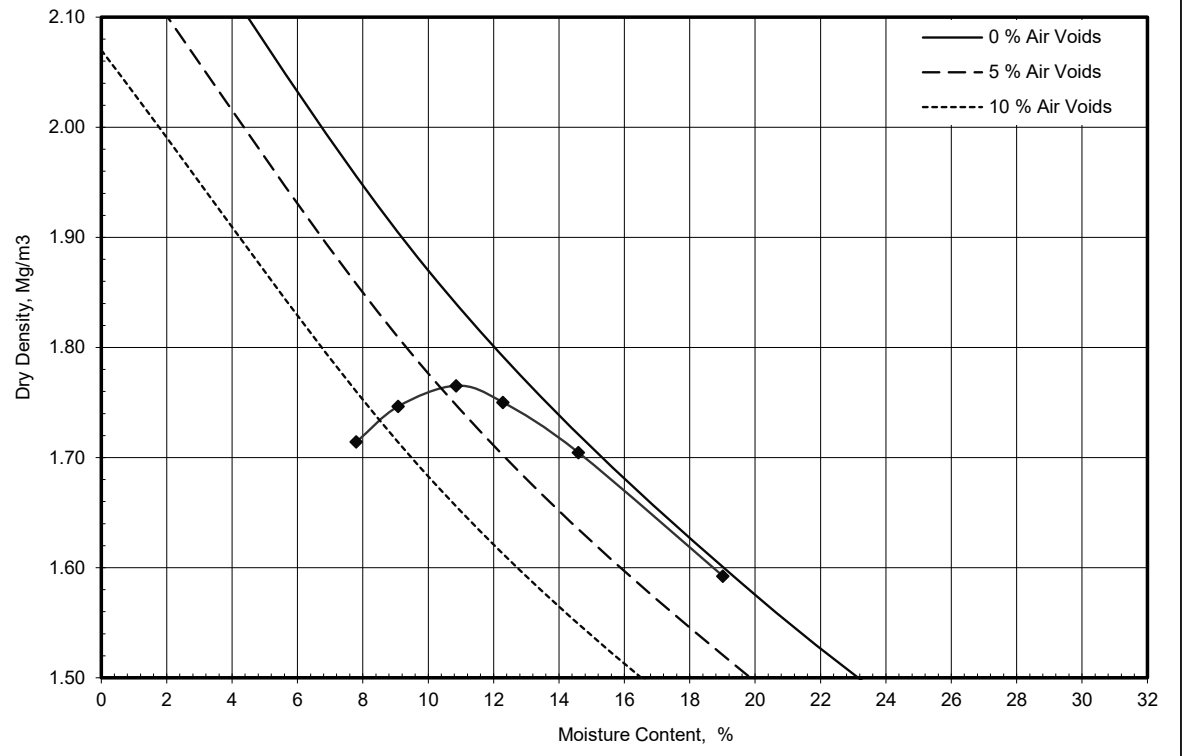
	Dry Density / Moisture Content Relationship **Light Compaction**			Job Ref	33610
				Borehole / Pit No	BH103
Site Name	Phoenix Wharf, Port Talbot			Sample No	-
Project No.	2111006.005	Client	TEC	Depth Top	1.50 m
Soil Description	Dark greyish brown clayey silty very sandy GRAVEL (gravel is fmc and sub-angular to sub-rounded)			Depth Base	2.00 m
				Sample Type	B
Test Method	BS1377:Part 4:1990, clause 3.3, 2.5kg rammer			Samples received	14/06/2023
				Schedule received	19/06/2023
				Project Started	19/06/2023



Test Started		26/06/2023
Preparation		Material used was natural
Mould Type		One Litre
Samples Used		Single sample tested
Material Retained on 37.5 mm Sieve	%	0.0
Material Retained on 20.0 mm Sieve	%	3.0
Particle Density - Assumed	Mg/m³	2.30

Maximum Dry Density	Mg/m³	**1.77**
Optimum Moisture Content	%	**11**

Remarks	

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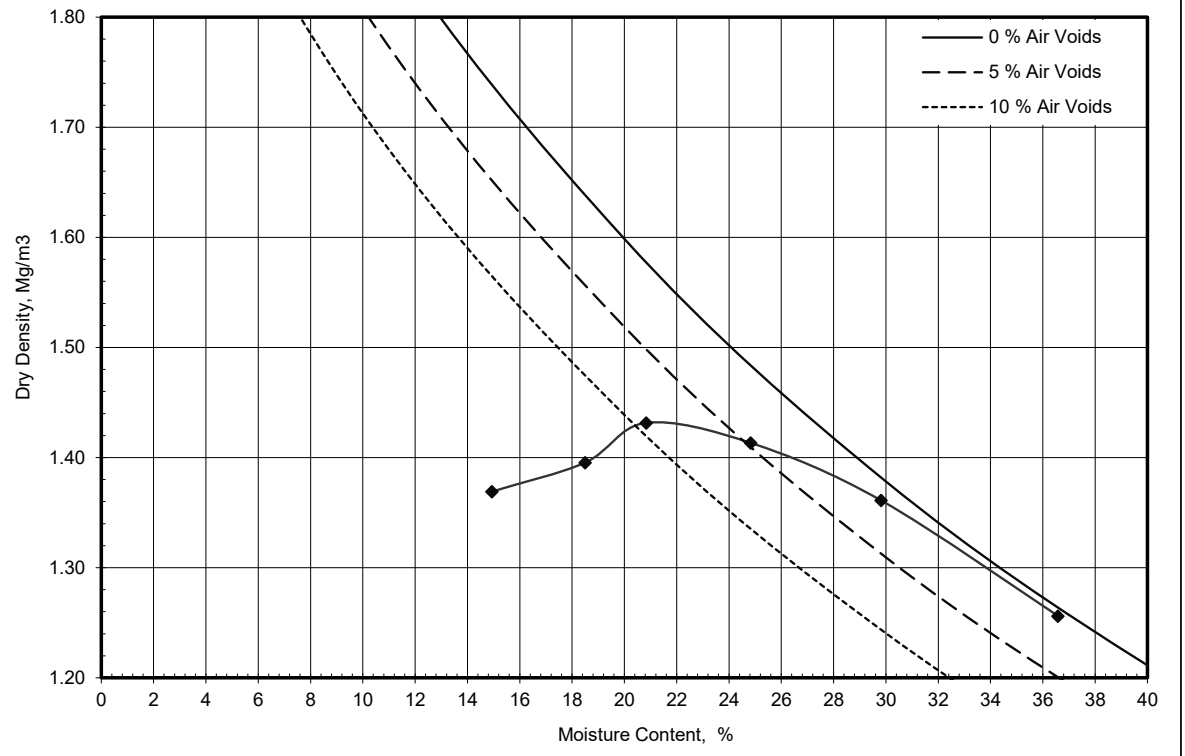
	Dry Density / Moisture Content Relationship **Light Compaction**			Job Ref	33610
				Borehole / Pit No	BH105
Site Name	Phoenix Wharf, Port Talbot			Sample No	-
Project No.	2111006.005	Client	TEC	Depth Top	0.00 m
Soil Description	Dark grey and black slightly clayey silty very sandy GRAVEL with numerous roots (gravel is fmc and sub-angular to sub-rounded)			Depth Base	0.30 m
				Sample Type	B
Test Method	BS1377:Part 4:1990, clause 3.3, 2.5kg rammer			Samples received	14/06/2023
				Schedule received	19/06/2023
				Project Started	19/06/2023



Test Started		26/06/2023
Preparation		Material used was natural
Mould Type		One Litre
Samples Used		Single sample tested
Material Retained on 37.5 mm Sieve	%	0.0
Material Retained on 20.0 mm Sieve	%	15
Particle Density - Assumed	Mg/m³	2.35

Maximum Dry Density	Mg/m³	**1.43**
Optimum Moisture Content	%	**21**

Remarks	

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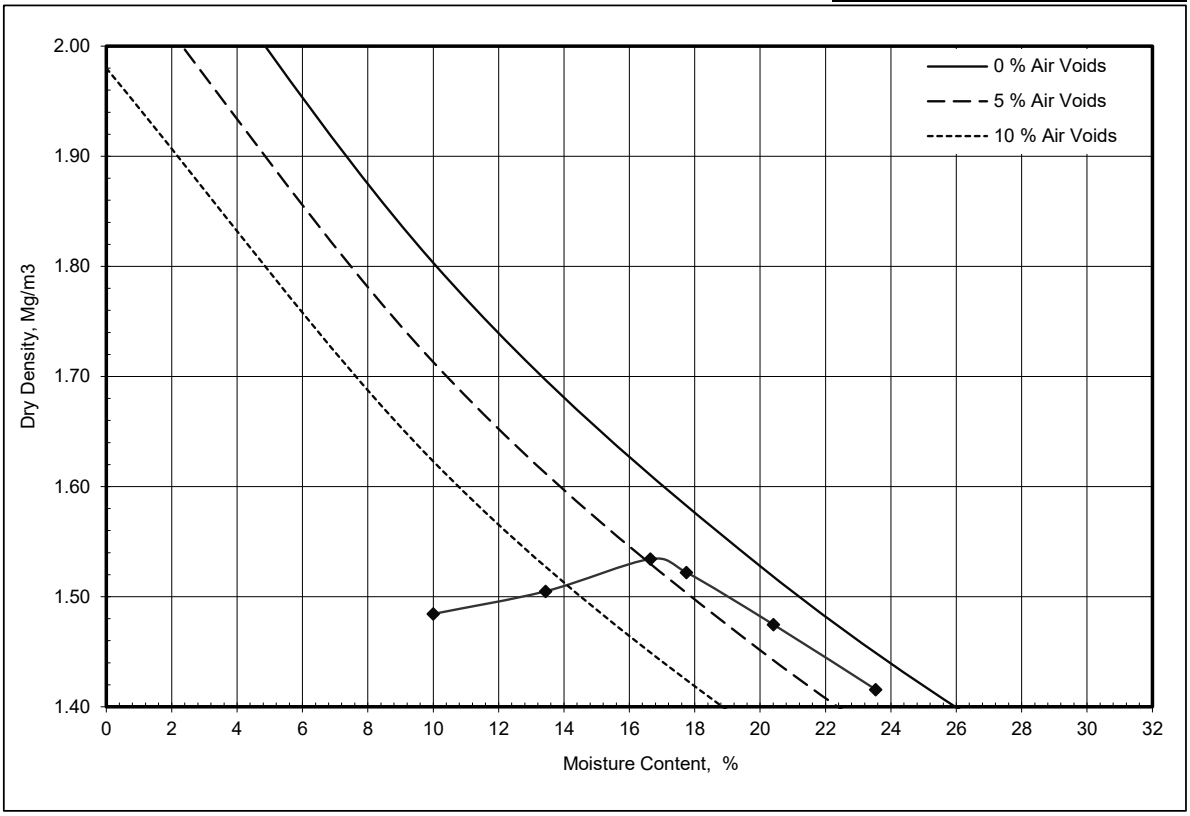
	Dry Density / Moisture Content Relationship **Light Compaction**			Job Ref	33610
				Borehole / Pit No	BH107
Site Name	Phoenix Wharf, Port Talbot			Sample No	-
Project No.	2111006.005	Client	TEC	Depth Top	0.50 m
Soil Description	Black slightly clayey silty very gravelly SAND with fmc brick and tarmac fragments (gravel is fmc and sub-angular to sub-rounded)			Depth Base	1.00 m
				Sample Type	B
Test Method	BS1377:Part 4:1990, clause 3.3, 2.5kg rammer			Samples received	14/06/2023
				Schedule received	19/06/2023
				Project Started	19/06/2023



Test Started		26/06/2023
Preparation		Material used was natural
Mould Type		One Litre
Samples Used		Single sample tested
Material Retained on 37.5 mm Sieve	%	15
Material Retained on 20.0 mm Sieve	%	5.7
Particle Density - Assumed	Mg/m³	2.20

Maximum Dry Density	Mg/m³	**1.53**
Optimum Moisture Content	%	**17**

Remarks	

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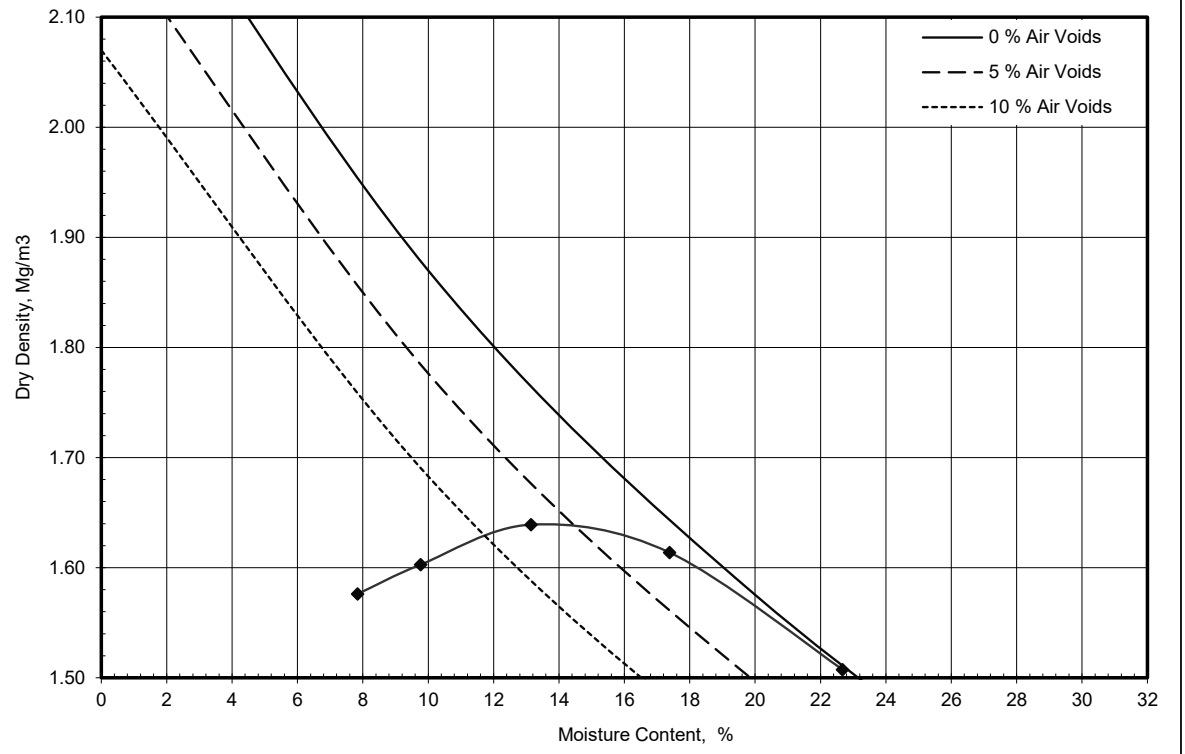
	Dry Density / Moisture Content Relationship **Light Compaction**			Job Ref	33610
				Borehole / Pit No	BH109
Site Name	Phoenix Wharf, Port Talbot			Sample No	-
Project No.	2111006.005	Client	TEC	Depth Top	2.50 m
Soil Description	Greyish brown slightly silty fm SAND			Depth Base	3.00 m
				Sample Type	B
Test Method	BS1377:Part 4:1990, clause 3.3, 2.5kg rammer			Samples received	14/06/2023
				Schedule received	19/06/2023
				Project Started	19/06/2023



Test Started		05/07/2023
Preparation		Material used was natural
Mould Type		One Litre
Samples Used		Single sample tested
Material Retained on 37.5 mm Sieve	%	0.0
Material Retained on 20.0 mm Sieve	%	0.0
Particle Density - Assumed	Mg/m³	2.30

Maximum Dry Density	Mg/m³	**1.64**
Optimum Moisture Content	%	**14**

Remarks	

Test Report by K4 SOILS LABORATORY
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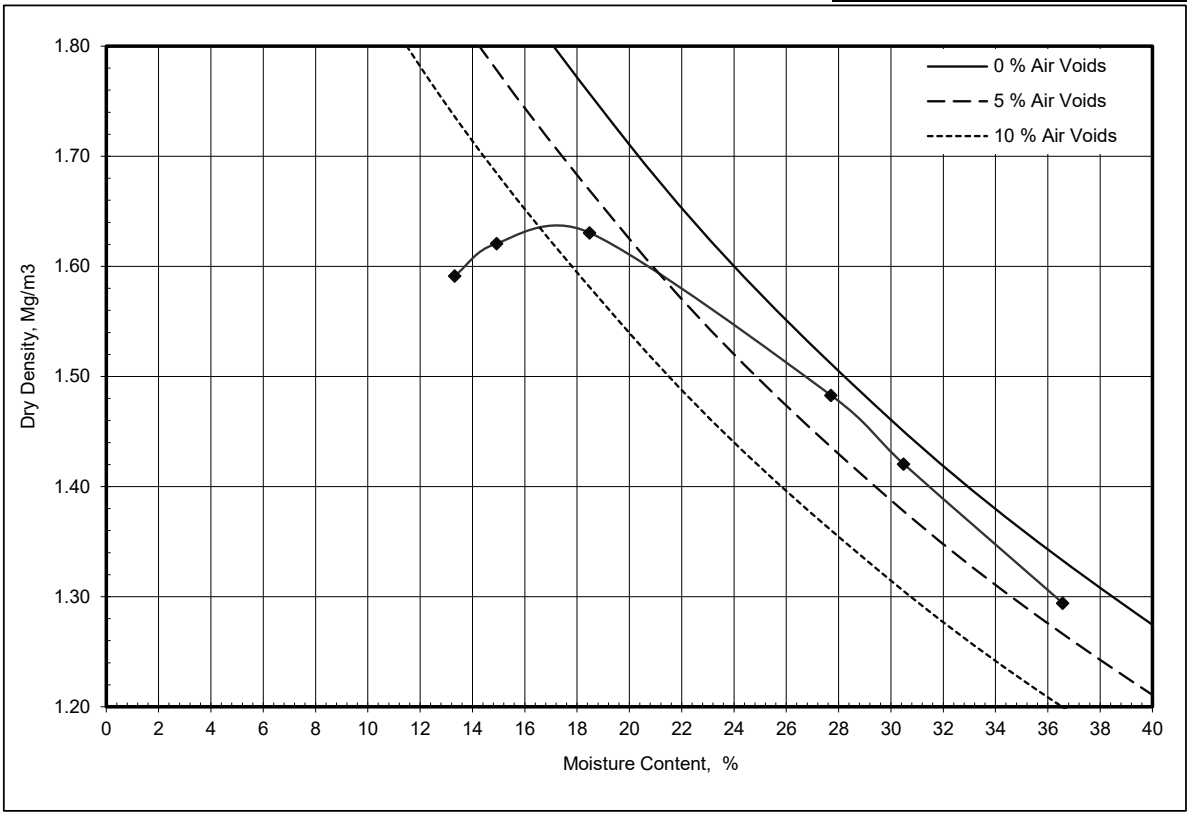
	Dry Density / Moisture Content Relationship **Light Compaction**			Job Ref	33610
				Borehole / Pit No	BH112
Site Name	Phoenix Wharf, Port Talbot			Sample No	-
Project No.	2111006.005	Client	TEC	Depth Top	3.00 m
Soil Description	Grey slightly sandy silty CLAY with rare fine gravel			Depth Base	3.50 m
				Sample Type	B
Test Method	BS1377:Part 4:1990, clause 3.3, 2.5kg rammer			Samples received	14/06/2023
				Schedule received	19/06/2023
				Project Started	19/06/2023



Test Started		26/06/2023
Preparation		Material used was natural
Mould Type		One Litre
Samples Used		Single sample tested
Material Retained on 37.5 mm Sieve	%	0.0
Material Retained on 20.0 mm Sieve	%	0.0
Particle Density - Assumed	Mg/m³	2.60

Maximum Dry Density	Mg/m³	**1.64**
Optimum Moisture Content	%	**17**

Remarks	

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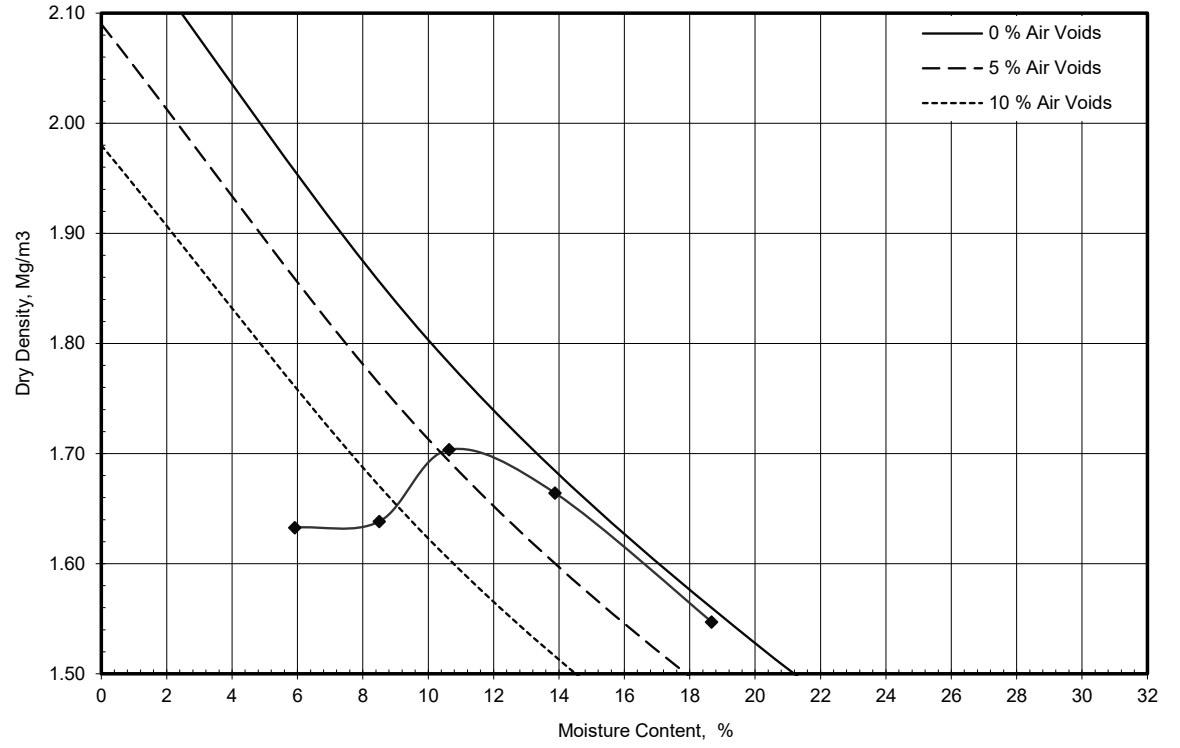
	Dry Density / Moisture Content Relationship **Light Compaction**			Job Ref	33610
				Borehole / Pit No	BH116
Site Name	Phoenix Wharf, Port Talbot			Sample No	-
Project No.	2111006.005	Client	TEC	Depth Top	0.50 m
Soil Description	Dark grey clayey silty very gravelly SAND (gravel is fmc and angular to sub-angular)			Depth Base	1.00 m
				Sample Type	B
Test Method	BS1377:Part 4:1990, clause 3.3, 2.5kg rammer			Samples received	14/06/2023
				Schedule received	19/06/2023
				Project Started	19/06/2023



Test Started		05/07/2023
Preparation		Material used was natural
Mould Type		One Litre
Samples Used		Single sample tested
Material Retained on 37.5 mm Sieve	%	0.0
Material Retained on 20.0 mm Sieve	%	7.1
Particle Density - Assumed	Mg/m³	2.20

Maximum Dry Density	Mg/m³	**1.70**
Optimum Moisture Content	%	**11**

Remarks	

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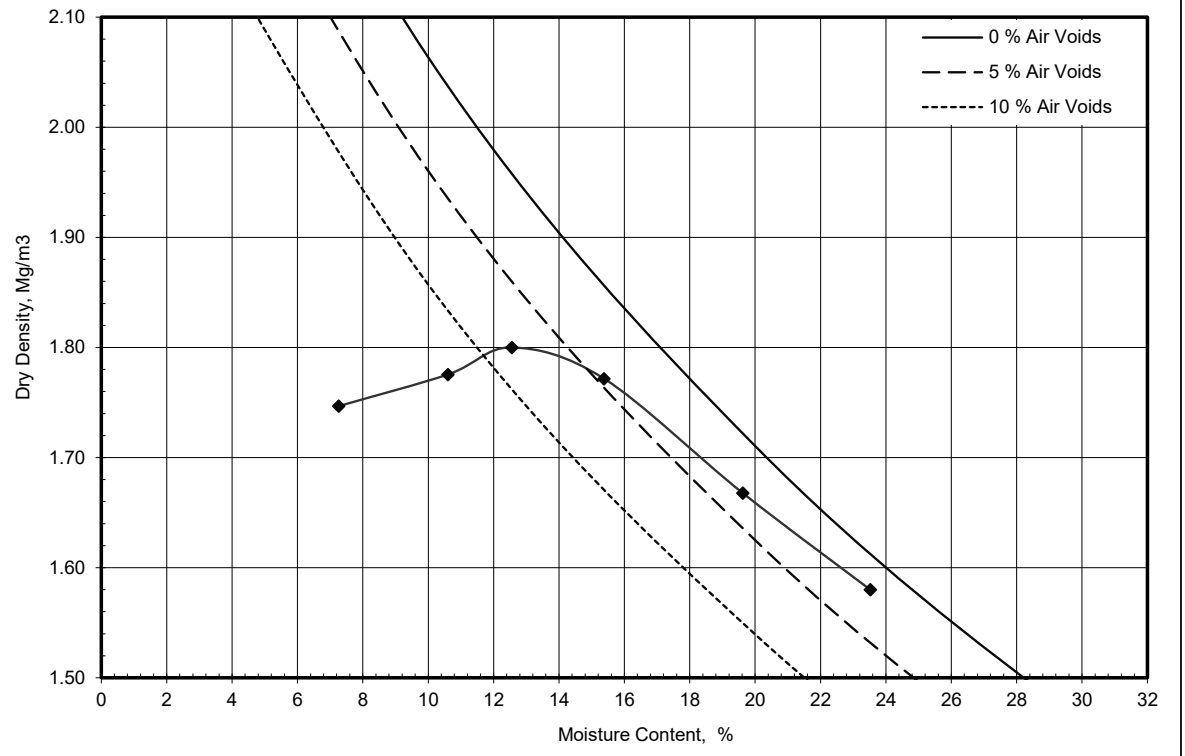
	Dry Density / Moisture Content Relationship **Light Compaction**			Job Ref	33610
				Borehole / Pit No	TP102
Site Name	Phoenix Wharf, Port Talbot			Sample No	-
Project No.	2111006.005	Client	TEC	Depth Top	0.60 m
Soil Description	Brown clayey gravelly silty SAND (gravel is fmc and angular to sub-angular)			Depth Base	1.00 m
				Sample Type	B
Test Method	BS1377:Part 4:1990, clause 3.3, 2.5kg rammer			Samples received	14/06/2023
				Schedule received	19/06/2023
				Project Started	19/06/2023



Test Started		27/06/2023
Preparation		Material used was natural
Mould Type		One Litre
Samples Used		Single sample tested
Material Retained on 37.5 mm Sieve	%	3.9
Material Retained on 20.0 mm Sieve	%	1.9
Particle Density - Measured using small pyknometer	Mg/m³	2.60

Maximum Dry Density	Mg/m³	**1.80**
Optimum Moisture Content	%	**13**

Remarks	

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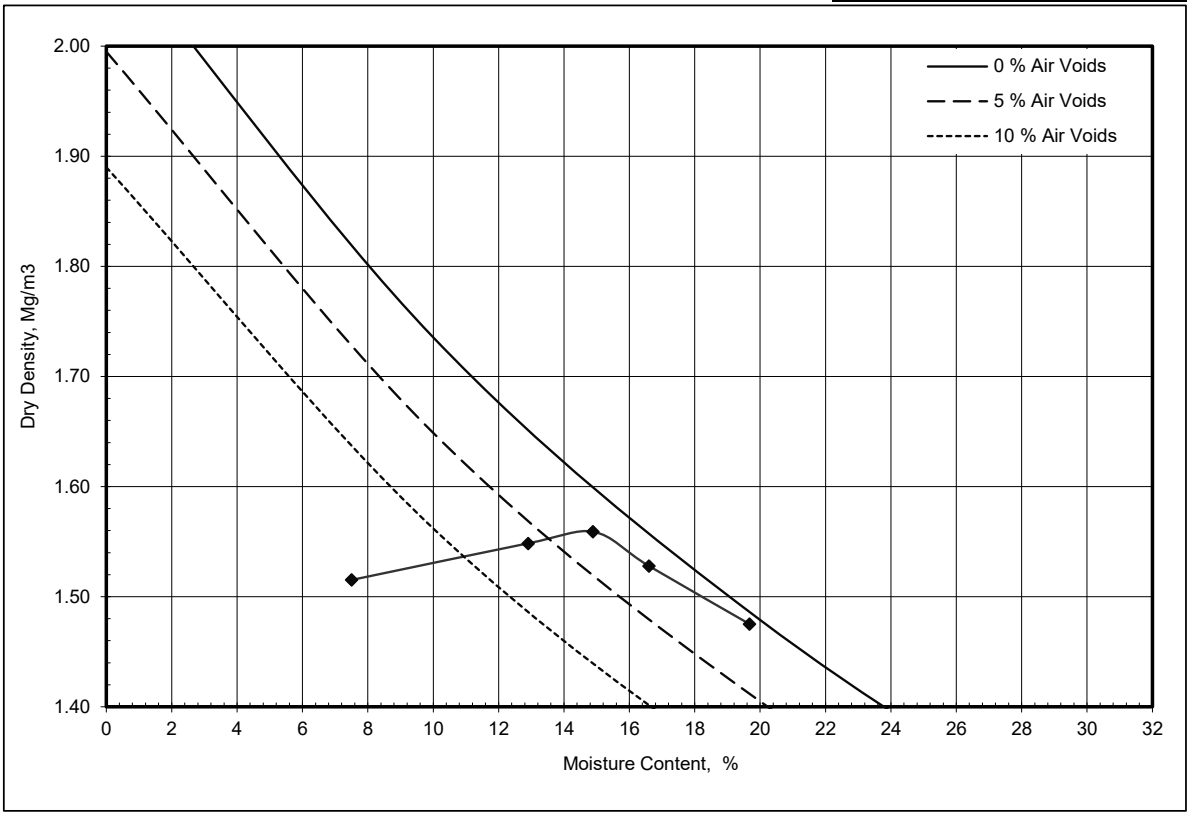
	Dry Density / Moisture Content Relationship **Light Compaction**			Job Ref	33610
				Borehole / Pit No	TP103A
Site Name	Phoenix Wharf, Port Talbot			Sample No	-
Project No.	2111006.005	Client	TEC	Depth Top	1.20 m
Soil Description	Black slightly clayey silty very gravelly SAND with clinker fragments (gravel is fmc and angular to sub-angular)			Depth Base	1.80 m
				Sample Type	B
Test Method	BS1377:Part 4:1990, clause 3.3, 2.5kg rammer			Samples received	14/06/2023
				Schedule received	19/06/2023
				Project Started	19/06/2023



Test Started		05/07/2023
Preparation		Material used was natural
Mould Type		One Litre
Samples Used		Single sample tested
Material Retained on 37.5 mm Sieve	%	0.0
Material Retained on 20.0 mm Sieve	%	7.0
Particle Density - Assumed	Mg/m³	2.10

Maximum Dry Density	Mg/m³	**1.56**
Optimum Moisture Content	%	**15**

Remarks	

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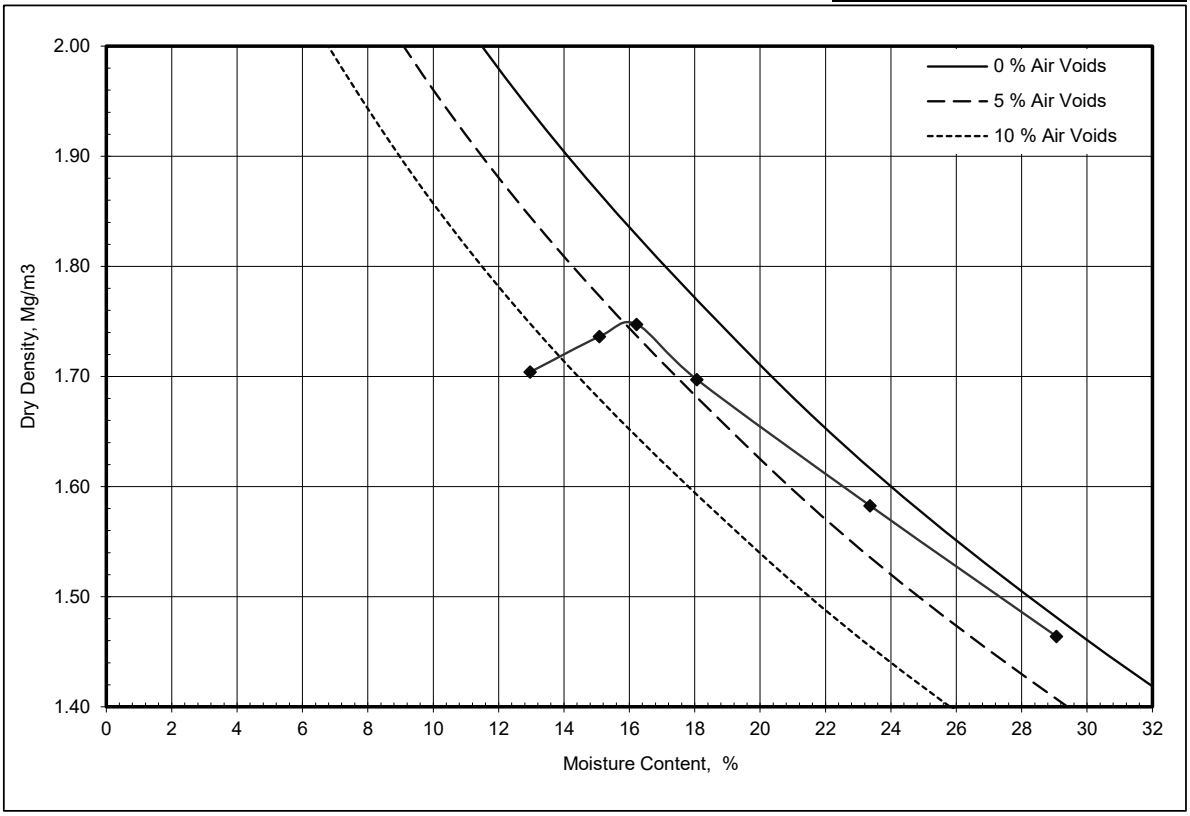
	Dry Density / Moisture Content Relationship **Light Compaction**			Job Ref	33610
				Borehole / Pit No	TP104
Site Name	Phoenix Wharf, Port Talbot			Sample No	-
Project No.	2111006.005	Client	TEC	Depth Top	1.00 m
Soil Description	Greyish brown slightly gravelly sandy silty CLAY with occasional roots (gravel is fmc and angular to sub-angular)			Depth Base	1.40 m
				Sample Type	B
Test Method	BS1377:Part 4:1990, clause 3.3, 2.5kg rammer			Samples received	14/06/2023
				Schedule received	19/06/2023
				Project Started	19/06/2023



Test Started		27/06/2023
Preparation		Material used was natural
Mould Type		One Litre
Samples Used		Single sample tested
Material Retained on 37.5 mm Sieve	%	0.0
Material Retained on 20.0 mm Sieve	%	2.4
Particle Density - Assumed	Mg/m³	2.60

Maximum Dry Density	Mg/m³	**1.75**
Optimum Moisture Content	%	**16**

Remarks	

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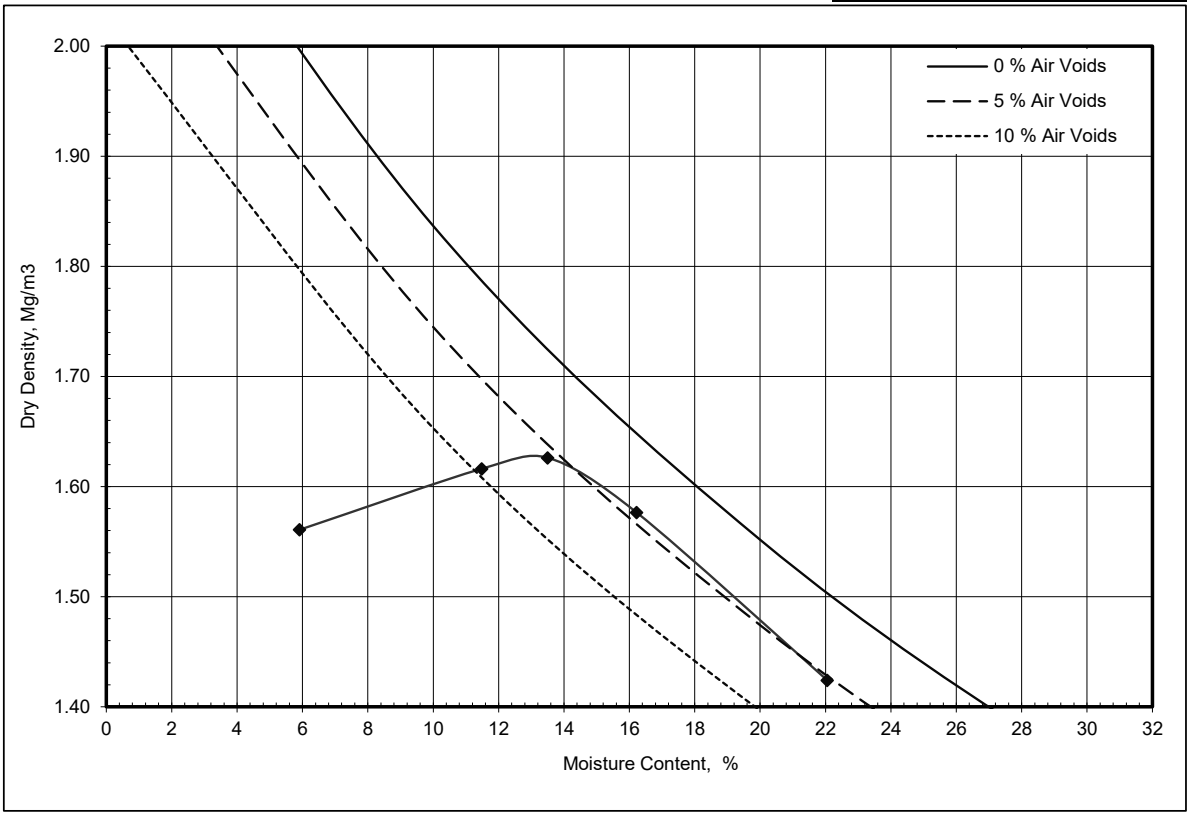
	Dry Density / Moisture Content Relationship **Light Compaction**			Job Ref	33610
				Borehole / Pit No	TP114
Site Name	Phoenix Wharf, Port Talbot			Sample No	-
Project No.	2111006.005	Client	TEC	Depth Top	0.80 m
Soil Description	Brown slightly clayey slightly silty SAND with rare fine gravel			Depth Base	1.20 m
				Sample Type	B
Test Method	BS1377:Part 4:1990, clause 3.3, 2.5kg rammer			Samples received	14/06/2023
				Schedule received	19/06/2023
				Project Started	19/06/2023



Test Started		27/06/2023
Preparation		Material used was natural
Mould Type		One Litre
Samples Used		Single sample tested
Material Retained on 37.5 mm Sieve	%	0.0
Material Retained on 20.0 mm Sieve	%	0.0
Particle Density - Assumed	Mg/m³	2.25

Maximum Dry Density	Mg/m³	**1.63**
Optimum Moisture Content	%	**13**

Remarks	

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
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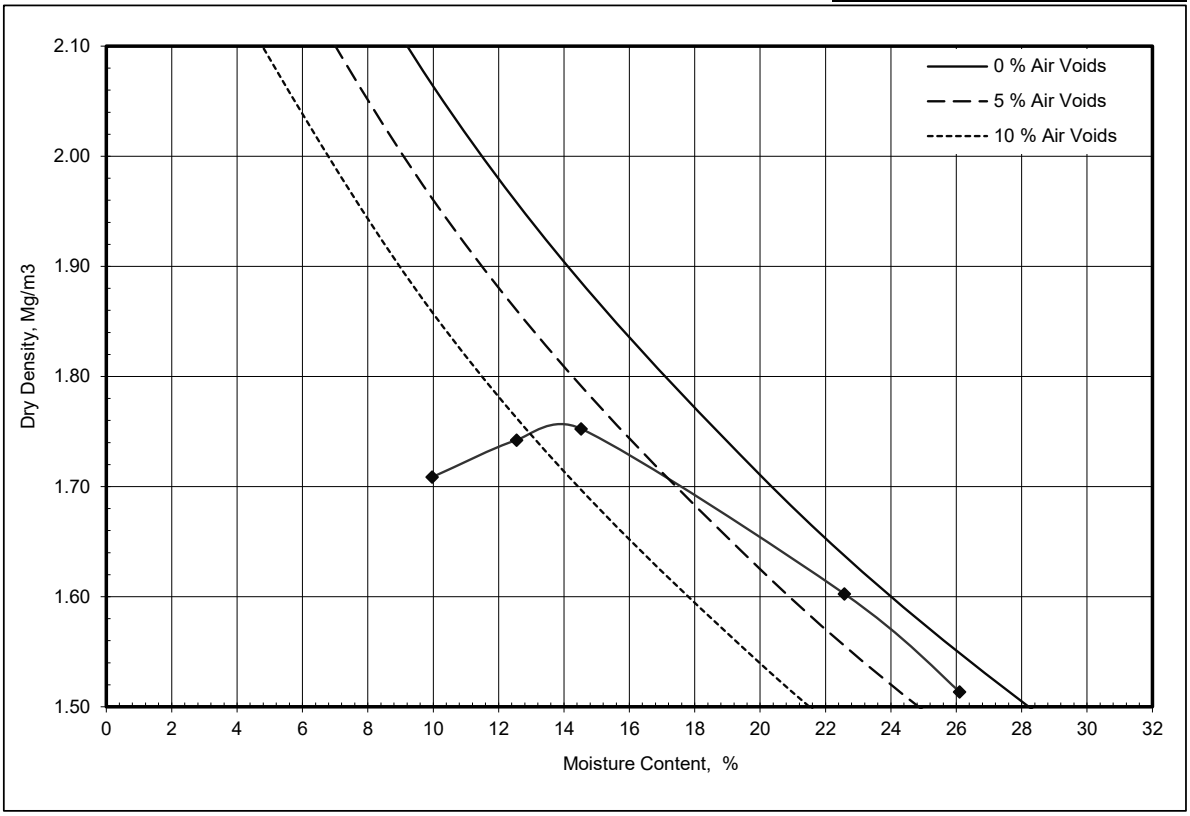
Checked and Approved
Initials: **J.P**
Date: 26/07/2023

	Dry Density / Moisture Content Relationship **Light Compaction**			Job Ref	33610
				Borehole / Pit No	TP116
Site Name	Phoenix Wharf, Port Talbot			Sample No	-
Project No.	2111006.005	Client	TEC	Depth Top	1.40 m
Soil Description	Bluish grey sandy silty CLAY			Depth Base	1.80 m
				Sample Type	B
Test Method	BS1377:Part 4:1990, clause 3.3, 2.5kg rammer			Samples received	14/06/2023
				Schedule received	19/06/2023
				Project Started	19/06/2023



Test Started		27/06/2023
Preparation		Material used was natural
Mould Type		One Litre
Samples Used		Single sample tested
Material Retained on 37.5 mm Sieve	%	0.0
Material Retained on 20.0 mm Sieve	%	0.0
Particle Density - Assumed	Mg/m³	2.60

Maximum Dry Density	Mg/m³	**1.75**
Optimum Moisture Content	%	**14**

Remarks	

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Date: 26/07/2023

California Bearing Ratio (CBR)

Job Ref	33610				
Borehole/Pit No.	BH101				
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006	Client	TEC	Depth Top	1.50 m
Soil Description	Grey slightly sandy slightly gravelly silty CLAY (gravel is fmc and angular)			Depth Base	2.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377 : Part 4 : 1990, clause 7			Project Started	19/06/2023
				Date Tested	28/06/2023

Specimen Preparation

Condition: REMOULDED

Details: Recompacted with specified standard effort using 2.5kg rammer

Material retained on 20mm sieve removed: 3.7 %

Initial Specimen details:

Bulk density	1.68	Mg/m3	
Dry density	1.13	Mg/m3	
Moisture content	48	%	

Soaking details: Not soaked

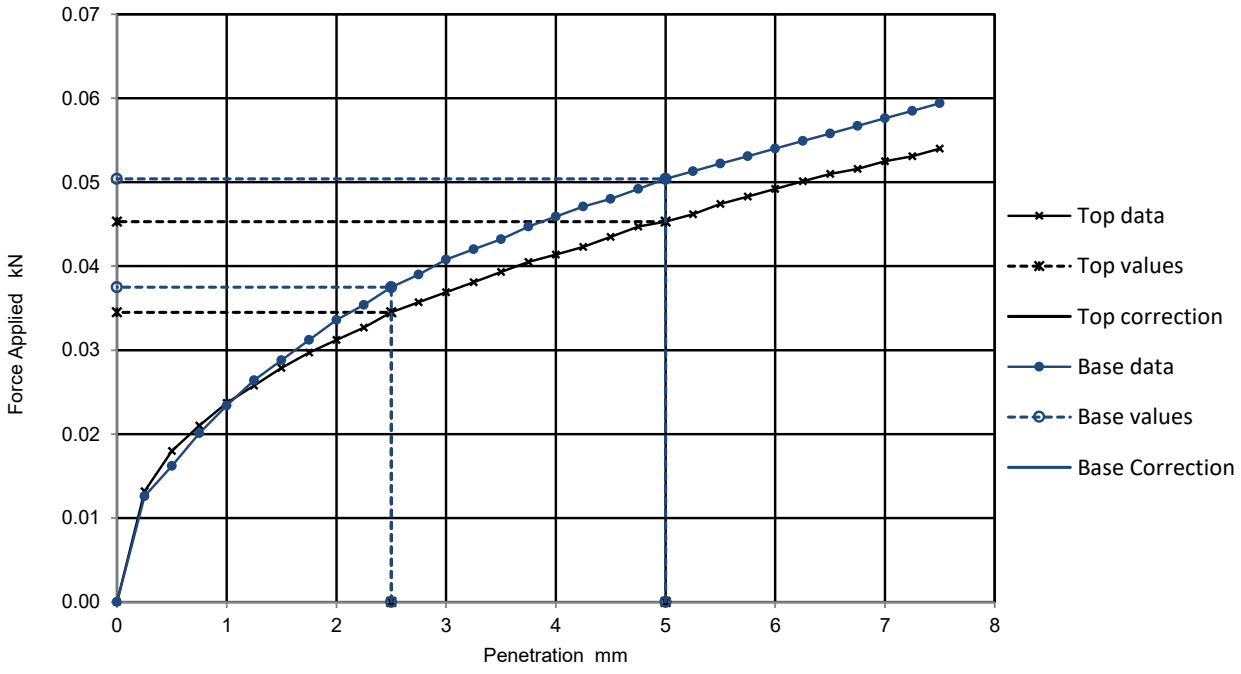
Period of soaking: - days

Time to surface: - days

Amount of swell recorded: - mm

Surcharge applied: 6 kg / 4 kPa

Force v Penetration Plots



Results

	Curve correction applied	CBR Values, % 2.5mm	5mm	Highest	Average	Moisture Content %
TOP	No	0.26	0.23	0.26	0.27	49
BASE	No	0.28	0.25	0.28		48

Remarks

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
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Initials: J.P

Date: 26/07/2023

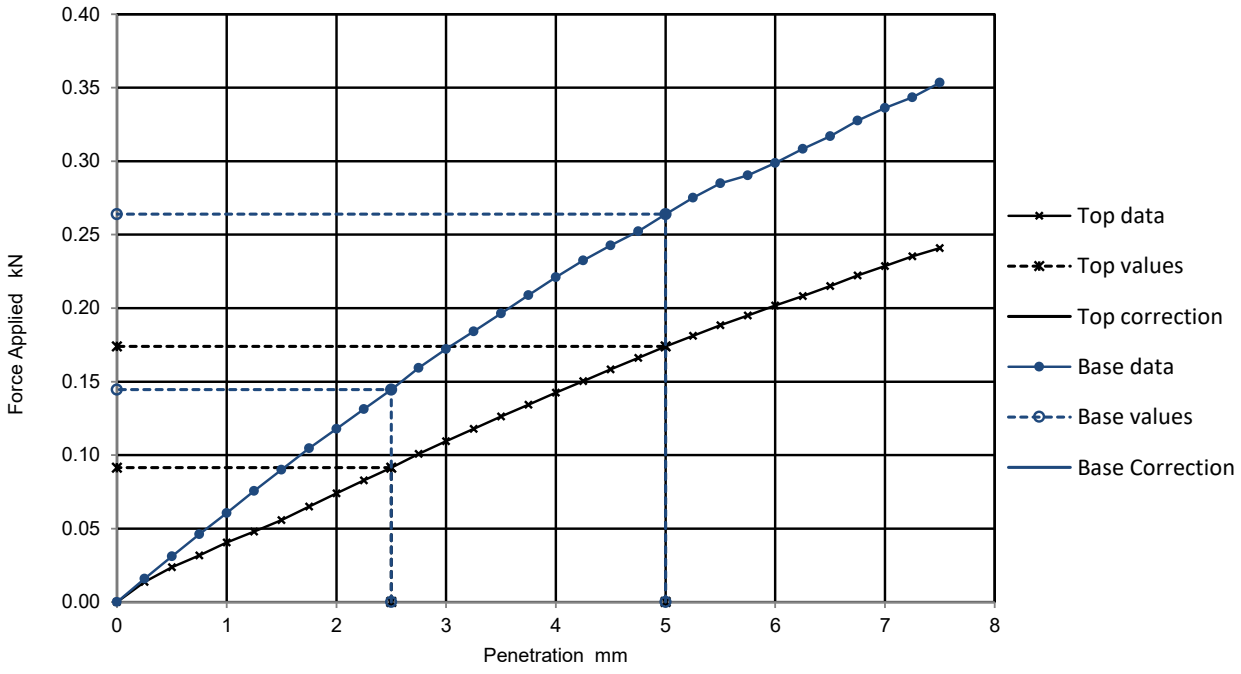
California Bearing Ratio (CBR)

Job Ref	33610				
Borehole/Pit No.	BH103				
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006	Client	TEC	Depth Top	0.50 m
Soil Description	Dark greyish brown clayey silty very gravelly SAND with occasional roots (gravel is fmc and angular to sub-rounded)			Depth Base	1.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377 : Part 4 : 1990, clause 7			Project Started	19/06/2023
				Date Tested	28/06/2023

Specimen Preparation

Condition	REMOULDED			Soaking details	Not soaked	
Details	Recompacted with specified standard effort using 2.5kg rammer			Period of soaking	-	days
				Time to surface	-	days
				Amount of swell recorded	-	mm
Material retained on 20mm sieve removed		3.9	%			
Initial Specimen details	Bulk density	1.89	Mg/m3	Surcharge applied	6	kg
	Dry density	1.61	Mg/m3		4	kPa
	Moisture content	18	%			

Force v Penetration Plots



Results

	Curve correction applied	CBR Values, %				Moisture Content %
		2.5mm	5mm	Highest	Average	
TOP	No	0.69	0.87	0.87	N/A	18
BASE	No	1.1	1.3	1.3		21

Remarks

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
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Initials: **J.P**

Date: 26/07/2023

UKAS TESTING 2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

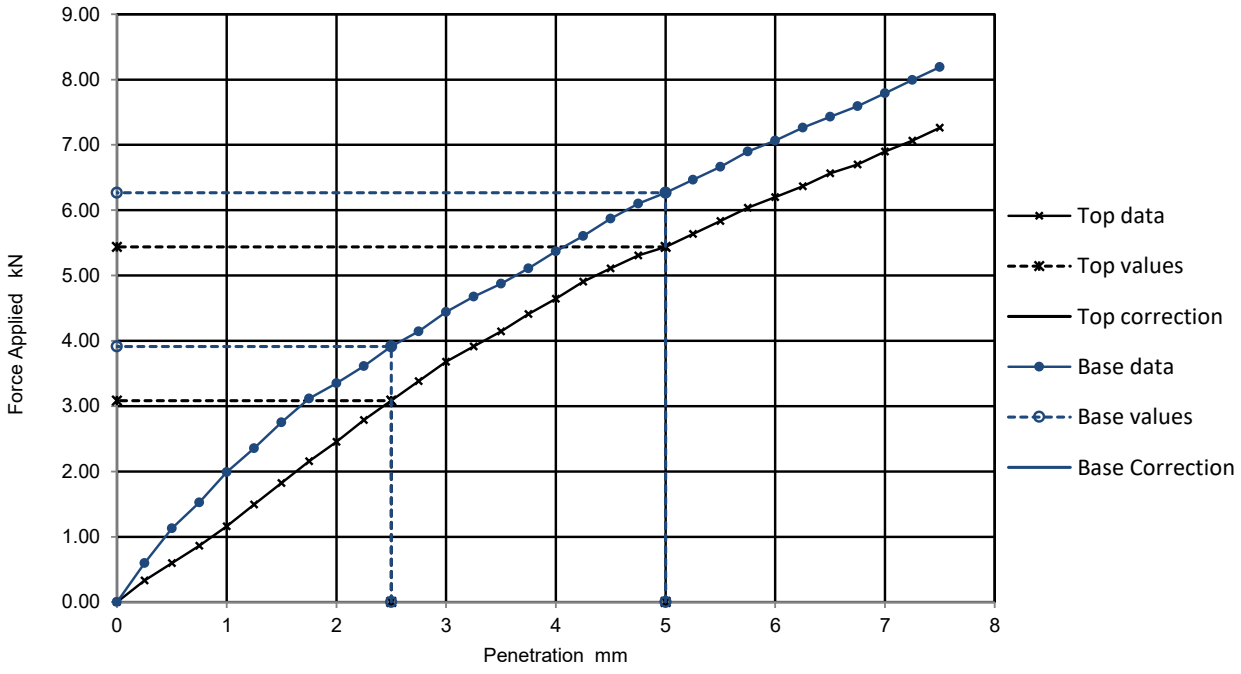
California Bearing Ratio (CBR)

Job Ref	33610				
Borehole/Pit No.	BH103				
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006	Client	TEC	Depth Top	2.50 m
Soil Description	Black slightly clayey sandy GRAVEL (gravel is fmc and sub-angular to sub-rounded)			Depth Base	3.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377 : Part 4 : 1990, clause 7			Project Started	19/06/2023
				Date Tested	10/07/2023

Specimen Preparation

Condition	REMOULDED			Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer			Period of soaking	- days
				Time to surface	- days
				Amount of swell recorded	- mm
Material retained on 20mm sieve removed		27	%		
Initial Specimen details	Bulk density	2.08	Mg/m3	Surcharge applied	6 kg
	Dry density	1.86	Mg/m3		4 kPa
	Moisture content	12	%		

Force v Penetration Plots



Results

	Curve correction applied	CBR Values, %				Moisture Content %
		2.5mm	5mm	Highest	Average	
TOP	No	23	27	27	29	11
BASE	No	30	31	31		12

Remarks

Test Report by K4 SOILS LABORATORY
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Date: 26/07/2023

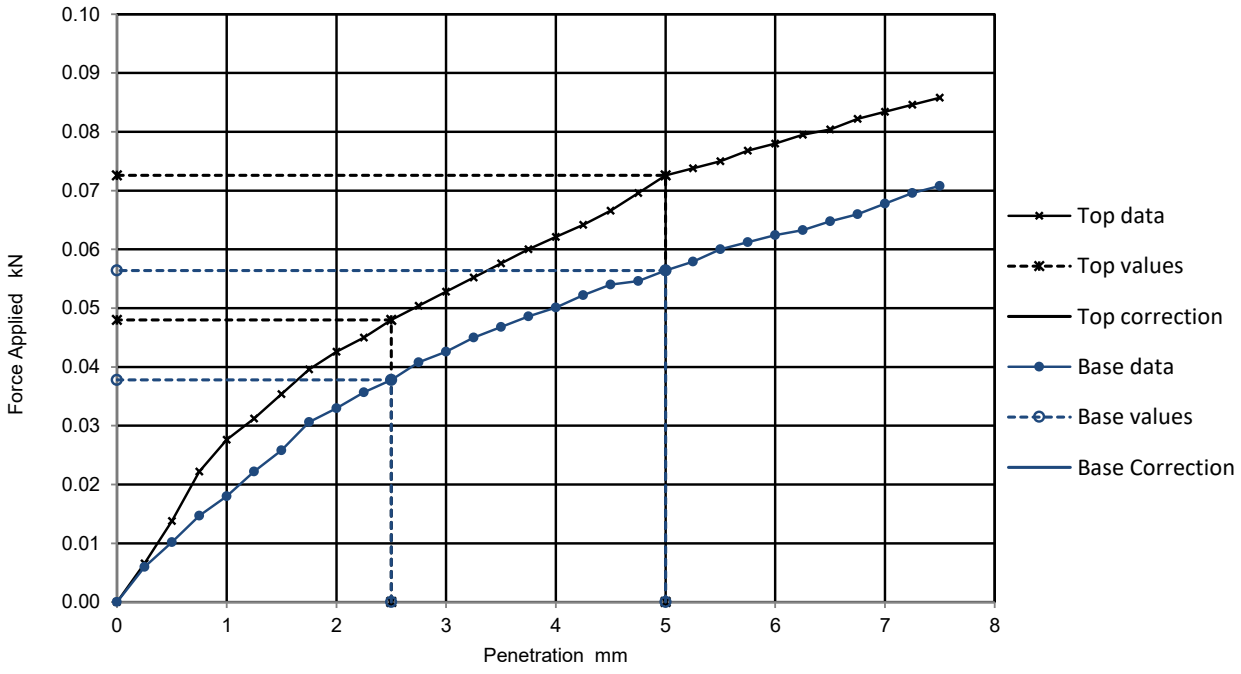
California Bearing Ratio (CBR)

Job Ref	33610				
Borehole/Pit No.	BH110				
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006	Client	TEC	Depth Top	2.50 m
Soil Description	Dark grey slightly gravelly slightly organic silty CLAY (gravel is fmc and sub-angular)			Depth Base	3.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377 : Part 4 : 1990, clause 7			Project Started	19/06/2023
				Date Tested	10/07/2023

Specimen Preparation

Condition	REMOULDED			Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer			Period of soaking	- days
				Time to surface	- days
				Amount of swell recorded	- mm
Material retained on 20mm sieve removed		5.7	%		
Initial Specimen details	Bulk density	1.68	Mg/m3	Surcharge applied	6 kg
	Dry density	1.08	Mg/m3		4 kPa
	Moisture content	56	%		

Force v Penetration Plots



Results

	Curve correction applied	CBR Values, %				Moisture Content %
		2.5mm	5mm	Highest	Average	
TOP	No	0.36	0.36	0.36	N/A	50
BASE	No	0.29	0.28	0.29		53

Remarks

Test Report by K4 SOILS LABORATORY
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Date: 26/07/2023

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Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R16

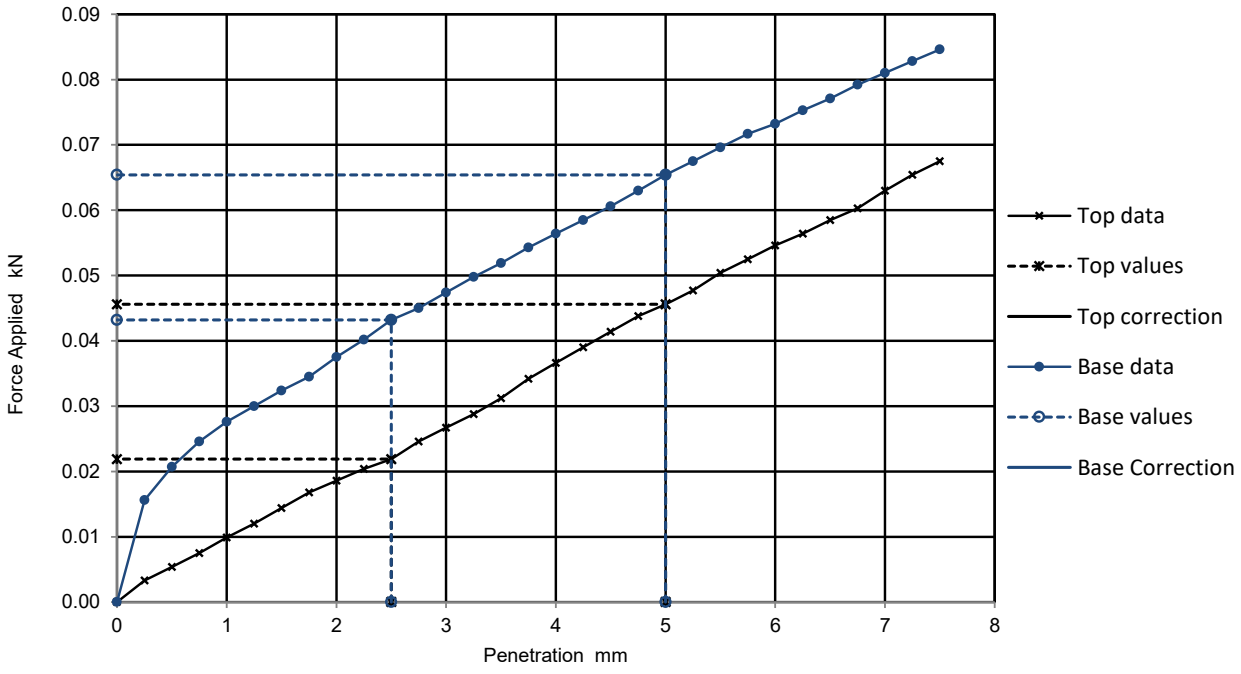
California Bearing Ratio (CBR)

Job Ref	33610				
Borehole/Pit No.	BH113				
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006	Client	TEC	Depth Top	2.50 m
Soil Description	Grey sandy gravelly silty CLAY (gravel is fmc and sub-angular to rounded)			Depth Base	3.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377 : Part 4 : 1990, clause 7			Project Started	19/06/2023
				Date Tested	11/07/2023

Specimen Preparation

Condition	REMOULDED			Soaking details	Not soaked	
Details	Recompacted with specified standard effort using 2.5kg rammer			Period of soaking	-	days
				Time to surface	-	days
				Amount of swell recorded	-	mm
Material retained on 20mm sieve removed		46	%			
Initial Specimen details	Bulk density	1.89	Mg/m3	Surcharge applied	6	kg
	Dry density	1.44	Mg/m3		4	kPa
	Moisture content	32	%			

Force v Penetration Plots



Results

	Curve correction applied	CBR Values, %				Moisture Content %
		2.5mm	5mm	Highest	Average	
TOP	No	0.17	0.23	0.23	N/A	31
BASE	No	0.33	0.33	0.33		29

Remarks

Test Report by K4 SOILS LABORATORY
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Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R16

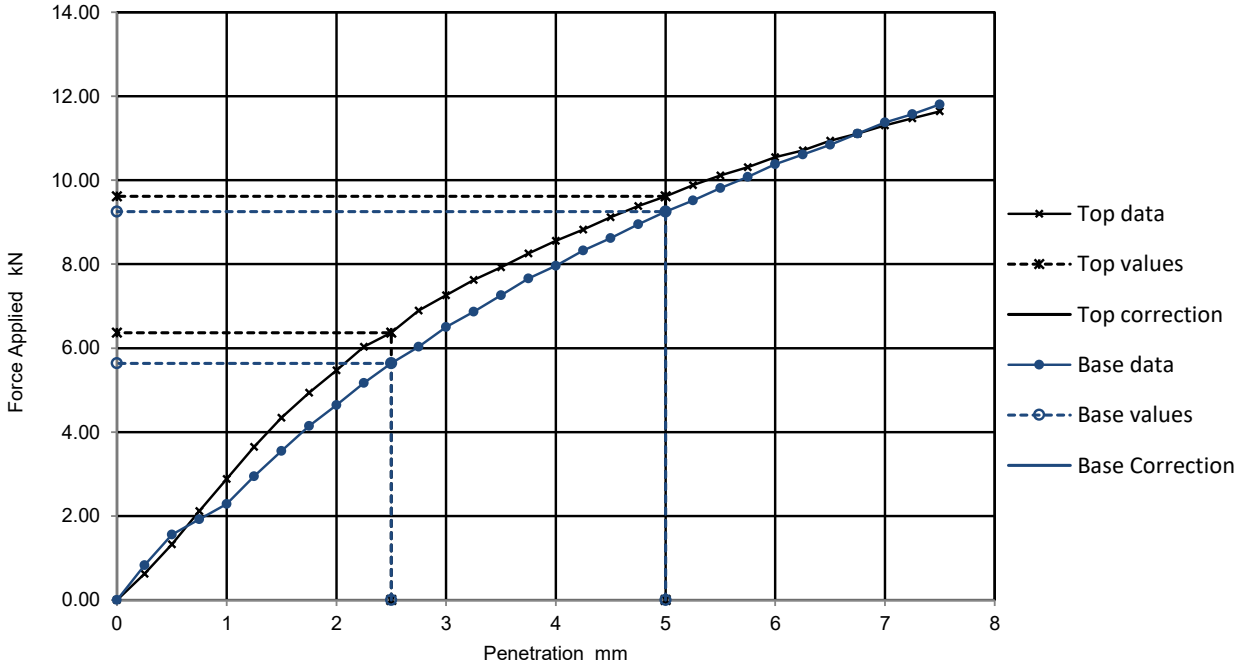
California Bearing Ratio (CBR)

Job Ref	33610				
Borehole/Pit No.	TP101				
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006	Client	TEC	Depth Top	0.20 m
Soil Description	Dark grey slightly clayey silty gravelly SAND with occasional rootlets (gravel is fmc and sub-angular to rounded)			Depth Base	0.60 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377 : Part 4 : 1990, clause 7			Project Started	19/06/2023
				Date Tested	17/07/2023

Specimen Preparation

Condition	REMOULDED			Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer			Period of soaking	- days
				Time to surface	- days
				Amount of swell recorded	- mm
Material retained on 20mm sieve removed		14	%		
Initial Specimen details	Bulk density	1.99	Mg/m3	Surcharge applied	10 kg
	Dry density	1.77	Mg/m3		6 kPa
	Moisture content	13	%		

Force v Penetration Plots



Results

	Curve correction applied	CBR Values, % 2.5mm	5mm	Highest	Average	Moisture Content %
TOP	No	48	48	48	47	13
BASE	No	43	46	46		14

Remarks

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Initials: **J.P**

Date: 26/07/2023

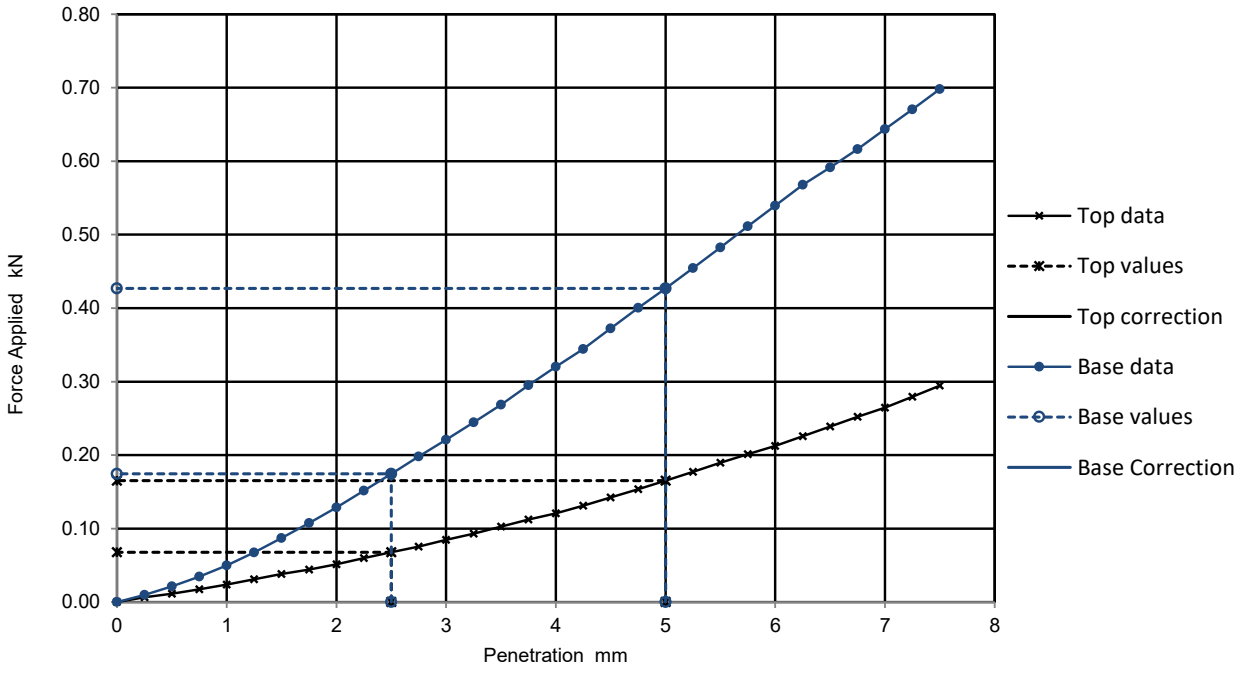
California Bearing Ratio (CBR)

Job Ref	33610				
Borehole/Pit No.	TP104				
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006	Client	TEC	Depth Top	0.30 m
Soil Description	Brown gravelly sandy silty CLAY with clinker fragments (gravel is fmc and angular to sub-rounded)			Depth Base	0.60 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377 : Part 4 : 1990, clause 7			Project Started	19/06/2023
				Date Tested	11/07/2023

Specimen Preparation

Condition	REMOULDED			Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer			Period of soaking	- days
				Time to surface	- days
				Amount of swell recorded	- mm
Material retained on 20mm sieve removed		15	%		
Initial Specimen details	Bulk density	1.81	Mg/m3	Surcharge applied	6 kg
	Dry density	1.45	Mg/m3		4 kPa
	Moisture content	24	%		

Force v Penetration Plots



Results

	Curve correction applied	CBR Values, % 2.5mm	5mm	Highest	Average	Moisture Content %
TOP	No	0.51	0.83	0.83	N/A	25
BASE	No	1.3	2.1	2.1		25

Remarks

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Date: 26/07/2023

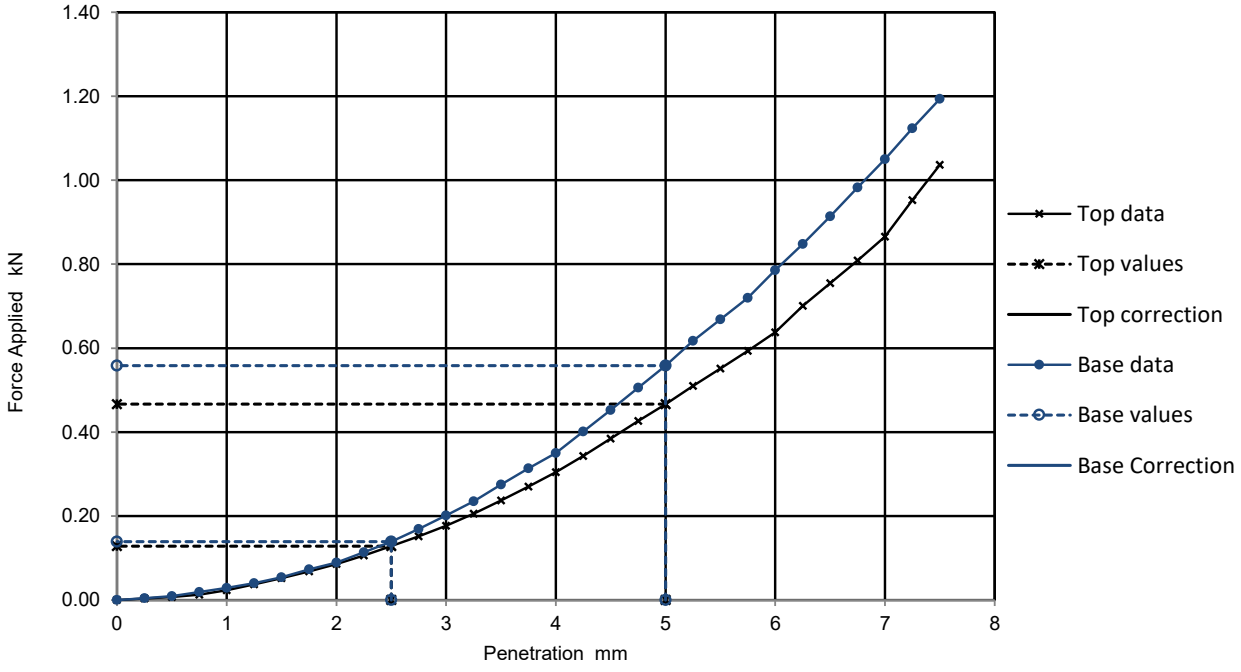
California Bearing Ratio (CBR)

Job Ref	33610				
Borehole/Pit No.	TP105				
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006	Client	TEC	Depth Top	1.00 m
Soil Description	Dark greyish brown slightly clayey silty very sandy GRAVEL with rare cobbles and coal fragments (gravel is fmc and angular to sub-rounded)			Depth Base	1.40 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377 : Part 4 : 1990, clause 7			Project Started	19/06/2023
				Date Tested	11/07/2023

Specimen Preparation

Condition	REMOULDED			Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer			Period of soaking	- days
				Time to surface	- days
				Amount of swell recorded	- mm
Material retained on 20mm sieve removed		25	%		
Initial Specimen details	Bulk density	2.11	Mg/m3	Surcharge applied	6 kg
	Dry density	1.78	Mg/m3		4 kPa
	Moisture content	18	%		

Force v Penetration Plots



Results

	Curve correction applied	CBR Values, %				Moisture Content %
		2.5mm	5mm	Highest	Average	
TOP	No	0.97	2.3	2.3	2.6	18
BASE	No	1.1	2.8	2.8		18

Remarks

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2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R16

California Bearing Ratio (CBR)

Job Ref	33610				
Borehole/Pit No.	TP111				
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006	Client	TEC	Depth Top	1.00 m
Soil Description	Brown slightly clayey slightly silty SAND			Depth Base	1.40 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377 : Part 4 : 1990, clause 7			Project Started	19/06/2023
				Date Tested	10/07/2023

Specimen Preparation

Condition: REMOULDED

Details: Recompacted with specified standard effort using 2.5kg rammer

Material retained on 20mm sieve removed: 0.00 %

Initial Specimen details:

Bulk density	1.91	Mg/m3
Dry density	1.59	Mg/m3
Moisture content	20	%

Soaking details: Not soaked

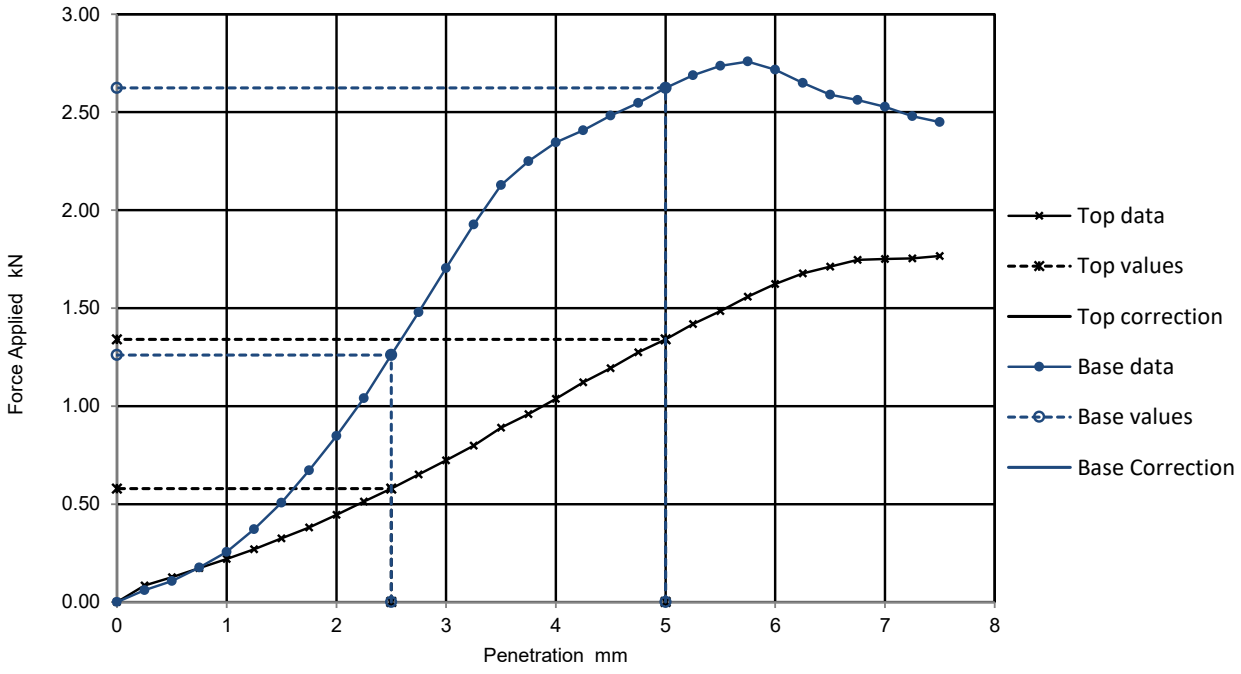
Period of soaking: - days

Time to surface: - days

Amount of swell recorded: - mm

Surcharge applied: 6 kg / 4 kPa

Force v Penetration Plots



Results

	Curve correction applied	CBR Values, % 2.5mm	5mm	Highest	Average	Moisture Content %
TOP	No	4.4	6.7	6.7	N/A	21
BASE	No	9.6	13	13		21

Remarks

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UKAS TESTING 2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

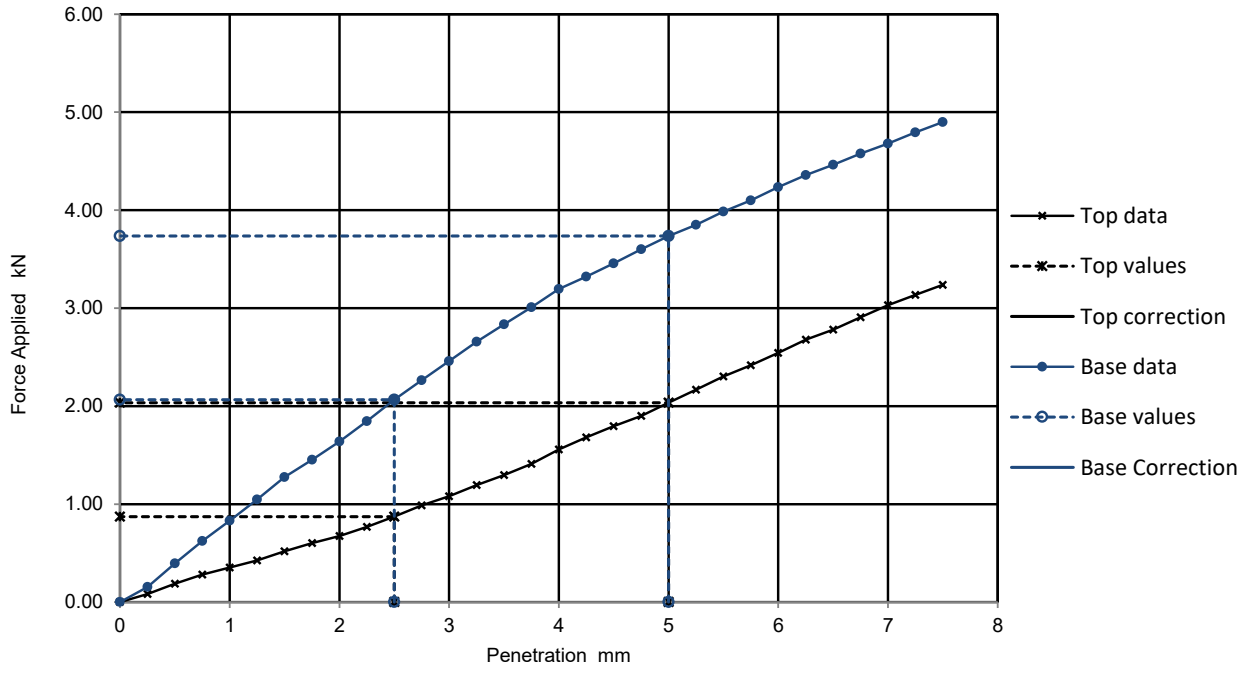
California Bearing Ratio (CBR)

Job Ref	33610				
Borehole/Pit No.	TP113				
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006	Client	TEC	Depth Top	0.40 m
Soil Description	Brown clayey gravelly SAND with occasional rootlets (gravel is fmc and sub-rounded to rounded)			Depth Base	0.80 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377 : Part 4 : 1990, clause 7			Project Started	19/06/2023
				Date Tested	11/07/2023

Specimen Preparation

Condition	REMOULDED			Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer			Period of soaking	- days
				Time to surface	- days
				Amount of swell recorded	- mm
Material retained on 20mm sieve removed		5.8	%		
Initial Specimen details	Bulk density	1.84	Mg/m3	Surcharge applied	6 kg
	Dry density	1.47	Mg/m3		4 kPa
	Moisture content	26	%		

Force v Penetration Plots



Results

	Curve correction applied	CBR Values, %				Moisture Content %
		2.5mm	5mm	Highest	Average	
TOP	No	6.6	10	10	N/A	24
BASE	No	16	19	19		23

Remarks

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UKAS TESTING 2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

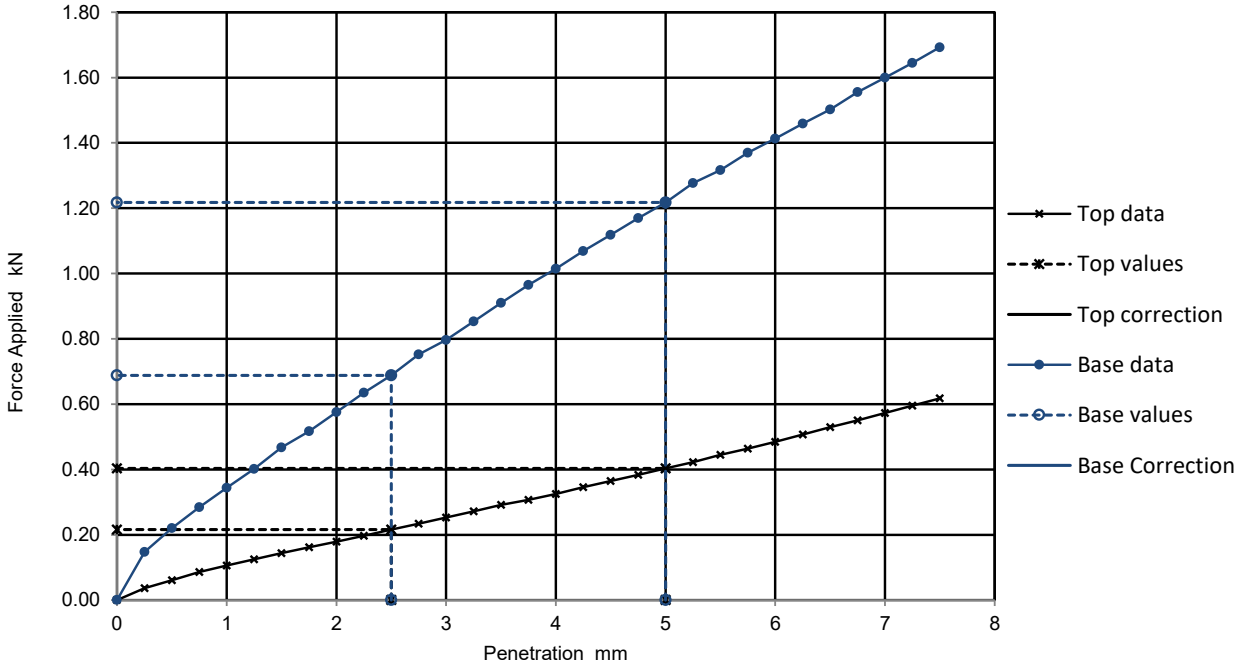
California Bearing Ratio (CBR)

Job Ref	33610				
Borehole/Pit No.	TP116				
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006	Client	TEC	Depth Top	0.60 m
Soil Description	Brown and grey silty clayey SAND with occaisonal rootlets			Depth Base	1.20 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377 : Part 4 : 1990, clause 7			Project Started	19/06/2023
				Date Tested	10/07/2023

Specimen Preparation

Condition	REMOULDED			Soaking details	Not soaked	
Details	Recompacted with specified standard effort using 2.5kg rammer			Period of soaking	-	days
				Time to surface	-	days
				Amount of swell recorded	-	mm
Material retained on 20mm sieve removed		0.00	%			
Initial Specimen details	Bulk density	2.00	Mg/m3	Surcharge applied	6	kg
	Dry density	1.69	Mg/m3		4	kPa
	Moisture content	19	%			

Force v Penetration Plots



Results

	Curve correction applied	CBR Values, % 2.5mm	5mm	Highest	Average	Moisture Content %
TOP	No	1.6	2.0	2.0	N/A	20
BASE	No	5.2	6.1	6.1		16

Remarks

Test Report by K4 SOILS LABORATORY
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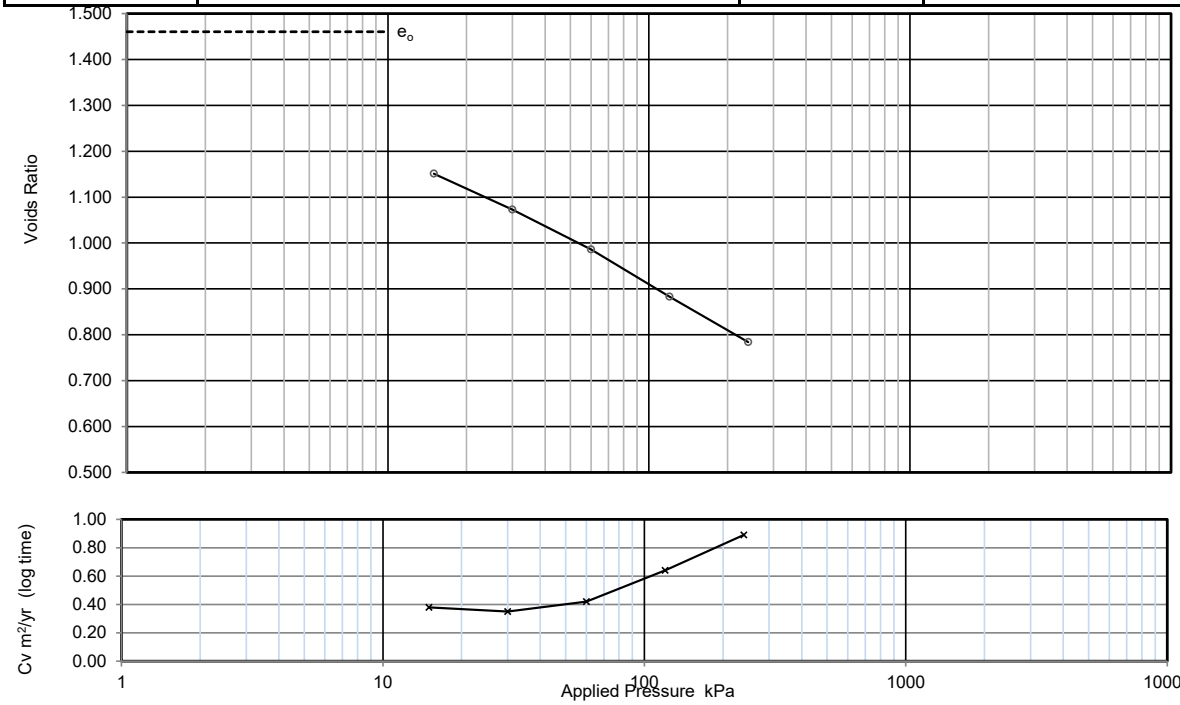
Checked and Approved

Initials: **J.P**

Date: 26/07/2023

ONE DIMENSIONAL CONSOLIDATION TEST

				Job Ref	33610
				Borehole/Pit No.	BH103
				Sample No.	-
Site Name	Phoenix Wharf, Port Talbot			Depth Top	9.00 m
Project ID	2111006.005	Client	TEC	Depth Base	9.80 m
Soil Description	Brownish grey silty CLAY			Sample Type	B
				Sample Received	14/06/2023
				Schedule received	19/06/2023
				Project Started	19/06/2023
Test Method	BS1377:Part 5: 1990, clause 3			Date Test started	29/06/2023



Applied Pressure	Voids ratio	Mv	Cv (t50, log)	Cv (t90, root)
kPa		m2/MN	m2/yr	m2/yr
2.0	1.460	-	-	-
15	1.151	9.7	0.38	0.35
30	1.073	2.4	0.35	0.47
60	0.986	1.4	0.42	0.6
120	0.883	0.86	0.64	0.68
240	0.784	0.44	0.89	1.3

Preparation

Orientation wthin sample: Vertical

Particle density: assumed 2.70 Mg/m3

Specimen details	Initial	Final	
Diameter	74.96	-	mm
Height	19.98	14.49	mm
Moisture Content	55	30	%
Bulk density	1.70	1.97	Mg/m3
Dry density	1.10	1.51	Mg/m3
Voids Ratio	1.460	0.784	
Saturation	101	103	%
Average temperature for test	20.0		oC
Swelling Pressure			kPa
Settlement on saturation			%

Remarks

Test Report by K4 SOILS LABORATORY
Unit 8 Olds Close Olds Approach
Watford Herts WD18 9RU
Tel: 01923 711 288
Email: James@k4soils.com

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Date: 26/07/2023

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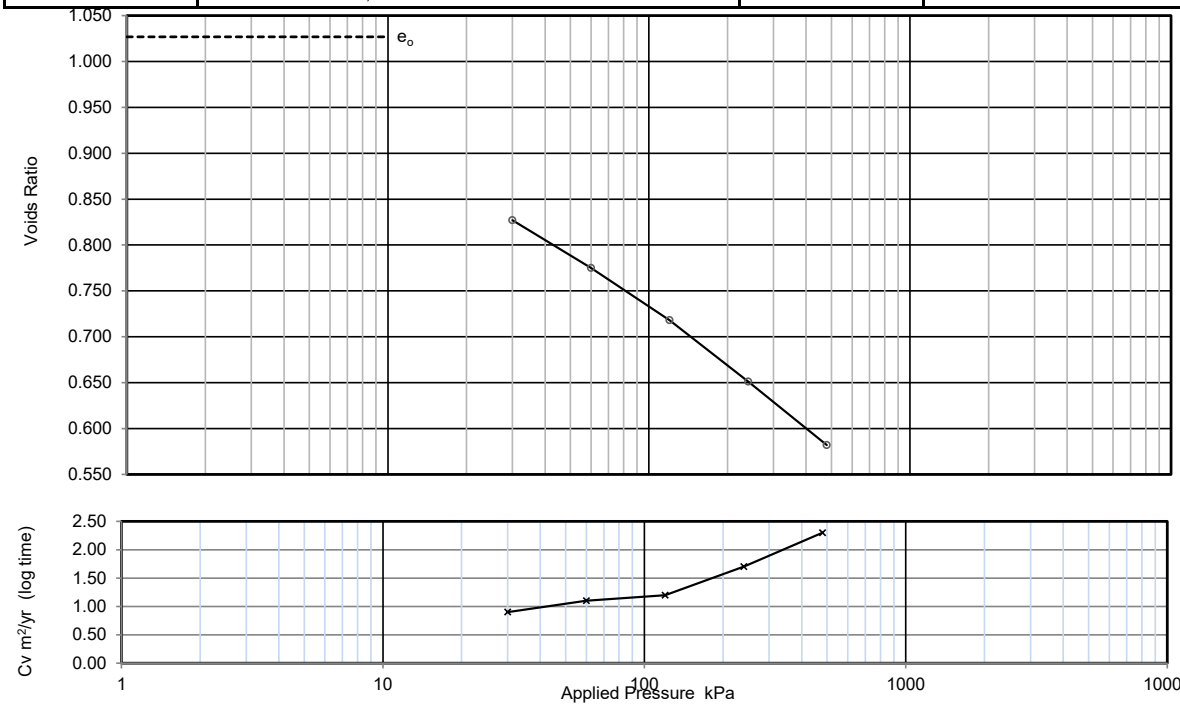
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

ONE DIMENSIONAL CONSOLIDATION TEST

				Job Ref	33610
				Borehole/Pit No.	BH104
				Sample No.	-
Site Name	Phoenix Wharf, Port Talbot			Depth Top	10.50 m
Project ID	2111006.005	Client	TEC	Depth Base	11.00 m
Soil Description	Grey sandy silty CLAY			Sample Type	B
				Sample Received	14/06/2023
				Schedule received	19/06/2023
				Project Started	19/06/2023
Test Method	BS1377:Part 5: 1990, clause 3			Date Test started	29/06/2023



Applied Pressure	Voids ratio	Mv	Cv (t50, log)	Cv (t90, root)
kPa		m2/MN	m2/yr	m2/yr
2.0	1.027	-	-	-
30	0.827	3.5	0.9	0.98
60	0.775	0.96	1.1	2.1
120	0.718	0.53	1.2	1.8
240	0.651	0.33	1.7	2.8
480	0.582	0.18	2.3	3.6

Preparation

Orientation wthin sample: Vertical

Particle density: assumed 2.70 Mg/m3

Specimen details	Initial	Final	
Diameter	75.06	-	mm
Height	18.97	14.80	mm
Moisture Content	39	23	%
Bulk density	1.85	2.10	Mg/m3
Dry density	1.33	1.71	Mg/m3
Voids Ratio	1.027	0.582	
Saturation	102	107	%
Average temperature for test	20.0		oC
Swelling Pressure			kPa
Settlement on saturation			%

Remarks

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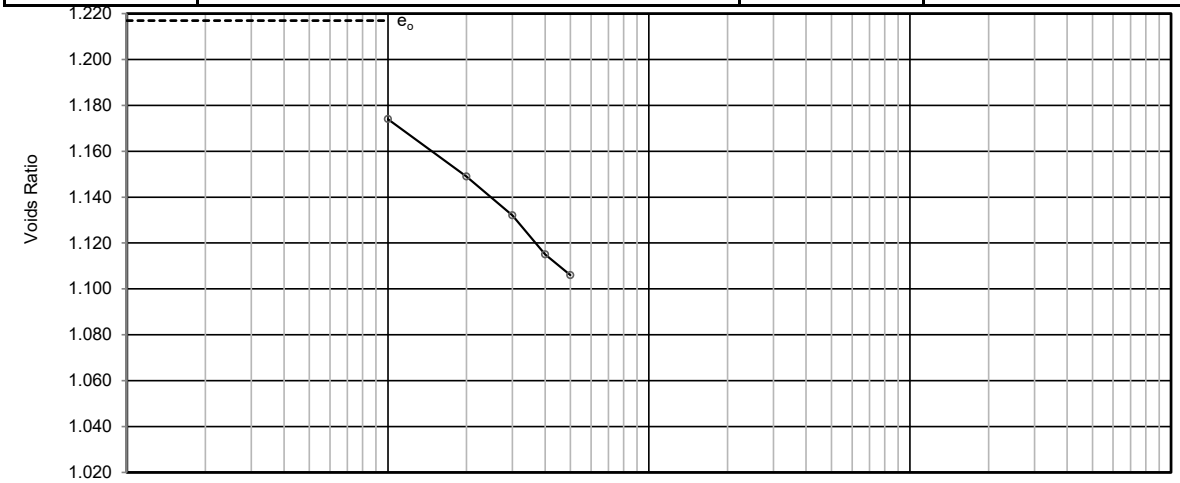
ONE DIMENSIONAL CONSOLIDATION TEST

				Job Ref	33610
				Borehole/Pit No.	BH105
				Sample No.	-
Site Name	Phoenix Wharf, Port Talbot			Depth Top	0.00 m
Project ID	2111006.005	Client	TEC	Depth Base	0.30 m
Soil Description	Dark grey and black slightly clayey silty very sandy GRAVEL with numerous roots (gravel is fmc and sub-angular to sub-rounded)			Sample Type	B
				Sample Received	14/06/2023
				Schedule received	19/06/2023
				Project Started	19/06/2023
Test Method	BS1377:Part 5: 1990, clause 3			Date Test started	27/06/2023



Applied Pressure	Voids ratio	Mv	Cv (t50, log)	Cv (t90, root)
kPa		m2/MN	m2/yr	m2/yr
2.0	1.217	-	-	-
10	1.174	2.4	35	100
20	1.149	1.2	3	15
30	1.132	0.8	1.5	4.2
40	1.115	0.75	0.073	0.6
50	1.106	0.44	0.073	0.094

Preparation

Orientation wthin sample: Vertical

Particle density: assumed 2.66 Mg/m3

Specimen details	Initial	Final	
Diameter	75.05	-	mm
Height	19.88	18.89	mm
Moisture Content	42	37	%
Bulk density	1.71	1.73	Mg/m3
Dry density	1.20	1.26	Mg/m3
Voids Ratio	1.217	1.106	
Saturation	93	89	%
Average temperature for test	20.0		oC
Swelling Pressure			kPa
Settlement on saturation			%

Remarks

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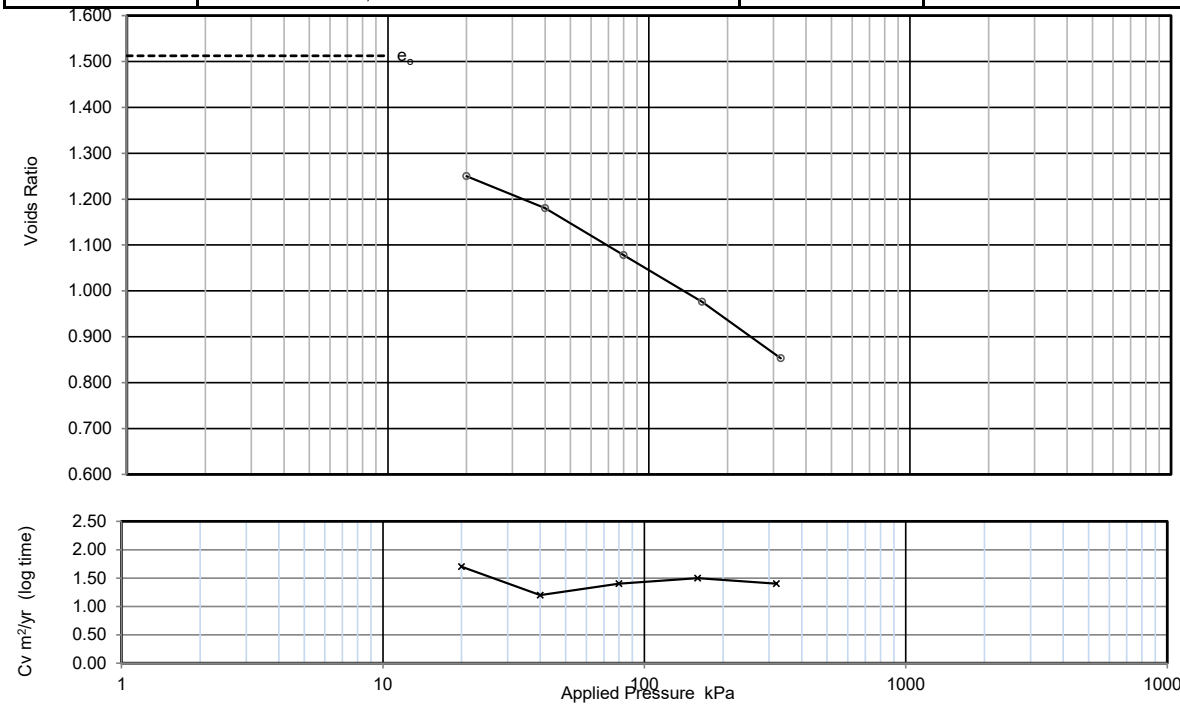
MSF-5-R6

ONE DIMENSIONAL CONSOLIDATION TEST

				Job Ref	33610
				Borehole/Pit No.	BH106
				Sample No.	-
Site Name	Phoenix Wharf, Port Talbot			Depth Top	9.00 m
Project ID	2111006.005	Client	TEC	Depth Base	10.00 m
Soil Description	Dark brownish grey sandy silty CLAY with traces of peat pockets			Sample Type	B
				Sample Received	14/06/2023
				Schedule received	19/06/2023
				Project Started	19/06/2023
Test Method	BS1377:Part 5: 1990, clause 3			Date Test started	28/06/2023



Applied Pressure	Voids ratio	Mv	Cv (t50, log)	Cv (t90, root)
kPa		m2/MN	m2/yr	m2/yr
2.0	1.512	-	-	-
20	1.250	5.8	1.7	2.2
40	1.180	1.6	1.2	2
80	1.078	1.2	1.4	2
160	0.976	0.62	1.5	1.8
320	0.853	0.39	1.4	2.6

Preparation

Orientation wthin sample: Vertical

Particle density: assumed 2.66 Mg/m3

Specimen details	Initial	Final	
Diameter	75.05	-	mm
Height	19.00	14.02	mm
Moisture Content	58	34	%
Bulk density	1.67	1.92	Mg/m3
Dry density	1.06	1.44	Mg/m3
Voids Ratio	1.512	0.853	
Saturation	102	106	%
Average temperature for test	20.0		oC
Swelling Pressure			kPa
Settlement on saturation			%

Remarks

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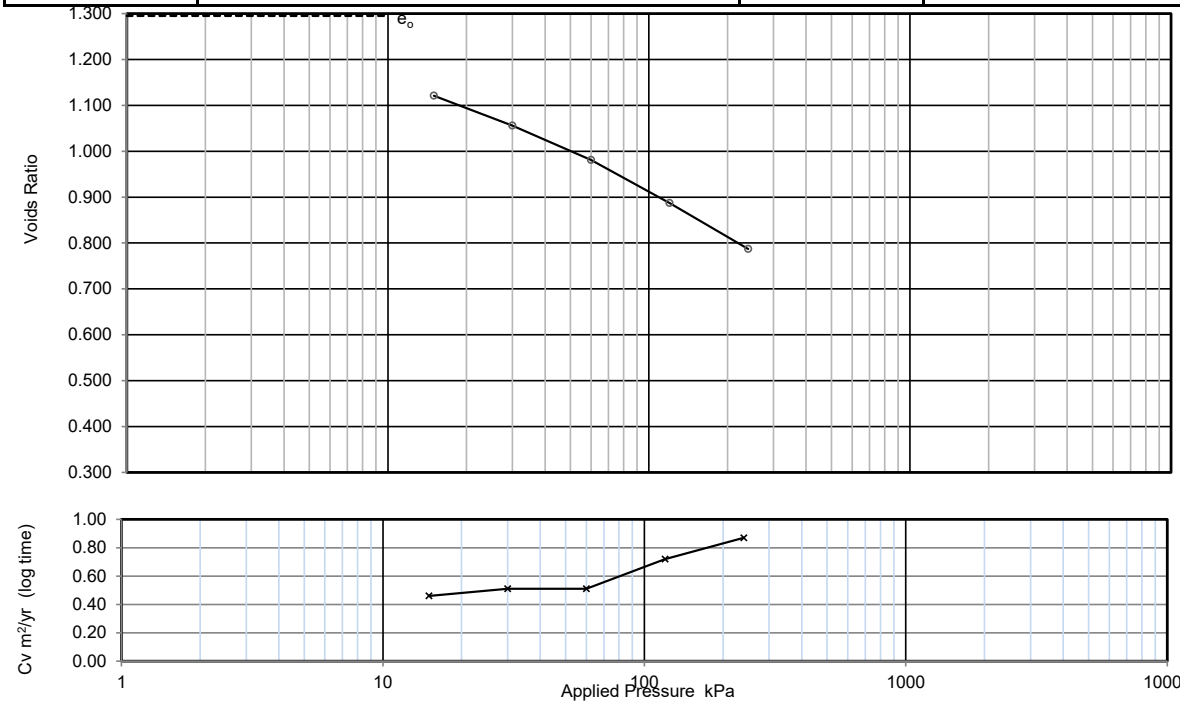
ONE DIMENSIONAL CONSOLIDATION TEST

				Job Ref	33610
				Borehole/Pit No.	BH107
				Sample No.	-
Site Name	Phoenix Wharf, Port Talbot			Depth Top	10.50 m
Project ID	2111006.005	Client	TEC	Depth Base	11.00 m
Soil Description	Brownish grey, grey and black slightly sandy slightly peaty silty CLAY with rare rootlets			Sample Type	B
				Sample Received	14/06/2023
				Schedule received	19/06/2023
				Project Started	19/06/2023
Test Method	BS1377:Part 5: 1990, clause 3			Date Test started	29/06/2023



Applied Pressure	Voids ratio	Mv	Cv (t50, log)	Cv (t90, root)
kPa		m2/MN	m2/yr	m2/yr
2.0	1.295	-	-	-
15	1.121	5.9	0.46	0.45
30	1.056	2	0.51	0.5
60	0.981	1.2	0.51	0.98
120	0.887	0.79	0.72	0.97
240	0.787	0.44	0.87	1.2

Preparation

Orientation wthin sample: Vertical

Particle density: assumed 2.64 Mg/m3

Specimen details	Initial	Final	
Diameter	74.79	-	mm
Height	18.98	14.78	mm
Moisture Content	52	33	%
Bulk density	1.74	1.96	Mg/m3
Dry density	1.15	1.48	Mg/m3
Voids Ratio	1.295	0.787	
Saturation	105	111	%
Average temperature for test	20.0		oC
Swelling Pressure			kPa
Settlement on saturation			%

Remarks

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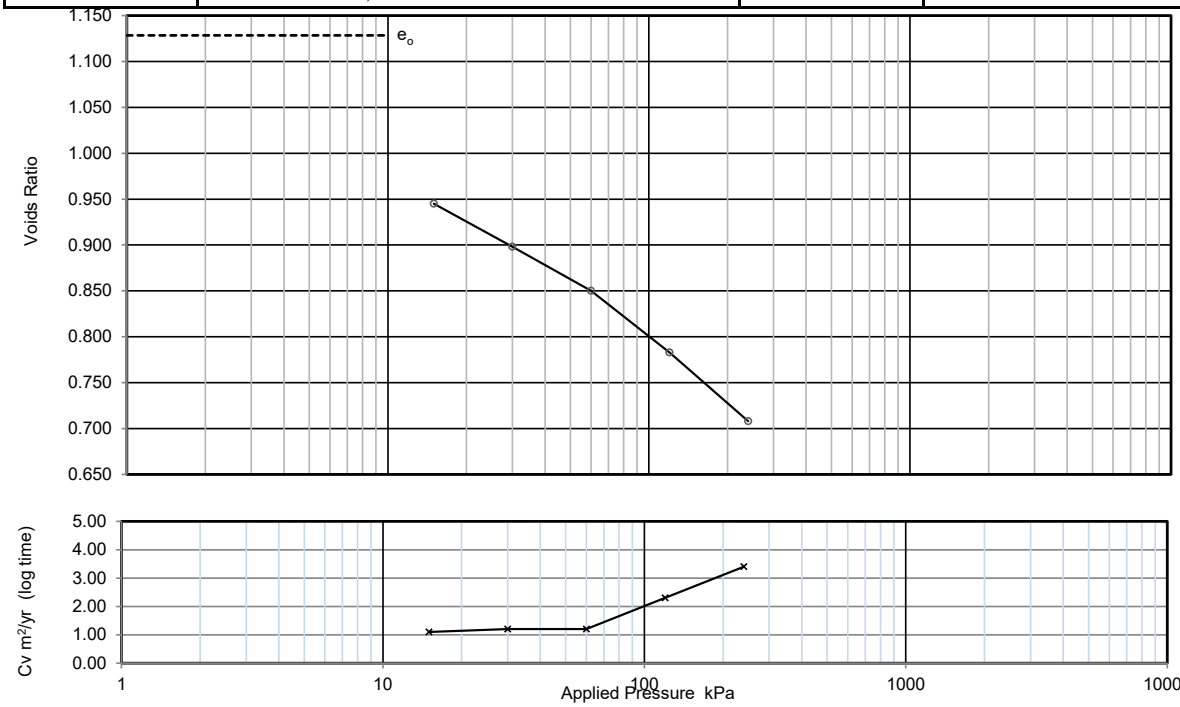
ONE DIMENSIONAL CONSOLIDATION TEST

				Job Ref	33610
				Borehole/Pit No.	BH108
				Sample No.	-
Site Name	Phoenix Wharf, Port Talbot			Depth Top	8.00 m
Project ID	2111006.005	Client	TEC	Depth Base	9.00 m
Soil Description	Grey slightly sandy slightly peaty silty CLAY with occasional decayed wood fragments			Sample Type	B
				Sample Received	14/06/2023
				Schedule received	19/06/2023
				Project Started	19/06/2023
Test Method	BS1377:Part 5: 1990, clause 3			Date Test started	29/06/2023



Applied Pressure	Voids ratio	Mv	Cv (t50, log)	Cv (t90, root)
kPa		m2/MN	m2/yr	m2/yr
2.0	1.128	-	-	-
15	0.945	6.6	1.1	0.92
30	0.898	1.6	1.2	1.4
60	0.850	0.83	1.2	2.2
120	0.783	0.61	2.3	3
240	0.708	0.35	3.4	4.4

Preparation

Orientation wthin sample: Vertical

Particle density: assumed 2.66 Mg/m3

Specimen details	Initial	Final	
Diameter	74.95	-	mm
Height	18.80	15.09	mm
Moisture Content	45	29	%
Bulk density	1.81	2.01	Mg/m3
Dry density	1.25	1.56	Mg/m3
Voids Ratio	1.128	0.708	
Saturation	106	109	%
Average temperature for test	20.0		oC
Swelling Pressure			kPa
Settlement on saturation			%

Remarks

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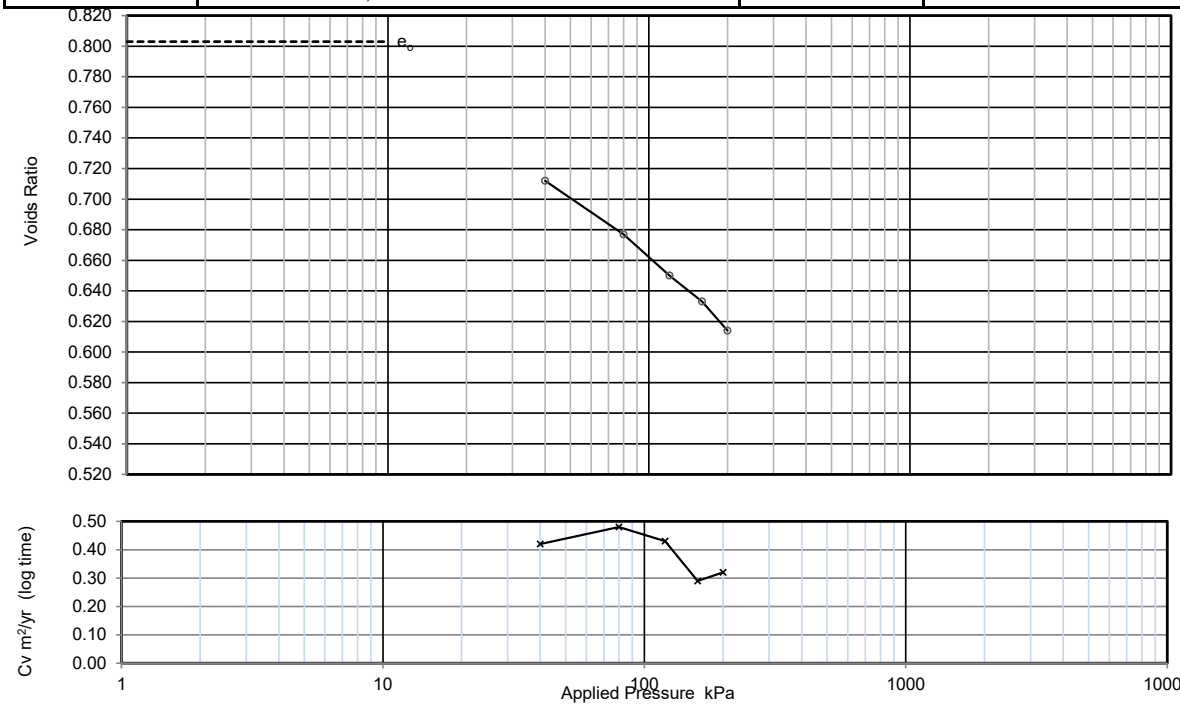
ONE DIMENSIONAL CONSOLIDATION TEST

				Job Ref	33610
				Borehole/Pit No.	BH110
				Sample No.	-
Site Name	Phoenix Wharf, Port Talbot			Depth Top	4.50 m
Project ID	2111006.005	Client	TEC	Depth Base	5.00 m
Soil Description	Greyish brown and brownish grey slightly sandy silty CLAY			Sample Type	B
				Sample Received	14/06/2023
				Schedule received	19/06/2023
				Project Started	19/06/2023
Test Method	BS1377:Part 5: 1990, clause 3			Date Test started	28/06/2023



Applied Pressure	Voids ratio	Mv	Cv (t50, log)	Cv (t90, root)
kPa		m2/MN	m2/yr	m2/yr
2.0	0.803	-	-	-
40	0.712	1.3	0.42	0.5
80	0.677	0.52	0.48	0.64
120	0.650	0.4	0.43	0.52
160	0.633	0.26	0.29	0.53
200	0.614	0.29	0.32	0.31

Preparation

Orientation wthin sample: Vertical

Particle density: assumed 2.67 Mg/m3

Specimen details	Initial	Final	
Diameter	75.80	-	mm
Height	18.94	16.95	mm
Moisture Content	32	27	%
Bulk density	1.96	2.10	Mg/m3
Dry density	1.48	1.65	Mg/m3
Voids Ratio	0.803	0.614	
Saturation	108	117	%
Average temperature for test	20.0		oC
Swelling Pressure			kPa
Settlement on saturation			%

Remarks

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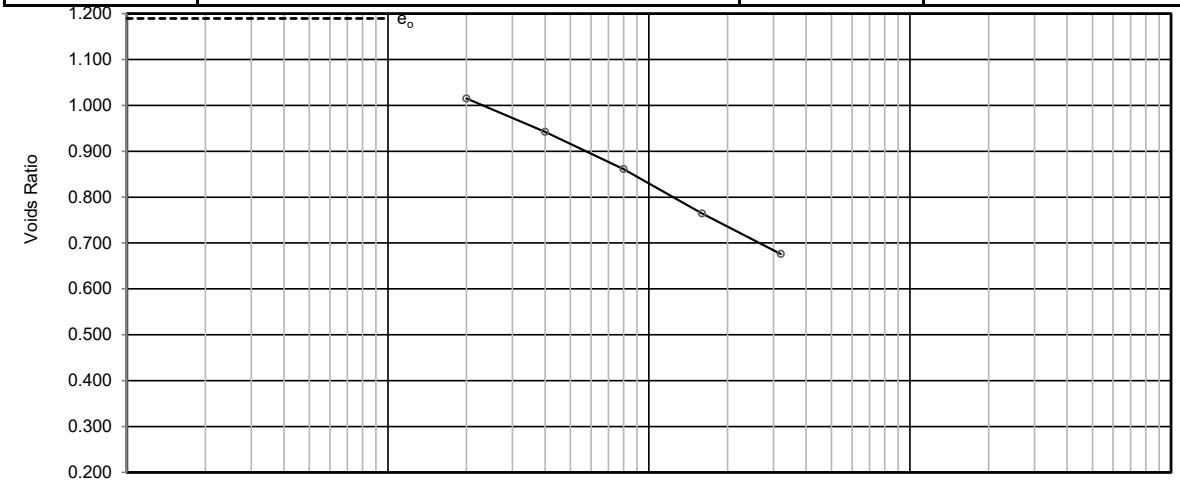
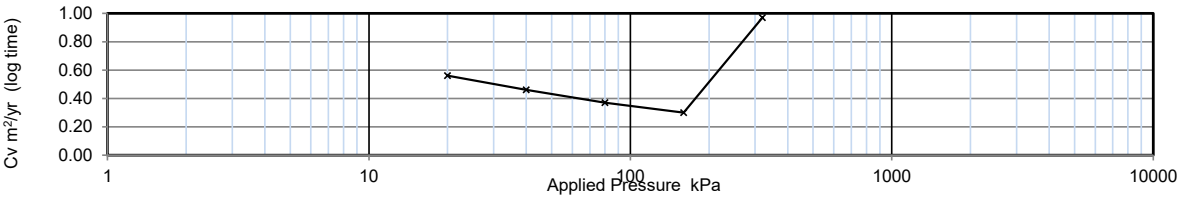
ONE DIMENSIONAL CONSOLIDATION TEST

				Job Ref	33610
				Borehole/Pit No.	BH111
				Sample No.	-
Site Name	Phoenix Wharf, Port Talbot			Depth Top	7.50 m
Project ID	2111006.005	Client	TEC	Depth Base	8.00 m
Soil Description	Brownish grey silty CLAY			Sample Type	B
				Sample Received	14/06/2023
				Schedule received	19/06/2023
				Project Started	19/06/2023
Test Method	BS1377:Part 5: 1990, clause 3			Date Test started	29/06/2023





Applied Pressure	Voids ratio	Mv	Cv (t50, log)	Cv (t90, root)
kPa		m2/MN	m2/yr	m2/yr
2.0	1.189	-	-	-
20	1.015	4.4	0.56	0.69
40	0.942	1.8	0.46	0.66
80	0.861	1	0.37	0.47
160	0.764	0.65	0.3	0.36
320	0.676	0.31	0.97	1.3

Preparation

Orientation wthin sample: Vertical

Particle density: assumed 2.65 Mg/m3

Specimen details	Initial	Final	
Diameter	76.00	-	mm
Height	18.60	14.24	mm
Moisture Content	47	29	%
Bulk density	1.78	2.04	Mg/m3
Dry density	1.21	1.58	Mg/m3
Voids Ratio	1.189	0.676	
Saturation	104	114	%
Average temperature for test	20.0		oC
Swelling Pressure			kPa
Settlement on saturation			%

Remarks

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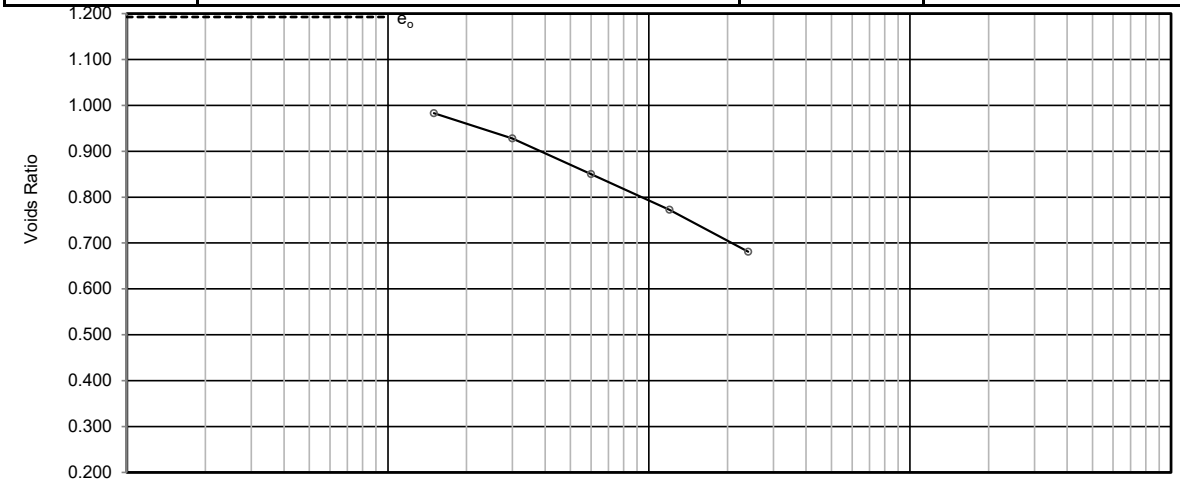
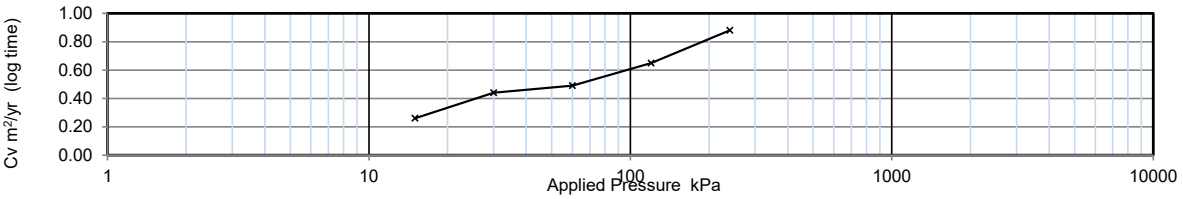
MSF-5-R6

ONE DIMENSIONAL CONSOLIDATION TEST

				Job Ref	33610
				Borehole/Pit No.	BH120
				Sample No.	-
Site Name	Phoenix Wharf, Port Talbot			Depth Top	4.50 m
Project ID	2111006.005	Client	TEC	Depth Base	5.00 m
Soil Description	Dark grey slightly sandy slightly gravelly organic silty CLAY (gravel is fmc and sub-angular to sub-rounded)			Sample Type	B
				Sample Received	14/06/2023
				Schedule received	19/06/2023
				Project Started	19/06/2023
Test Method	BS1377:Part 5: 1990, clause 3			Date Test started	28/06/2023





Applied Pressure	Voids ratio	Mv	Cv (t50, log)	Cv (t90, root)
kPa		m2/MN	m2/yr	m2/yr
2.0	1.193	-	-	-
15	0.983	7.4	0.26	0.3
30	0.928	1.8	0.44	0.58
60	0.850	1.4	0.49	0.7
120	0.772	0.7	0.65	0.87
240	0.681	0.43	0.88	1.2

Preparation

Orientation wthin sample: Vertical

Particle density: assumed 2.64 Mg/m3

Specimen details	Initial	Final	
Diameter	74.95	-	mm
Height	18.84	14.44	mm
Moisture Content	47	28	%
Bulk density	1.77	2.01	Mg/m3
Dry density	1.20	1.57	Mg/m3
Voids Ratio	1.193	0.681	
Saturation	103	109	%
Average temperature for test	20.0		oC
Swelling Pressure			kPa
Settlement on saturation			%

Remarks

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MSF-5-R6

Summary of Particle Density Test Results

Job No.	Project Name	Programme	
33610	Phoenix Wharf, Port Talbot	Samples received	14/06/2023
		Schedule received	19/06/2023
Project No.	Client	Project started	19/06/2023
2111006.005	TEC	Testing Started	03/07/2023

Hole No.	Sample				Soil Description	Particle density	Method	Remarks
	Ref	Top m	Base m	Type		Mg/m3		
BH101	-	2.50	3.00	B	Bluish grey slightly sandy silty CLAY with rare coarse sub-angular gravel and traces of rootlets	2.63	small pyknometer	
BH102	-	18.00	18.50	B	Grey sandy GRAVEL with numerous cobbles (gravel is fmc and angular to rounded)	2.67	small pyknometer	
BH104	-	2.50	3.00	B	Brown sandy silty CLAY	2.63	small pyknometer	
BH104	-	6.00	6.50	B	Bluish grey and brown sandy silty CLAY	2.67	small pyknometer	
BH105	-	7.00	10.00	B	Dark grey slightly sandy alluvial silty CLAY with rare fine sub-angular gravel	2.69	small pyknometer	
BH105	-	13.50	17.00	B	Grey slightly clayey silty very sandy GRAVEL (gravel is fmc and sub-angular to rounded)	2.65	small pyknometer	
BH110	-	2.50	3.00	B	Dark grey slightly gravelly slightly organic silty CLAY (gravel is fmc and sub-angular)	2.61	small pyknometer	
BH112	-	4.00	8.40	B	Dark grey silty SAND	2.63	small pyknometer	
BH113	-	2.50	3.00	B	Grey sandy gravelly silty CLAY (gravel is fmc and sub-angular to rounded)	2.60	small pyknometer	
BH114	-	11.50	15.00	B	Brown slightly clayey sandy GRAVEL with rare cobbles (gravel is fmc and sub-angular to rounded)	2.70	small pyknometer	
BH115	-	15.00	17.20	B	Grey gravelly sandy silty CLAY (gravel is fmc and sub-angular to sub-rounded)	2.63	Large pyknometer	
BH120	-	12.00	12.50	B	Dark grey slightly gravelly peaty silty CLAY (gravel is fmc and sub-rounded to rounded)	2.36	small pyknometer	
BH120	-	18.00	18.50	B	Grey slightly clayey sandy GRAVEL with cobbles (gravel is fmc and sub-angular to rounded)	2.70	Large pyknometer	
CHST102A	-	1.60	2.40	B	Brown SAND with rare fm angular gravel	2.70	small pyknometer	
TP102	-	0.60	1.00	B	Brown clayey gravelly silty SAND (gravel is fmc and angular to sub-angular)	2.67	small pyknometer	
TP104	-	0.30	0.60	B	Brown gravelly sandy silty CLAY with clinker fragments (gravel is fmc and angular to sub-rounded)	2.53	small pyknometer	
TP111	-	1.00	1.40	B	Brown slightly clayey slightly silty SAND	2.66	small pyknometer	

UKAS TESTING

Test Methods: BS1377: Part 2: 1990:
Particle Density: (gas jar) clause 8.2 (pyknometer) 8.
Density: (linear) clause 7.2 (immersion) clause 7.3

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Email: james@K4soils.com

Checked and Approved

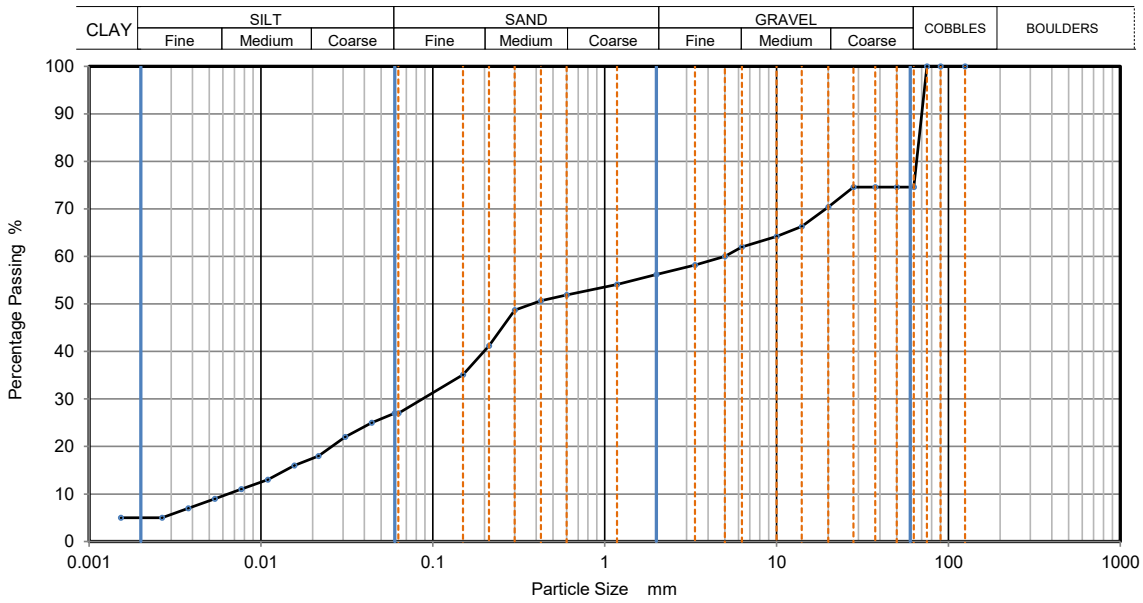
Initials **J.P**

Date: 30/08/2023

PARTICLE SIZE DISTRIBUTION

Site Name	Phoenix Wharf, Port Talbot			Job Ref	33610
				Borehole/Pit No.	BH101
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	0.50 m
Soil Description	Black clayey gravelly very silty SAND with occasional fmc and cobble sized brick, concrete and tarmac fragments (gravel is fmc and angular to sub-angular)			Depth Base	1.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	04/07/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0598	27
90	100	0.0441	25
75	100	0.0309	22
63	75	0.0216	18
50	75	0.0156	16
37.5	75	0.0110	13
28	75	0.0077	11
20	70	0.0054	9
14	66	0.0038	7
10	64	0.0027	5
6.3	62	0.0015	5
5	60		
3.35	58		
2	56		
1.18	54		
0.6	52	Particle density (assumed)	
0.425	51	2.70 Mg/m3	
0.3	49		
0.212	41		
0.15	35		
0.063	27		

Sample Proportions	% dry mass
Very coarse	25.40
Gravel	18.35
Sand	29.22
Silt	22.30
Clay	4.70

Grading Analysis		
D100	mm	
D60	mm	5.01
D30	mm	0.0866
D10	mm	0.00682
Uniformity Coefficient		730
Curvature Coefficient		0.22

Remarks

Preparation and testing in accordance with BS1377 unless noted below

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K4 Soils Laboratory

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Initials: **J.P**

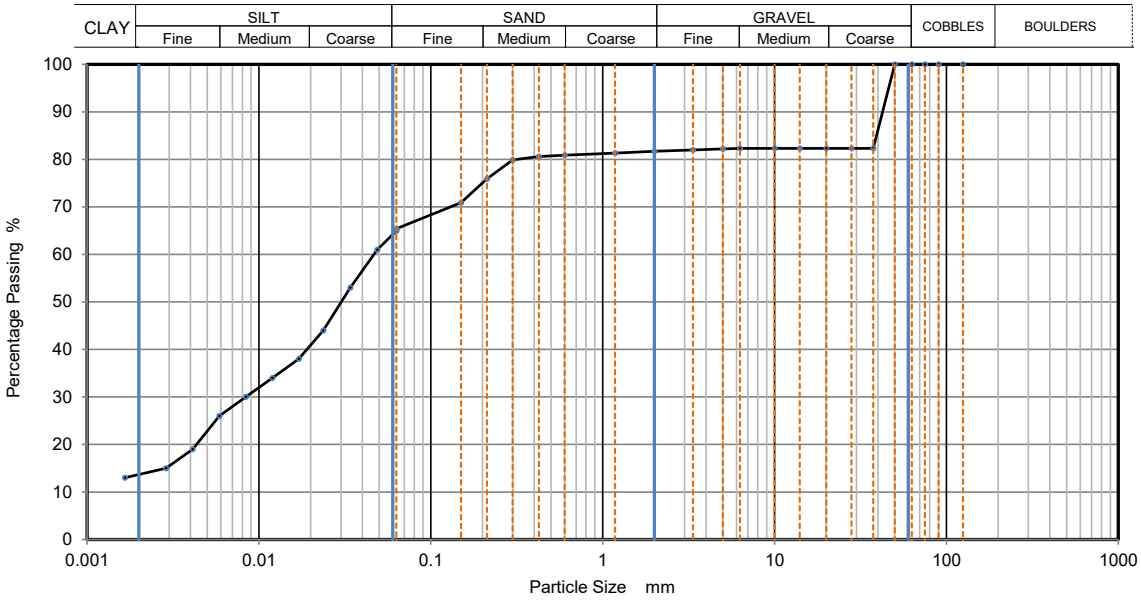
Date: 30/08/2023

2519 Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr) MSF-5-R3

PARTICLE SIZE DISTRIBUTION

Site Name	Phoenix Wharf, Port Talbot			Job Ref	33610
				Borehole/Pit No.	BH101
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	2.50 m
Soil Description	Bluish grey slightly sandy silty CLAY with rare coarse sub-angular gravel and traces of rootlets			Depth Base	3.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	05/07/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	65
90	100	0.0488	61
75	100	0.0340	53
63	100	0.0237	44
50	100	0.0171	38
37.5	82	0.0120	34
28	82	0.0084	30
20	82	0.0059	26
14	82	0.0041	19
10	82	0.0029	15
6.3	82	0.0017	13
5	82		
3.35	82		
2	82		
1.18	81		
0.6	81	Particle density (measured)	
0.425	81	2.63	Mg/m3
0.3	80		
0.212	76		
0.15	71		
0.063	65		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	18.35
Sand	16.26
Silt	51.70
Clay	13.70

Grading Analysis		
D100	mm	
D60	mm	0.0463
D30	mm	0.00857
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

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Date: 30/08/2023

UKAS TESTING

2519

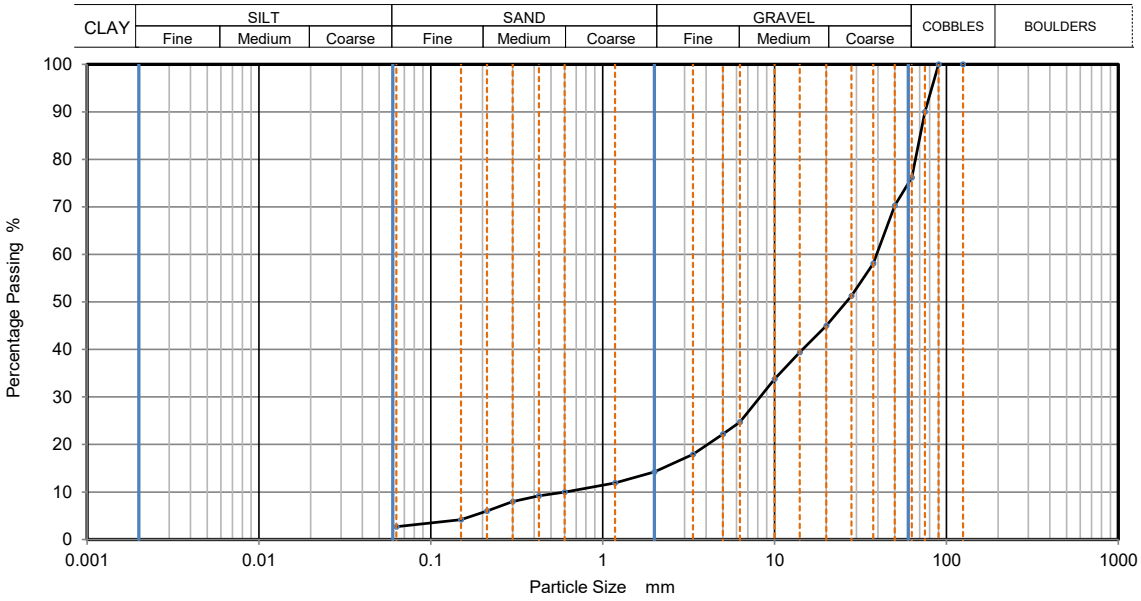
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R3

PARTICLE SIZE DISTRIBUTION

				Job Ref	33610
				Borehole/Pit No.	BH102
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	18.00 m
Soil Description	Grey sandy GRAVEL with numerous cobbles (gravel is fmc and angular to rounded)			Depth Base	18.50 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	11/07/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	90		
63	76		
50	70		
37.5	58		
28	51		
20	45		
14	39		
10	34		
6.3	25		
5	22		
3.35	18		
2	14		
1.18	12		
0.6	10		
0.425	9		
0.3	8		
0.212	6		
0.15	4		
0.063	3		

Sample Proportions	% dry mass
Very coarse	23.80
Gravel	62.05
Sand	11.50
Fines <0.063mm	2.68

Grading Analysis		
D100	mm	
D60	mm	39.2
D30	mm	8.26
D10	mm	0.604
Uniformity Coefficient		65
Curvature Coefficient		2.9

Remarks

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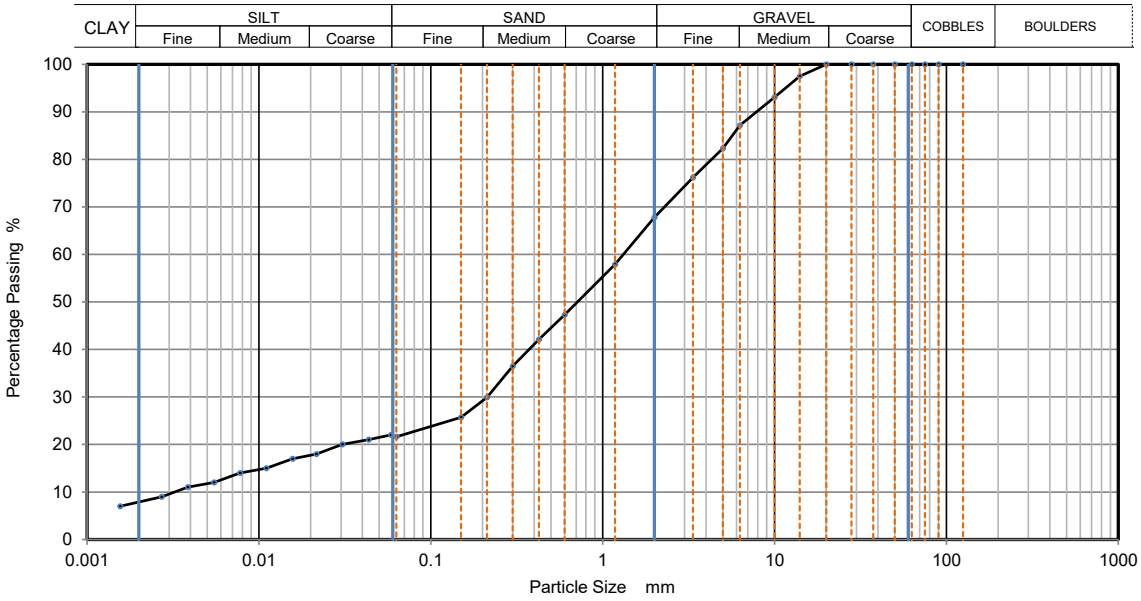
PARTICLE SIZE DISTRIBUTION

				Job Ref	33610
				Borehole/Pit No.	BH103
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	0.50 m
Soil Description	Dark greyish brown clayey silty very gravelly SAND with occasional roots (gravel is fmc and angular to sub-rounded)			Depth Base	1.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	04/07/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0585	22
90	100	0.0434	21
75	100	0.0306	20
63	100	0.0216	18
50	100	0.0157	17
37.5	100	0.0110	15
28	100	0.0078	14
20	100	0.0055	12
14	98	0.0039	11
10	93	0.0027	9
6.3	87	0.0016	7
5	82		
3.35	76		
2	68		
1.18	58		
0.6	47	Particle density (assumed)	
0.425	42	2.70	Mg/m3
0.3	37		
0.212	30		
0.15	26		
0.063	22		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	32.21
Sand	46.19
Silt	13.70
Clay	7.90

Grading Analysis		
D100	mm	
D60	mm	1.32
D30	mm	0.213
D10	mm	0.00333
Uniformity Coefficient		400
Curvature Coefficient		10

Remarks

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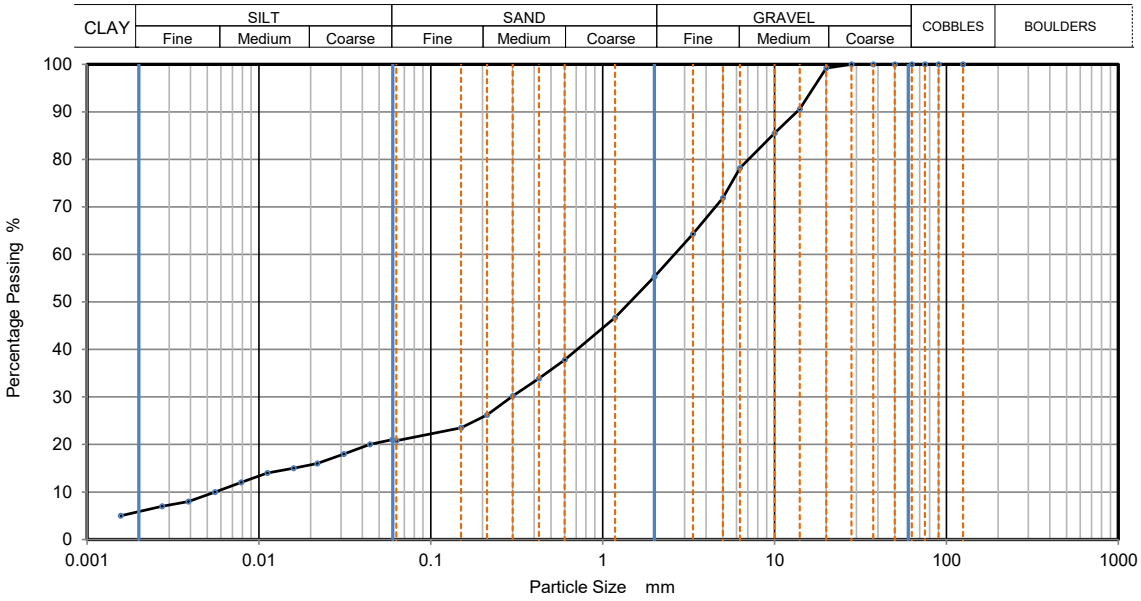
PARTICLE SIZE DISTRIBUTION

Site Name	Phoenix Wharf, Port Talbot			Job Ref	33610
				Borehole/Pit No.	BH103
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	1.50 m
Soil Description	Dark greyish brown clayey silty very sandy GRAVEL (gravel is fmc and sub-angular to sub-rounded)			Depth Base	2.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	04/07/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0597	21
90	100	0.0442	20
75	100	0.0311	18
63	100	0.0219	16
50	100	0.0159	15
37.5	100	0.0112	14
28	100	0.0079	12
20	99	0.0055	10
14	91	0.0039	8
10	86	0.0027	7
6.3	78	0.0016	5
5	72		
3.35	64		
2	55		
1.18	47		
0.6	38	Particle density (assumed)	
0.425	34	2.70 Mg/m3	
0.3	30		
0.212	26		
0.15	24		
0.063	21		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	44.68
Sand	34.54
Silt	14.80
Clay	6.00

Grading Analysis		
D100	mm	
D60	mm	2.61
D30	mm	0.296
D10	mm	0.00524
Uniformity Coefficient		500
Curvature Coefficient		6.4

Remarks

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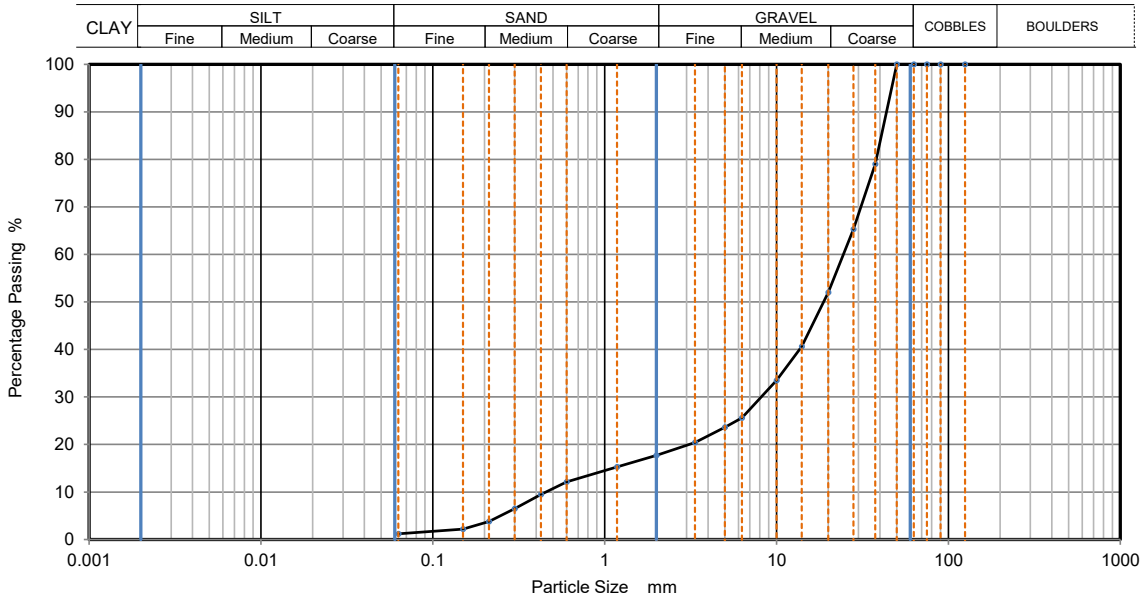
PARTICLE SIZE DISTRIBUTION

Site Name	Phoenix Wharf, Port Talbot			Job Ref	33610
				Borehole/Pit No.	BH103
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	19.50 m
Soil Description	Brownish grey sandy GRAVEL (gravel is fmc and sub-angular to rounded)			Depth Base	20.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	06/07/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	79		
28	65		
20	52		
14	41		
10	34		
6.3	26		
5	24		
3.35	20		
2	18		
1.18	15		
0.6	12		
0.425	10		
0.3	7		
0.212	4		
0.15	2		
0.063	1		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	82.30
Sand	16.53
Fines <0.063mm	1.17

Grading Analysis		
D100	mm	
D60	mm	24.5
D30	mm	8.15
D10	mm	0.456
Uniformity Coefficient		54
Curvature Coefficient		5.9

Remarks

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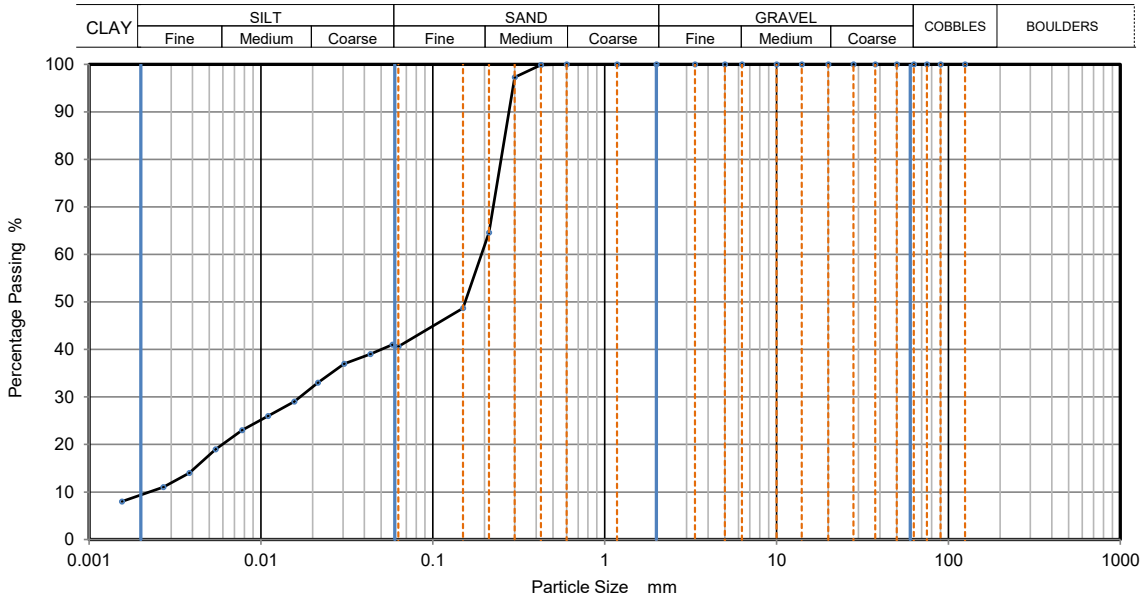
PARTICLE SIZE DISTRIBUTION

Site Name	Phoenix Wharf, Port Talbot			Job Ref	33610
				Borehole/Pit No.	BH104
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	6.00 m
Soil Description	Bluish grey and brown sandy silty CLAY			Depth Base	6.50 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	27/07/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0583	41
90	100	0.0433	39
75	100	0.0305	37
63	100	0.0215	33
50	100	0.0156	29
37.5	100	0.0110	26
28	100	0.0078	23
20	100	0.0054	19
14	100	0.0038	14
10	100	0.0027	11
6.3	100	0.0016	8
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density (measured)	
0.425	100	2.67 Mg/m3	
0.3	97		
0.212	65		
0.15	49		
0.063	41		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	0.00
Sand	59.40
Silt	31.00
Clay	9.60

Grading Analysis		
D100	mm	
D60	mm	0.192
D30	mm	0.0165
D10	mm	0.00213
Uniformity Coefficient		90
Curvature Coefficient		0.67

Remarks

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Date: 30/08/2023

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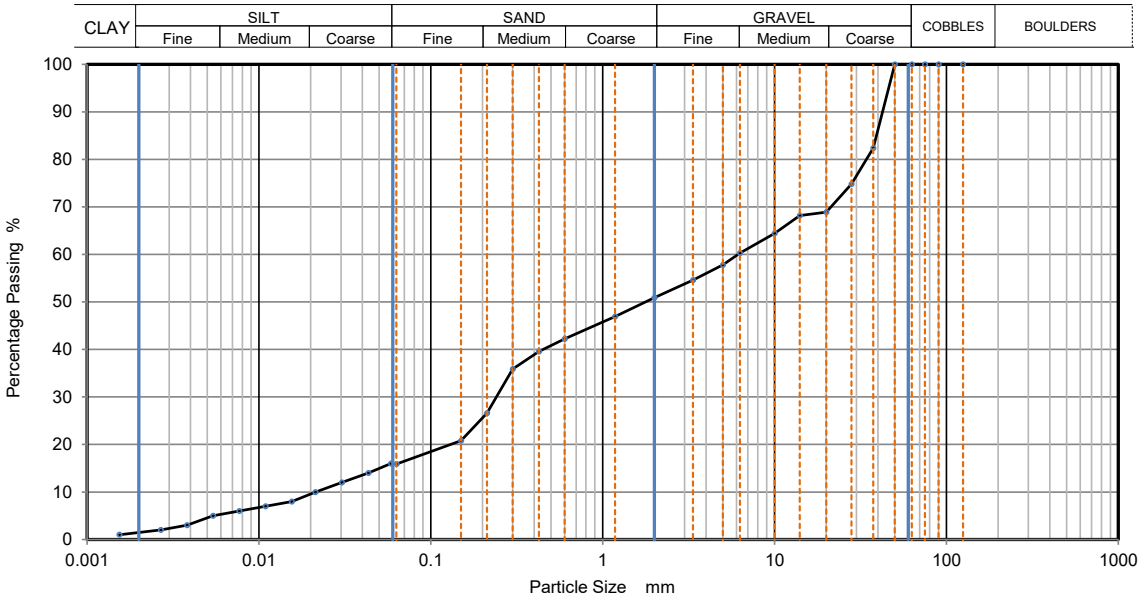
PARTICLE SIZE DISTRIBUTION

Site Name	Phoenix Wharf, Port Talbot			Job Ref	33610
				Borehole/Pit No.	BH105
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	0.00 m
Soil Description	Dark grey and black slightly clayey silty very sandy GRAVEL with numerous roots (gravel is fmc and sub-angular to sub-rounded)			Depth Base	0.30 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	04/07/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0585	16
90	100	0.0433	14
75	100	0.0304	12
63	100	0.0213	10
50	100	0.0155	8
37.5	82	0.0109	7
28	75	0.0077	6
20	69	0.0054	5
14	68	0.0038	3
10	64	0.0027	2
6.3	60	0.0015	1
5	58		
3.35	55		
2	51		
1.18	47		
0.6	42	Particle density (assumed)	
0.425	40	2.70 Mg/m3	
0.3	36		
0.212	27		
0.15	21		
0.063	16		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	49.07
Sand	35.03
Silt	14.80
Clay	1.10

Grading Analysis		
D100	mm	
D60	mm	6.14
D30	mm	0.241
D10	mm	0.0226
Uniformity Coefficient		270
Curvature Coefficient		0.42

Remarks

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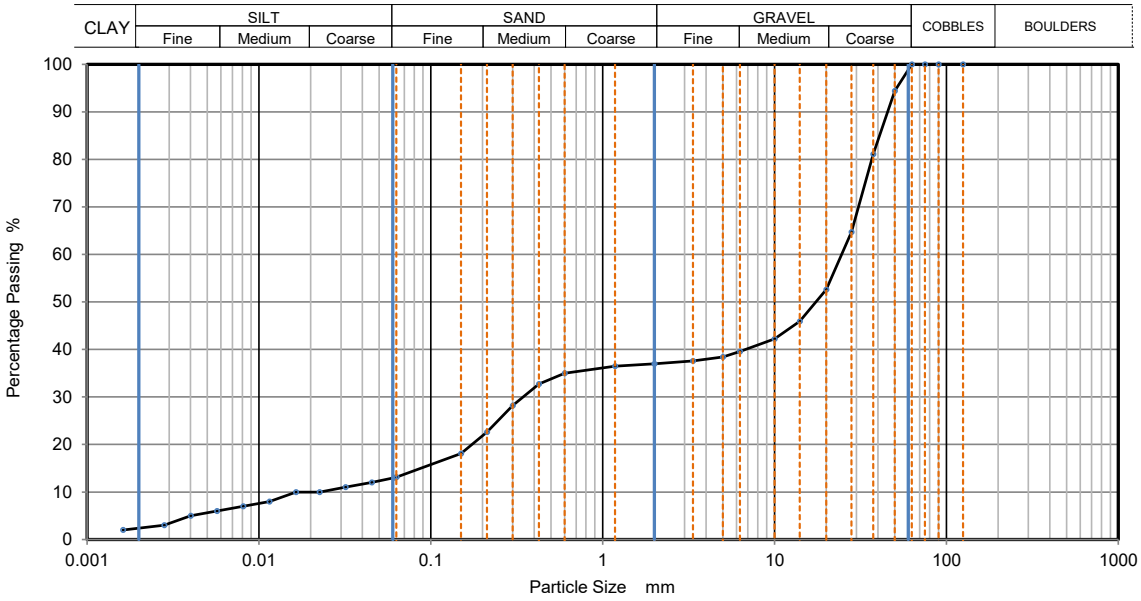
Date: 30/08/2023

2519 Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr) MSF-5-R3

PARTICLE SIZE DISTRIBUTION

Site Name	Phoenix Wharf, Port Talbot			Job Ref	33610
				Borehole/Pit No.	BH105
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	13.50 m
Soil Description	Grey slightly clayey silty very sandy GRAVEL (gravel is fmc and sub-angular to rounded)			Depth Base	17.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	13/07/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0612	13
90	100	0.0453	12
75	100	0.0319	11
63	100	0.0225	10
50	94	0.0164	10
37.5	81	0.0115	8
28	65	0.0081	7
20	53	0.0057	6
14	46	0.0040	5
10	42	0.0028	3
6.3	40	0.0016	2
5	38		
3.35	38		
2	37		
1.18	37		
0.6	35	Particle density (measured)	
0.425	33	2.65 Mg/m3	
0.3	28		
0.212	23		
0.15	18		
0.063	13		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	63.05
Sand	23.87
Silt	10.50
Clay	2.60

Grading Analysis		
D100	mm	
D60	mm	24.6
D30	mm	0.344
D10	mm	0.0204
Uniformity Coefficient		1200
Curvature Coefficient		0.24

Remarks

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Initials: **J.P**

Date: 30/08/2023

UKAS TESTING

2519

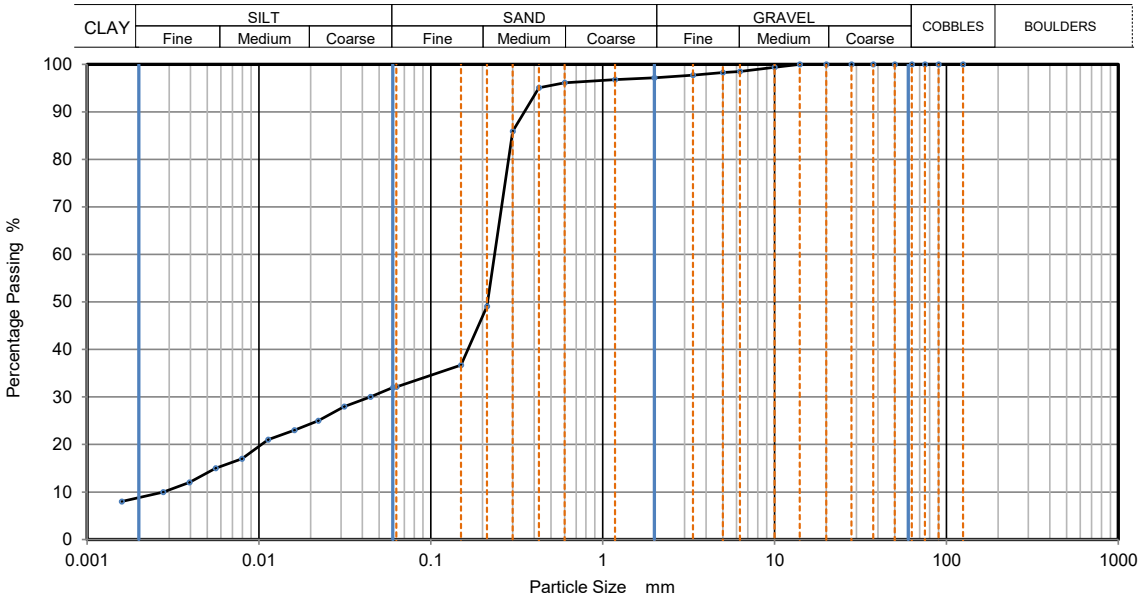
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R3

PARTICLE SIZE DISTRIBUTION

Site Name	Phoenix Wharf, Port Talbot			Job Ref	33610
				Borehole/Pit No.	BH106
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	4.00 m
Soil Description	Dark grey slightly gravelly clayey very silty SAND (gravel is fm and sub-angular)			Depth Base	- m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	04/07/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0602	32
90	100	0.0446	30
75	100	0.0314	28
63	100	0.0221	25
50	100	0.0161	23
37.5	100	0.0113	21
28	100	0.0079	17
20	100	0.0056	15
14	100	0.0039	12
10	99	0.0028	10
6.3	99	0.0016	8
5	98		
3.35	98		
2	97		
1.18	97		
0.6	96	Particle density (assumed)	
0.425	95	2.70 Mg/m3	
0.3	86		
0.212	49		
0.15	37		
0.063	32		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	2.79
Sand	65.13
Silt	23.60
Clay	8.50

Grading Analysis		
D100	mm	
D60	mm	0.235
D30	mm	0.0454
D10	mm	0.00285
Uniformity Coefficient		82
Curvature Coefficient		3.1

Remarks

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K4 Soils Laboratory

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Checked and Approved

Initials: **J.P**

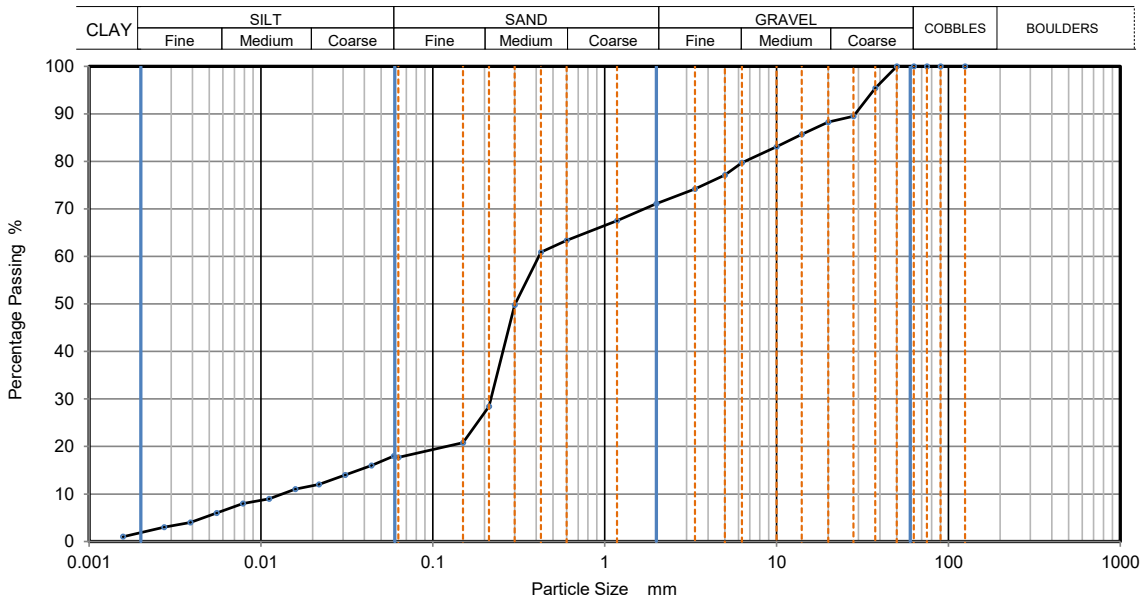
Date: 30/08/2023

2519 Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr) MSF-5-R3

PARTICLE SIZE DISTRIBUTION

Site Name	Phoenix Wharf, Port Talbot			Job Ref	33610
				Borehole/Pit No.	BH107
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	0.50 m
Soil Description	Black slightly clayey silty very gravelly SAND with fmc brick and tarmac fragments (gravel is fmc and sub-angular to sub-rounded)			Depth Base	1.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	04/07/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0593	18
90	100	0.0439	16
75	100	0.0309	14
63	100	0.0217	12
50	100	0.0158	11
37.5	95	0.0111	9
28	90	0.0078	8
20	88	0.0055	6
14	86	0.0039	4
10	83	0.0027	3
6.3	80	0.0016	1
5	77		
3.35	74		
2	71		
1.18	68		
0.6	63	Particle density (assumed)	
0.425	61	2.70	Mg/m3
0.3	50		
0.212	28		
0.15	21		
0.063	18		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	28.92
Sand	53.42
Silt	15.80
Clay	1.90

Grading Analysis		
D100	mm	
D60	mm	0.413
D30	mm	0.218
D10	mm	0.0128
Uniformity Coefficient		32
Curvature Coefficient		9

Remarks

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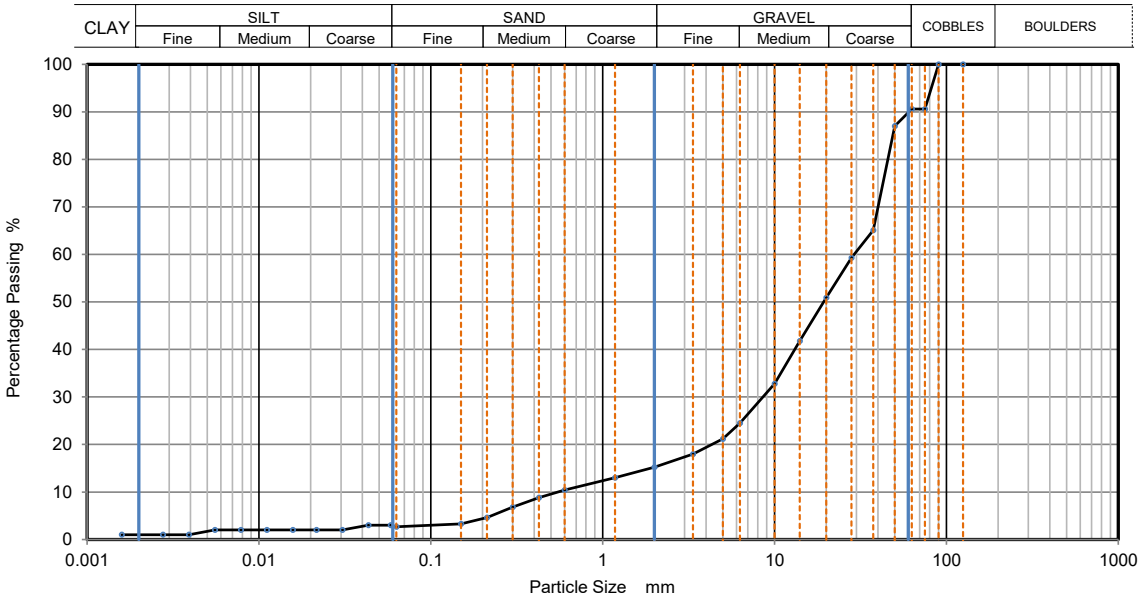
PARTICLE SIZE DISTRIBUTION

Site Name	Phoenix Wharf, Port Talbot			Job Ref	33610
				Borehole/Pit No.	BH107
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	16.50 m
Soil Description	Grey slightly clayey slightly silty sandy GRAVEL with rare cobbles (gravel is fmc and sub-rounded to rounded)			Depth Base	17.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	18/08/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0584	3
90	100	0.0433	3
75	91	0.0306	2
63	91	0.0216	2
50	87	0.0157	2
37.5	65	0.0111	2
28	59	0.0079	2
20	51	0.0055	2
14	42	0.0039	1
10	33	0.0028	1
6.3	25	0.0016	1
5	21		
3.35	18		
2	15		
1.18	13		
0.6	10	Particle density (assumed)	
0.425	9	2.70	Mg/m3
0.3	7		
0.212	5		
0.15	3		
0.063	3		

Sample Proportions	% dry mass
Very coarse	9.40
Gravel	75.41
Sand	12.53
Silt	1.70
Clay	1.00

Grading Analysis		
D100	mm	
D60	mm	29
D30	mm	8.56
D10	mm	0.553
Uniformity Coefficient		52
Curvature Coefficient		4.6

Remarks

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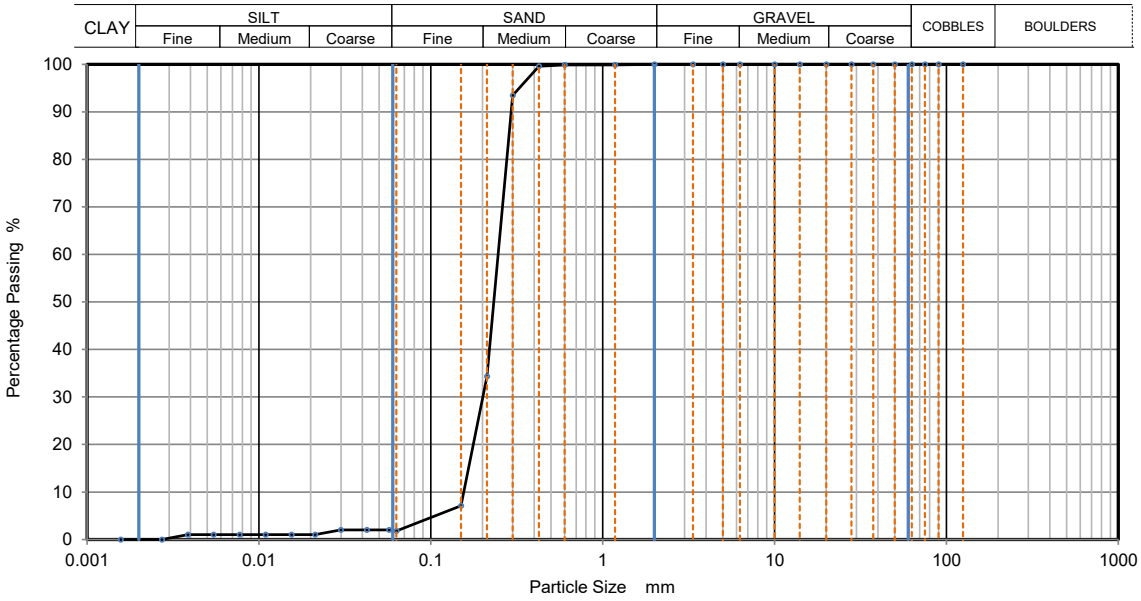
PARTICLE SIZE DISTRIBUTION

Site Name	Phoenix Wharf, Port Talbot			Job Ref	33610
				Borehole/Pit No.	BH109
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	2.50 m
Soil Description	Greyish brown slightly silty fm SAND			Depth Base	3.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	07/07/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0571	2
90	100	0.0425	2
75	100	0.0300	2
63	100	0.0212	1
50	100	0.0155	1
37.5	100	0.0109	1
28	100	0.0077	1
20	100	0.0055	1
14	100	0.0039	1
10	100	0.0027	0
6.3	100	0.0016	0
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density (assumed)	
0.425	100	2.70 Mg/m3	
0.3	94		
0.212	34		
0.15	7		
0.063	2		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	0.00
Sand	98.17
Silt	1.40
Clay	0.40

Grading Analysis		
D100	mm	
D60	mm	0.246
D30	mm	0.201
D10	mm	0.156
Uniformity Coefficient		1.6
Curvature Coefficient		1.1

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Date: 30/08/2023

UKAS TESTING

2519

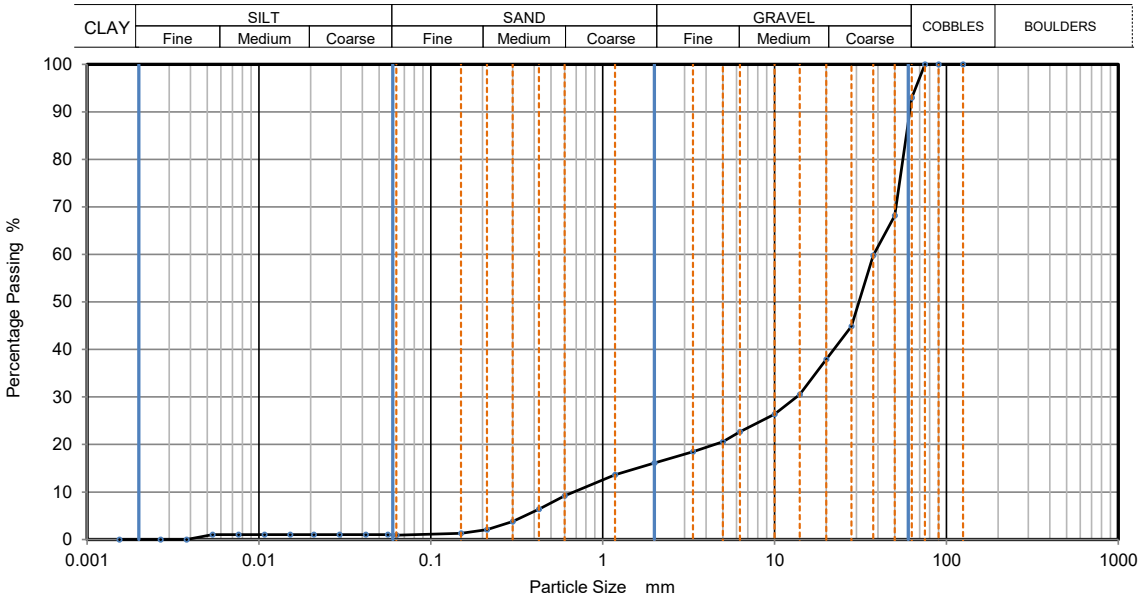
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R3

PARTICLE SIZE DISTRIBUTION

Site Name	Phoenix Wharf, Port Talbot			Job Ref	33610
				Borehole/Pit No.	BH110
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	18.00 m
Soil Description	Brownish grey slightly clayey slightly silty sandy GRAVEL with rare cobbles (gravel is fmc and sub-rounded to rounded)			Depth Base	19.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	06/07/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0561	1
90	100	0.0417	1
75	100	0.0294	1
63	93	0.0208	1
50	68	0.0152	1
37.5	60	0.0107	1
28	45	0.0076	1
20	38	0.0054	1
14	31	0.0038	0
10	26	0.0027	0
6.3	23	0.0015	0
5	21		
3.35	19		
2	16		
1.18	14		
0.6	9	Particle density (assumed)	
0.425	6	2.70 Mg/m3	
0.3	4		
0.212	2		
0.15	1		
0.063	1		

Sample Proportions	% dry mass
Very coarse	7.00
Gravel	76.84
Sand	15.21
Silt	0.70
Clay	0.20

Grading Analysis		
D100	mm	
D60	mm	37.8
D30	mm	13.4
D10	mm	0.677
Uniformity Coefficient		56
Curvature Coefficient		7

Remarks

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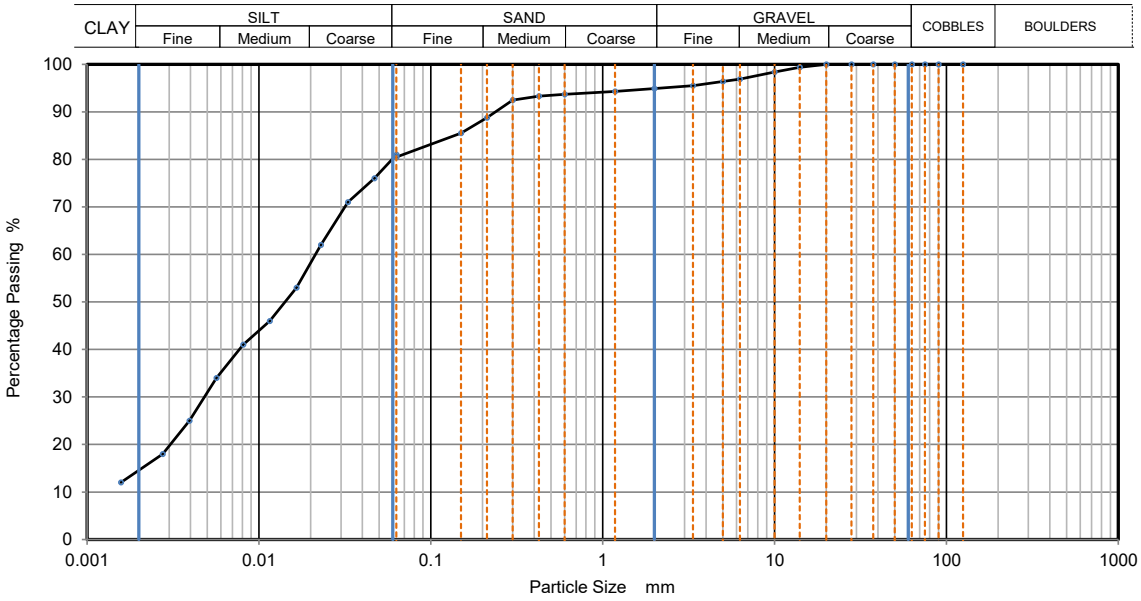
PARTICLE SIZE DISTRIBUTION

Site Name	Phoenix Wharf, Port Talbot			Job Ref	33610
				Borehole/Pit No.	BH111
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	3.50 m
Soil Description	Grey and dark grey slightly gravelly slightly sandy organic silty CLAY with occasional wood fragments and roots (gravel is fm and angular to sub-angular)			Depth Base	4.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	12/07/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	81
90	100	0.0469	76
75	100	0.0329	71
63	100	0.0230	62
50	100	0.0165	53
37.5	100	0.0116	46
28	100	0.0081	41
20	100	0.0057	34
14	99	0.0039	25
10	98	0.0028	18
6.3	97	0.0016	12
5	96		
3.35	96		
2	95		
1.18	94		
0.6	94	Particle density (assumed)	
0.425	93	2.70 Mg/m3	
0.3	93		
0.212	89		
0.15	86		
0.063	81		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	5.13
Sand	14.33
Silt	66.30
Clay	14.20

Grading Analysis		
D100	mm	
D60	mm	0.0215
D30	mm	0.00485
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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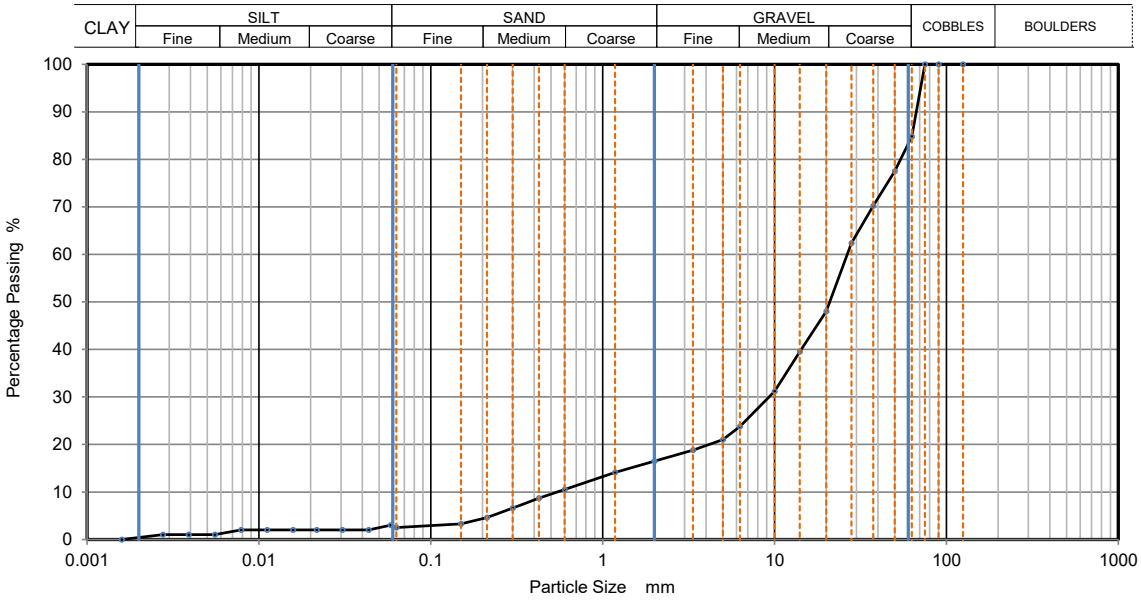
Date: 30/08/2023

PARTICLE SIZE DISTRIBUTION

Site Name	Phoenix Wharf, Port Talbot			Job Ref	33610
				Borehole/Pit No.	BH111
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	13.50 m
Soil Description	Grey slightly silty sandy GRAVEL with occasional cobbles (gravel is sub-angular to sub-rounded)			Depth Base	15.50 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	22/08/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0585	3
90	100	0.0434	2
75	100	0.0306	2
63	85	0.0216	2
50	78	0.0158	2
37.5	70	0.0111	2
28	62	0.0079	2
20	48	0.0055	1
14	40	0.0039	1
10	31	0.0028	1
6.3	24	0.0016	0
5	21		
3.35	19		
2	17		
1.18	14		
0.6	11	Particle density (assumed)	
0.425	9	2.70	Mg/m3
0.3	7		
0.212	5		
0.15	3		
0.063	3		

Sample Proportions	% dry mass
Very coarse	15.20
Gravel	68.36
Sand	13.94
Silt	2.00
Clay	0.50

Grading Analysis		
D100	mm	
D60	mm	26.4
D30	mm	9.26
D10	mm	0.548
Uniformity Coefficient		48
Curvature Coefficient		5.9

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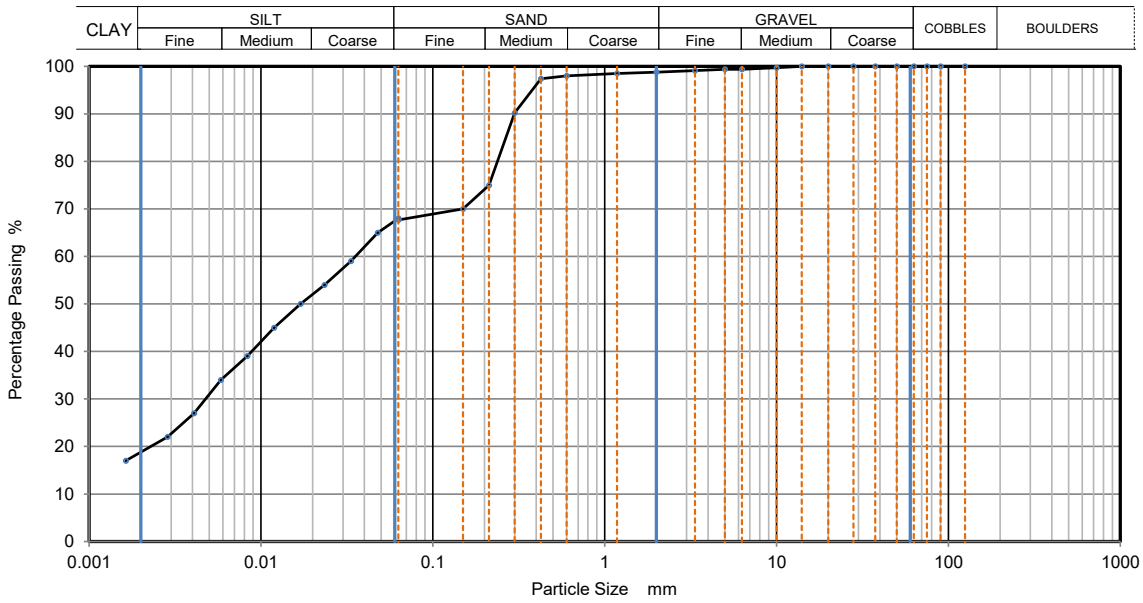
PARTICLE SIZE DISTRIBUTION

Site Name	Phoenix Wharf, Port Talbot			Job Ref	33610
				Borehole/Pit No.	BH112
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	3.00 m
Soil Description	Grey slightly sandy silty CLAY with rare fine gravel			Depth Base	3.50 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	04/07/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	68
90	100	0.0477	65
75	100	0.0334	59
63	100	0.0234	54
50	100	0.0170	50
37.5	100	0.0119	45
28	100	0.0083	39
20	100	0.0058	34
14	100	0.0041	27
10	100	0.0029	22
6.3	99	0.0016	17
5	99		
3.35	99		
2	99		
1.18	99		
0.6	98	Particle density (assumed)	
0.425	97	2.70 Mg/m3	
0.3	90		
0.212	75		
0.15	70		
0.063	68		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	1.18
Sand	31.12
Silt	48.70
Clay	19.00

Grading Analysis		
D100	mm	
D60	mm	0.0357
D30	mm	0.0047
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

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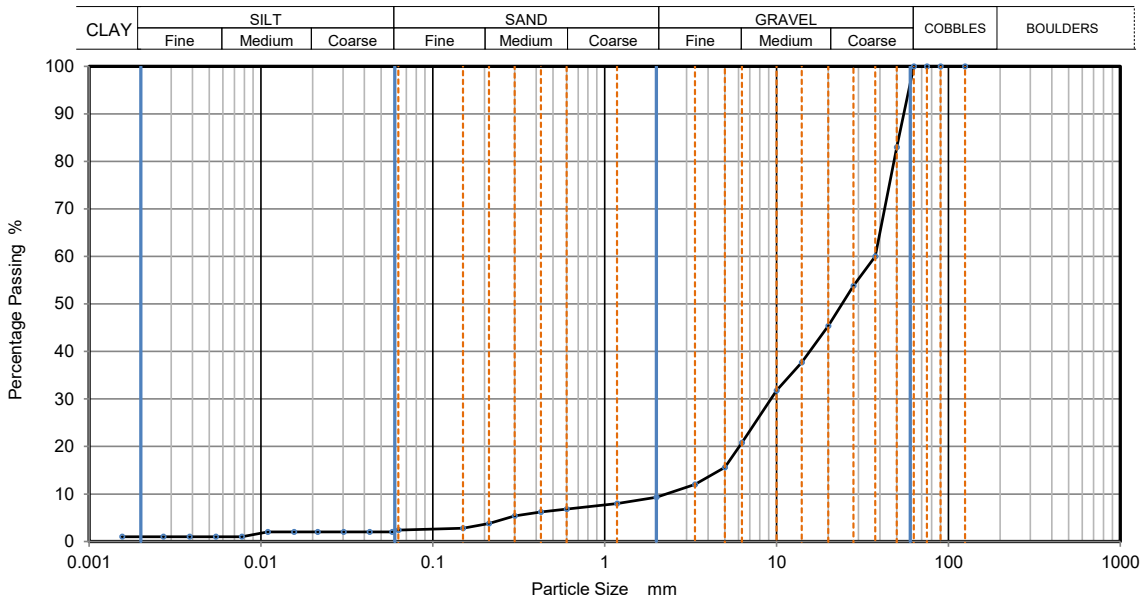
PARTICLE SIZE DISTRIBUTION

Site Name	Phoenix Wharf, Port Talbot			Job Ref	33610
				Borehole/Pit No.	BH113
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	13.50 m
Soil Description	Grey slightly silty sandy GRAVEL (gravel is fmc and sub-rounded to rounded)			Depth Base	14.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	18/08/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0579	2
90	100	0.0429	2
75	100	0.0303	2
63	100	0.0213	2
50	83	0.0156	2
37.5	60	0.0110	2
28	54	0.0077	1
20	45	0.0055	1
14	38	0.0038	1
10	32	0.0027	1
6.3	21	0.0016	1
5	16		
3.35	12		
2	9		
1.18	8		
0.6	7	Particle density (assumed)	
0.425	6	2.70 Mg/m3	
0.3	5		
0.212	4		
0.15	3		
0.063	2		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	90.68
Sand	6.90
Silt	1.70
Clay	0.70

Grading Analysis		
D100	mm	
D60	mm	37.5
D30	mm	9.26
D10	mm	2.28
Uniformity Coefficient		16
Curvature Coefficient		1

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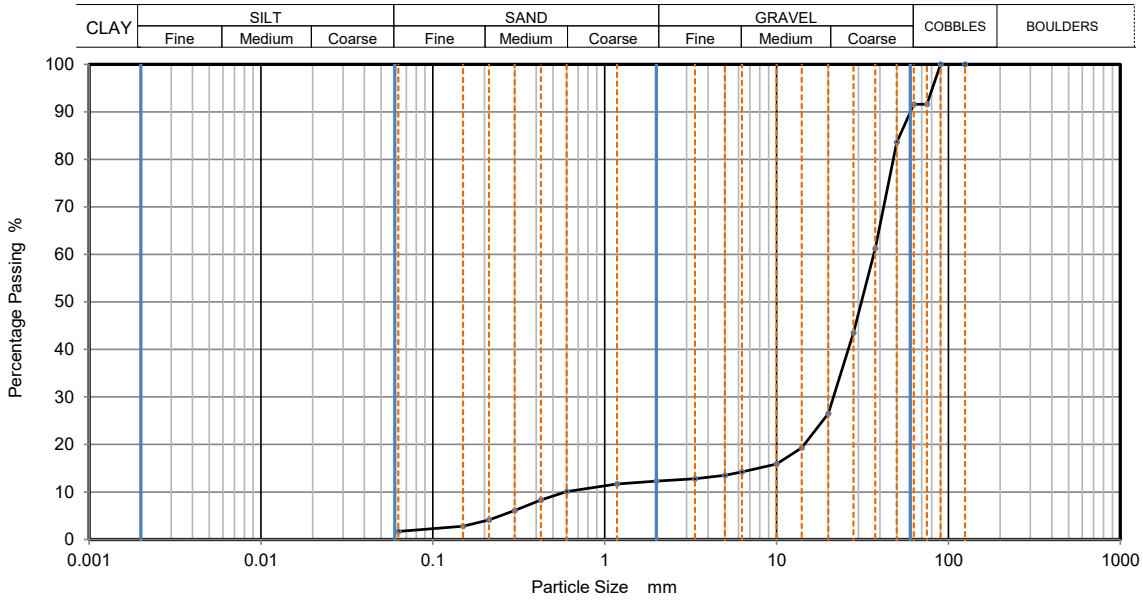
PARTICLE SIZE DISTRIBUTION

Site Name	Phoenix Wharf, Port Talbot			Job Ref	33610
				Borehole/Pit No.	BH114
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	11.50 m
Soil Description	Brown slightly clayey sandy GRAVEL with rare cobbles (gravel is fmc and sub-angular to rounded)			Depth Base	15.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	13/07/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	92		
63	92		
50	84		
37.5	61		
28	44		
20	27		
14	19		
10	16		
6.3	14		
5	14		
3.35	13		
2	12		
1.18	12		
0.6	10		
0.425	8		
0.3	6		
0.212	4		
0.15	3		
0.063	2		

Sample Proportions	% dry mass
Very coarse	8.40
Gravel	79.30
Sand	10.65
Fines <0.063mm	1.68

Grading Analysis		
D100	mm	
D60	mm	36.8
D30	mm	21.5
D10	mm	0.592
Uniformity Coefficient		62
Curvature Coefficient		21

Remarks

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K4 Soils Laboratory

Unit 8, Olds Close, Watford, Herts, WD18 9RU

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Tel: 01923 711288

Checked and Approved

Initials: **J.P**

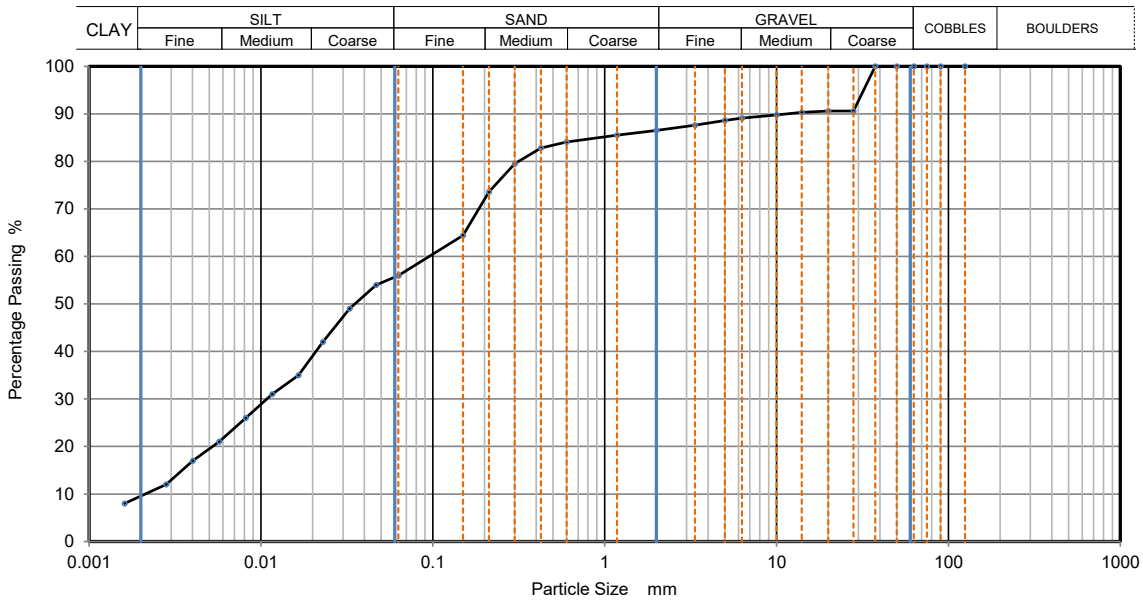
Date: 30/08/2023

2519 Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr) MSF-5-R3

PARTICLE SIZE DISTRIBUTION

Site Name	Phoenix Wharf, Port Talbot			Job Ref	33610
				Borehole/Pit No.	BH115
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	5.00 m
Soil Description	Dark grey and brown slightly gravelly slightly sandy organic silty CLAY with occasional roots and rootlets (gravel is fmc and sub-angular)			Depth Base	6.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	05/07/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	56
90	100	0.0468	54
75	100	0.0328	49
63	100	0.0229	42
50	100	0.0166	35
37.5	100	0.0116	31
28	91	0.0081	26
20	91	0.0057	21
14	90	0.0040	17
10	90	0.0028	12
6.3	89	0.0016	8
5	89		
3.35	88		
2	87		
1.18	86		
0.6	84	Particle density (assumed)	
0.425	83	2.70 Mg/m3	
0.3	80		
0.212	74		
0.15	64		
0.063	56		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	13.47
Sand	30.53
Silt	46.20
Clay	9.80

Grading Analysis		
D100	mm	
D60	mm	0.0953
D30	mm	0.0111
D10	mm	0.00207
Uniformity Coefficient		46
Curvature Coefficient		0.63

Remarks

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UKAS TESTING

2519

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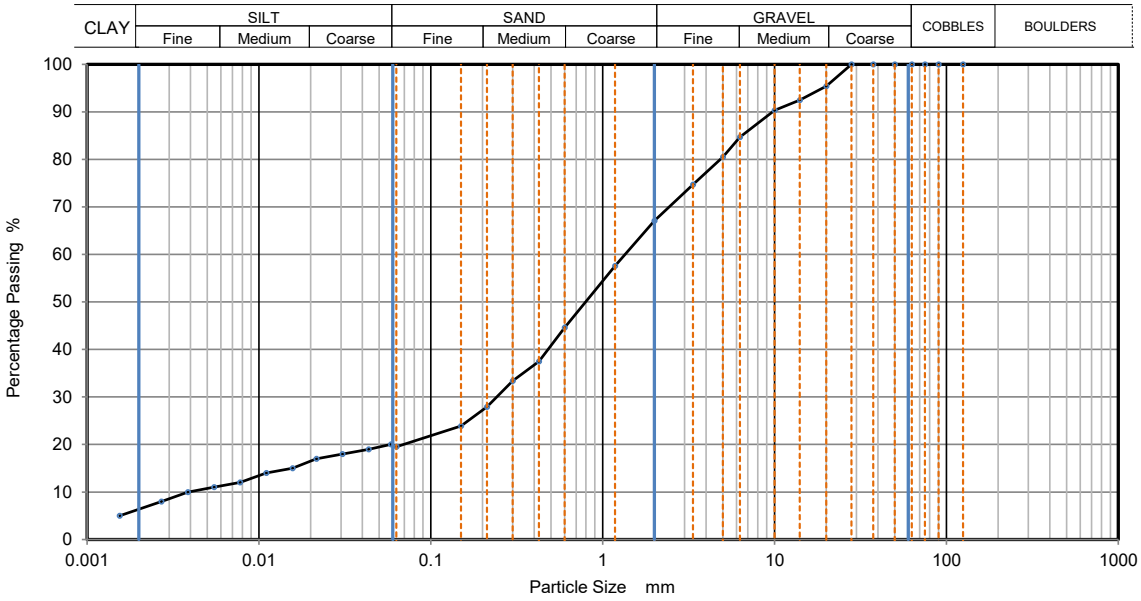
MSF-5-R3

PARTICLE SIZE DISTRIBUTION

				Job Ref	33610
				Borehole/Pit No.	BH116
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	0.50 m
Soil Description	Dark grey clayey silty very gravelly SAND (gravel is fmc and angular to sub-angular)			Depth Base	1.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	07/07/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0585	20
90	100	0.0434	19
75	100	0.0306	18
63	100	0.0216	17
50	100	0.0157	15
37.5	100	0.0110	14
28	100	0.0078	12
20	95	0.0055	11
14	93	0.0039	10
10	90	0.0027	8
6.3	85	0.0015	5
5	81		
3.35	75		
2	67		
1.18	58		
0.6	45	Particle density (assumed)	
0.425	38	2.70	Mg/m3
0.3	33		
0.212	28		
0.15	24		
0.063	20		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	32.88
Sand	47.65
Silt	13.40
Clay	6.10

Grading Analysis		
D100	mm	
D60	mm	1.35
D30	mm	0.242
D10	mm	0.00424
Uniformity Coefficient		320
Curvature Coefficient		10

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PARTICLE SIZE DISTRIBUTION

				Job Ref	33610
				Borehole/Pit No.	BH116
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	15.00 m
Soil Description	Grey slightly silty slightly clayey sandy GRAVEL with occasional cobbles (gravel is fmc and sub-angular to rounded)			Depth Base	15.50 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	05/07/2023

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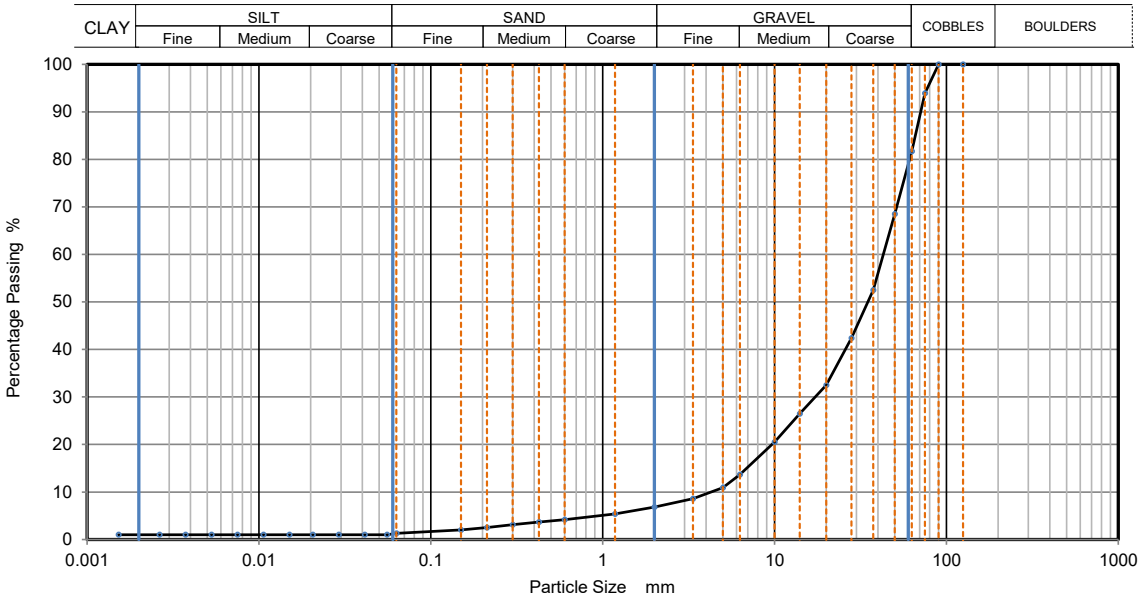

Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0555	1
90	100	0.0412	1
75	94	0.0291	1
63	82	0.0206	1
50	69	0.0150	1
37.5	53	0.0106	1
28	42	0.0075	1
20	33	0.0053	1
14	27	0.0037	1
10	21	0.0026	1
6.3	14	0.0015	1
5	11		
3.35	9		
2	7		
1.18	5		
0.6	4	Particle density (assumed)	
0.425	4	2.70	Mg/m3
0.3	3		
0.212	3		
0.15	2		
0.063	1		

Sample Proportions	% dry mass
Very coarse	18.30
Gravel	74.88
Sand	5.55
Silt	0.50
Clay	0.80

Grading Analysis		
D100	mm	
D60	mm	42.9
D30	mm	17.2
D10	mm	4.29
Uniformity Coefficient		10
Curvature Coefficient		1.6

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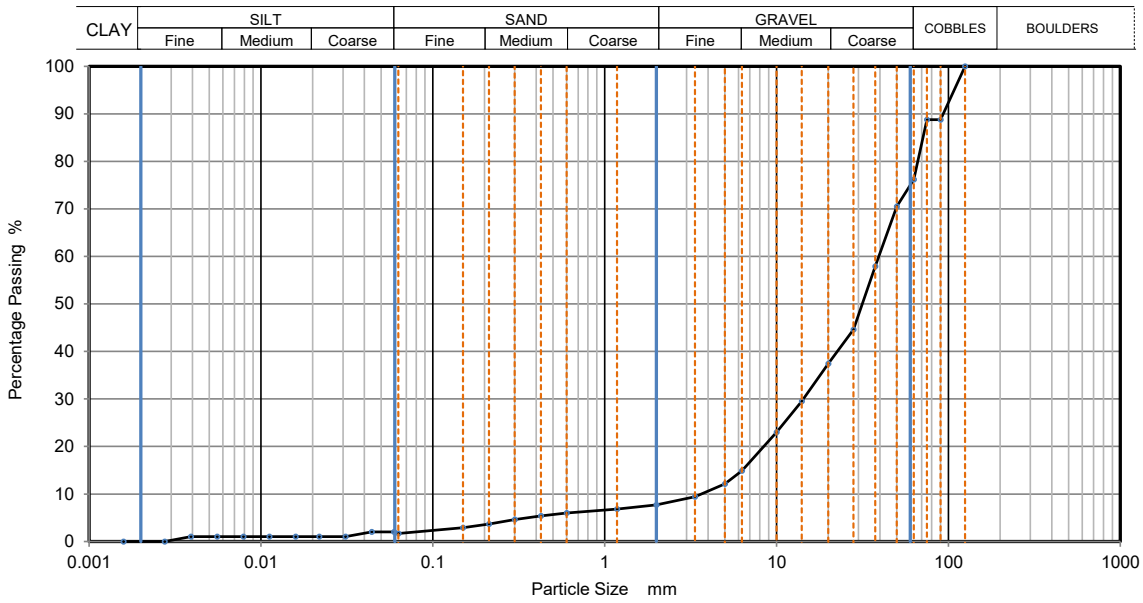
PARTICLE SIZE DISTRIBUTION

Site Name	Phoenix Wharf, Port Talbot			Job Ref	33610
				Borehole/Pit No.	BH120
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	13.50 m
Soil Description	Grey slightly clayey slightly silty sandy GRAVEL with numerous cobbles (gravel is fmc and sub-angular to rounded)			Depth Base	14.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	05/07/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0594	2
90	89	0.0440	2
75	89	0.0310	1
63	76	0.0218	1
50	71	0.0159	1
37.5	58	0.0112	1
28	45	0.0079	1
20	37	0.0056	1
14	30	0.0039	1
10	23	0.0028	0
6.3	15	0.0016	0
5	12		
3.35	9		
2	8		
1.18	7		
0.6	6	Particle density (assumed)	
0.425	5	2.70 Mg/m3	
0.3	5		
0.212	4		
0.15	3		
0.063	2		

Sample Proportions	% dry mass
Very coarse	23.80
Gravel	68.48
Sand	6.00
Silt	1.30
Clay	0.40

Grading Analysis		
D100	mm	125
D60	mm	39.3
D30	mm	14.3
D10	mm	3.65
Uniformity Coefficient		11
Curvature Coefficient		1.4

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PARTICLE SIZE DISTRIBUTION

Site Name	Phoenix Wharf, Port Talbot			Job Ref	33610
				Borehole/Pit No.	BH120
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	16.50 m
Soil Description	Grey slightly clayey sandy GRAVEL with occasional cobbles (gravel is fmc and sub-angular to rounded)			Depth Base	17.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	14/08/2023

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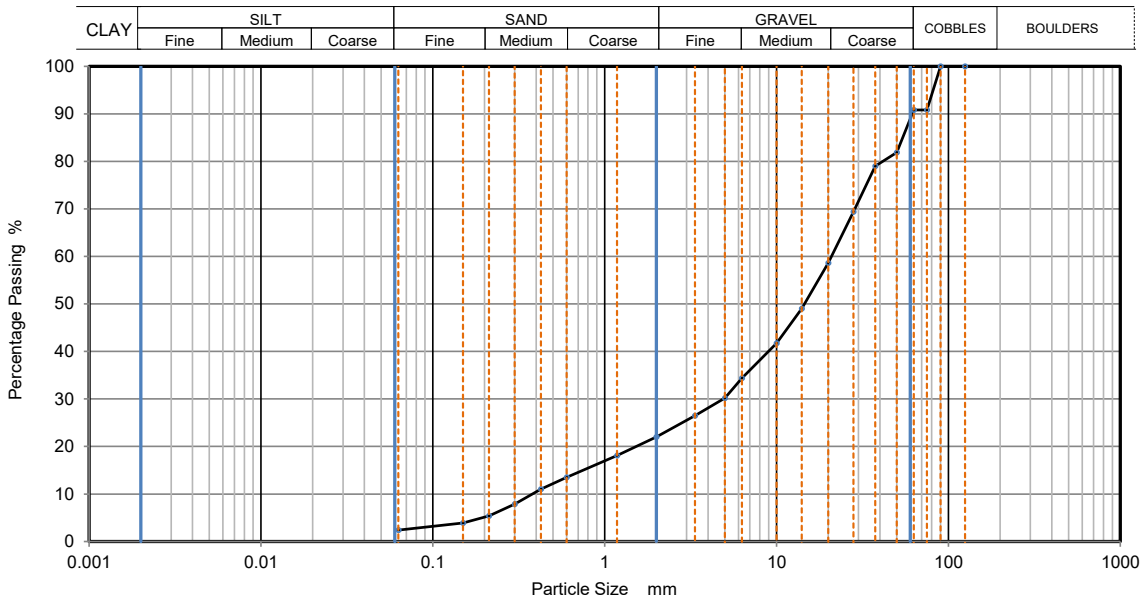

Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	91		
63	91		
50	82		
37.5	79		
28	69		
20	59		
14	49		
10	42		
6.3	34		
5	30		
3.35	27		
2	22		
1.18	18		
0.6	14		
0.425	11		
0.3	8		
0.212	5		
0.15	4		
0.063	2		

Sample Proportions	% dry mass
Very coarse	9.20
Gravel	68.77
Sand	19.61
Fines <0.063mm	2.40

Grading Analysis		
D100	mm	
D60	mm	20.9
D30	mm	4.91
D10	mm	0.381
Uniformity Coefficient		55
Curvature Coefficient		3

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UKAS TESTING

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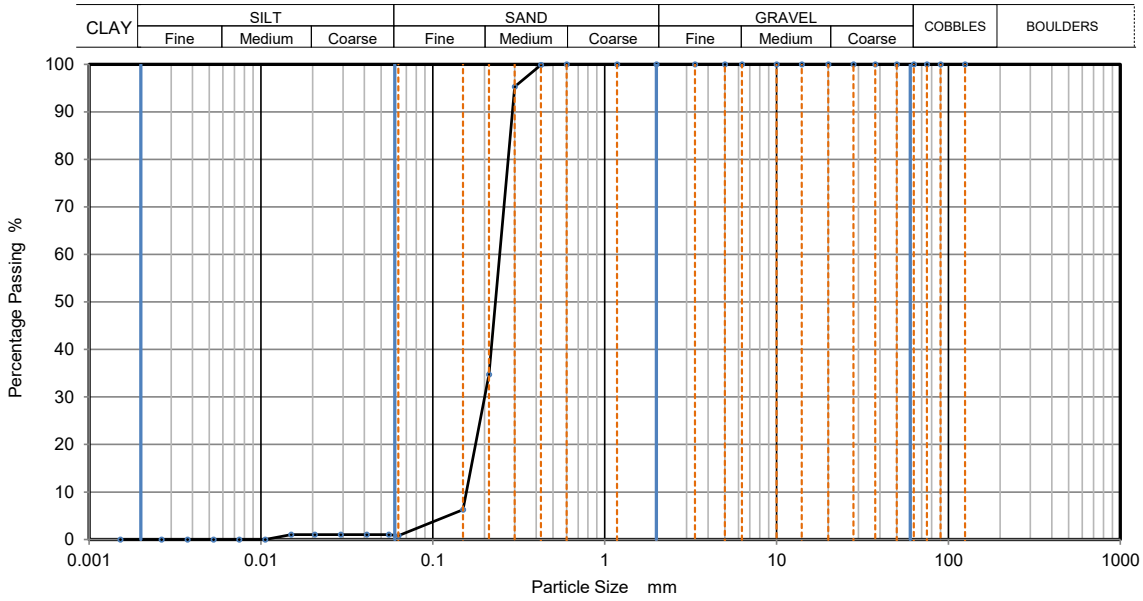
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R3

PARTICLE SIZE DISTRIBUTION

Site Name	Phoenix Wharf, Port Talbot			Job Ref	33610
				Borehole/Pit No.	CHST102A
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	1.60 m
Soil Description	Brown SAND with rare fm angular gravel			Depth Base	2.40 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	25/07/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0554	1
90	100	0.0412	1
75	100	0.0291	1
63	100	0.0205	1
50	100	0.0150	1
37.5	100	0.0106	0
28	100	0.0075	0
20	100	0.0053	0
14	100	0.0037	0
10	100	0.0026	0
6.3	100	0.0015	0
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density (measured)	
0.425	100	2.71	Mg/m3
0.3	95		
0.212	35		
0.15	6		
0.063	1		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	0.00
Sand	99.19
Silt	0.60
Clay	0.20

Grading Analysis		
D100	mm	
D60	mm	0.245
D30	mm	0.2
D10	mm	0.157
Uniformity Coefficient		1.6
Curvature Coefficient		1

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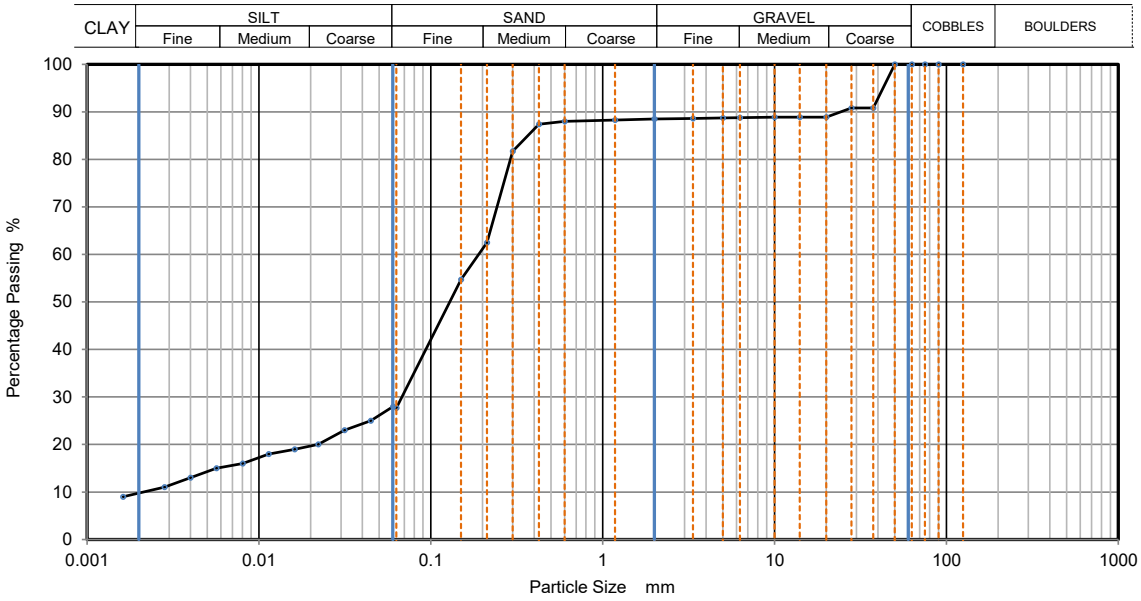
PARTICLE SIZE DISTRIBUTION

				Job Ref	33610
				Borehole/Pit No.	TP102
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	0.60 m
Soil Description	Brown clayey gravelly silty SAND (gravel is fmc and angular to sub-angular)			Depth Base	1.00 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	04/07/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0604	28
90	100	0.0447	25
75	100	0.0315	23
63	100	0.0222	20
50	100	0.0162	19
37.5	91	0.0114	18
28	91	0.0080	16
20	89	0.0057	15
14	89	0.0040	13
10	89	0.0028	11
6.3	89	0.0016	9
5	89		
3.35	89		
2	89		
1.18	88		
0.6	88	Particle density (measured)	
0.425	87	2.67 Mg/m3	
0.3	82		
0.212	63		
0.15	55		
0.063	28		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	11.48
Sand	60.77
Silt	17.60
Clay	10.20

Grading Analysis		
D100	mm	
D60	mm	0.19
D30	mm	0.0677
D10	mm	0.00192
Uniformity Coefficient		99
Curvature Coefficient		13

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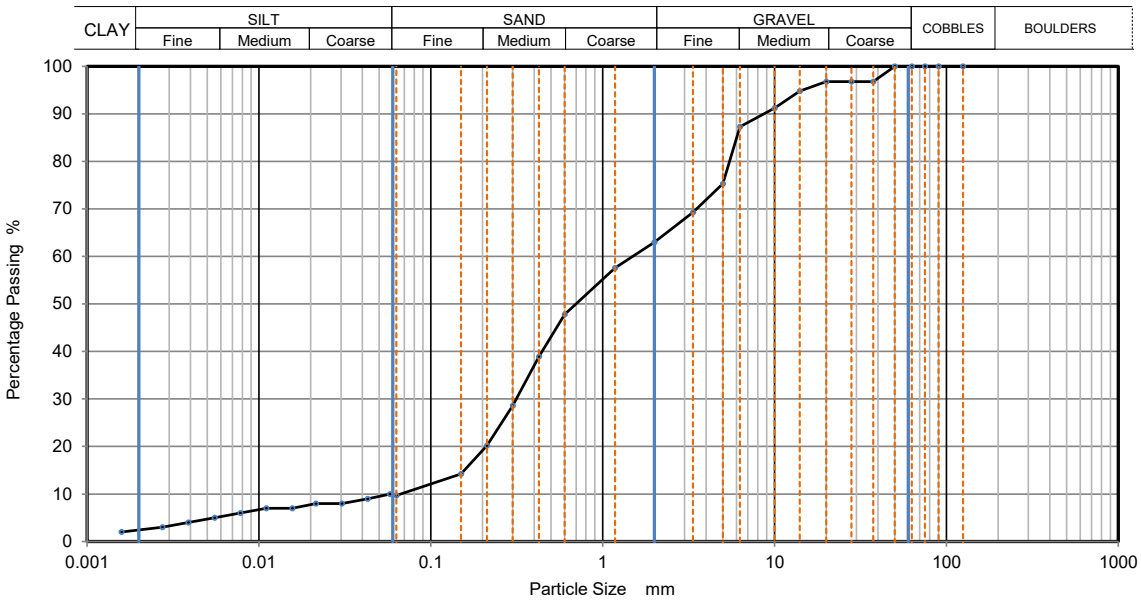
PARTICLE SIZE DISTRIBUTION

Site Name	Phoenix Wharf, Port Talbot			Job Ref	33610
				Borehole/Pit No.	TP103A
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	1.20 m
Soil Description	Black slightly clayey silty very gravelly SAND with clinker fragments (gravel is fmc and angular to sub-angular)			Depth Base	1.80 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	07/07/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0578	10
90	100	0.0429	9
75	100	0.0303	8
63	100	0.0214	8
50	100	0.0156	7
37.5	97	0.0110	7
28	97	0.0078	6
20	97	0.0055	5
14	95	0.0039	4
10	91	0.0027	3
6.3	87	0.0016	2
5	75		
3.35	69		
2	63		
1.18	58		
0.6	48	Particle density (assumed)	
0.425	39	2.70	Mg/m3
0.3	29		
0.212	20		
0.15	14		
0.063	10		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	37.01
Sand	53.31
Silt	7.40
Clay	2.30

Grading Analysis		
D100	mm	
D60	mm	1.49
D30	mm	0.314
D10	mm	0.0671
Uniformity Coefficient		22
Curvature Coefficient		0.99

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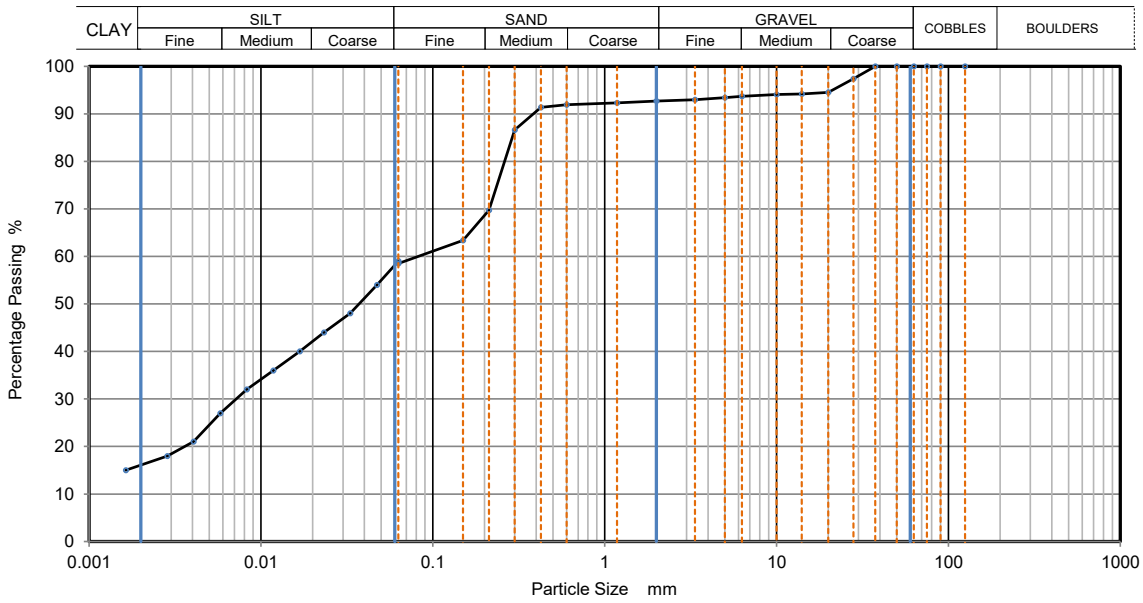
PARTICLE SIZE DISTRIBUTION

Site Name	Phoenix Wharf, Port Talbot			Job Ref	33610
				Borehole/Pit No.	TP104
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	1.00 m
Soil Description	Greyish brown slightly gravelly sandy silty CLAY with occasional roots (gravel is fmc and angular to sub-angular)			Depth Base	1.40 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	04/07/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	59
90	100	0.0473	54
75	100	0.0331	48
63	100	0.0232	44
50	100	0.0168	40
37.5	100	0.0118	36
28	97	0.0083	32
20	95	0.0058	27
14	94	0.0041	21
10	94	0.0028	18
6.3	94	0.0016	15
5	93		
3.35	93		
2	93		
1.18	92		
0.6	92	Particle density (assumed)	
0.425	91	2.70 Mg/m3	
0.3	87		
0.212	70		
0.15	63		
0.063	59		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	7.34
Sand	34.14
Silt	42.80
Clay	15.70

Grading Analysis		
D100	mm	
D60	mm	0.082
D30	mm	0.00726
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

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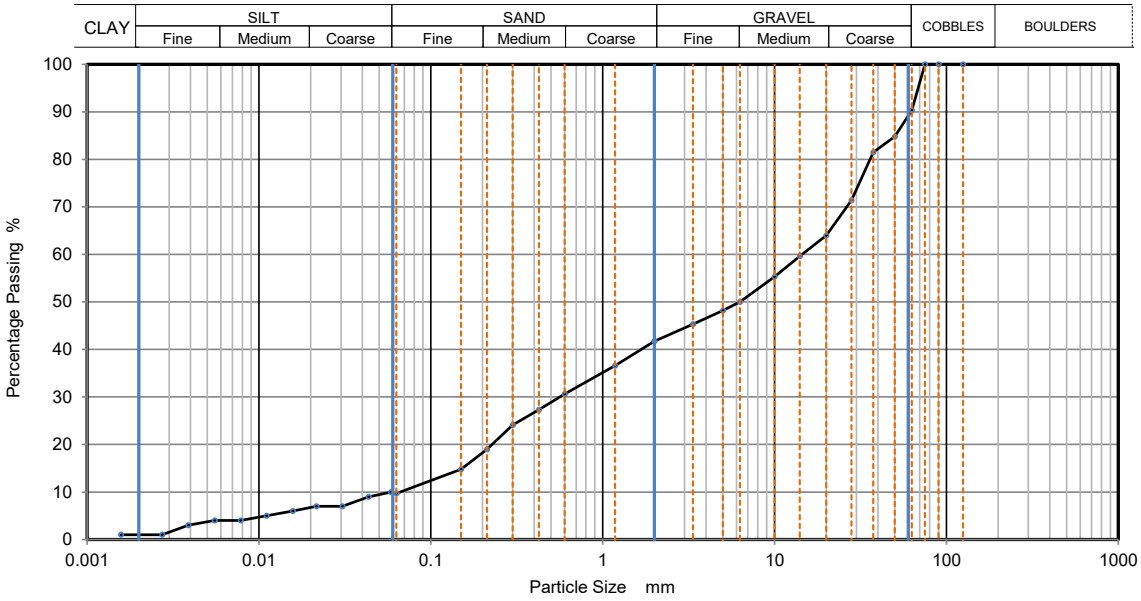
PARTICLE SIZE DISTRIBUTION

Site Name	Phoenix Wharf, Port Talbot			Job Ref	33610
				Borehole/Pit No.	TP105
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	1.00 m
Soil Description	Dark greyish brown slightly clayey silty very sandy GRAVEL with rare cobbles and coal fragments (gravel is fmc and angular to sub-rounded)			Depth Base	1.40 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	13/07/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0587	10
90	100	0.0435	9
75	100	0.0306	7
63	90	0.0216	7
50	85	0.0157	6
37.5	82	0.0111	5
28	71	0.0078	4
20	64	0.0055	4
14	60	0.0039	3
10	55	0.0027	1
6.3	50	0.0016	1
5	48		
3.35	45		
2	42		
1.18	37		
0.6	31	Particle density (assumed)	
0.425	27	2.70	Mg/m3
0.3	24		
0.212	19		
0.15	15		
0.063	10		

Sample Proportions	% dry mass
Very coarse	9.70
Gravel	48.63
Sand	31.98
Silt	8.60
Clay	1.10

Grading Analysis		
D100	mm	
D60	mm	14.5
D30	mm	0.562
D10	mm	0.0666
Uniformity Coefficient		220
Curvature Coefficient		0.33

Remarks

Preparation and testing in accordance with BS1377 unless noted below

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K4 Soils Laboratory

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Checked and Approved

Initials: **J.P**

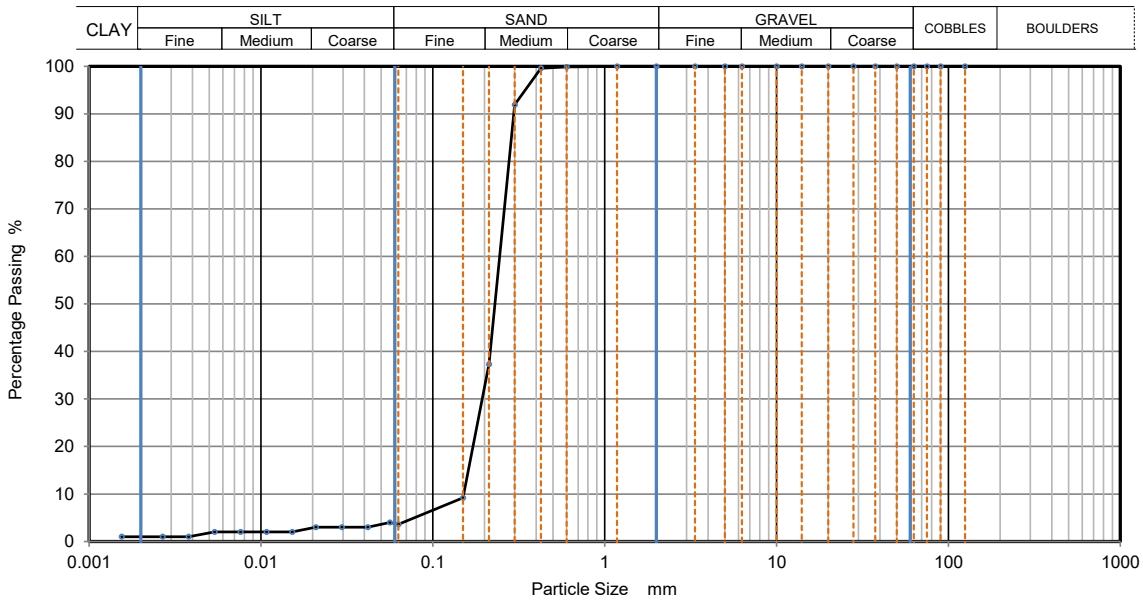
Date: 30/08/2023

2519 Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr) MSF-5-R3

PARTICLE SIZE DISTRIBUTION

				Job Ref	33610
				Borehole/Pit No.	TP111
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project No.	2111006.005	Client	TEC	Depth Top	1.00 m
Soil Description	Brown slightly clayey slightly silty SAND			Depth Base	1.40 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	12/07/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0562	4
90	100	0.0418	3
75	100	0.0295	3
63	100	0.0209	3
50	100	0.0152	2
37.5	100	0.0107	2
28	100	0.0076	2
20	100	0.0054	2
14	100	0.0038	1
10	100	0.0027	1
6.3	100	0.0015	1
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density (assumed)	
0.425	100	2.66 Mg/m3	
0.3	92		
0.212	37		
0.15	9		
0.063	4		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	0.00
Sand	96.39
Silt	2.90
Clay	0.70

Grading Analysis		
D100	mm	
D60	mm	0.245
D30	mm	0.194
D10	mm	0.151
Uniformity Coefficient		1.6
Curvature Coefficient		1

Remarks

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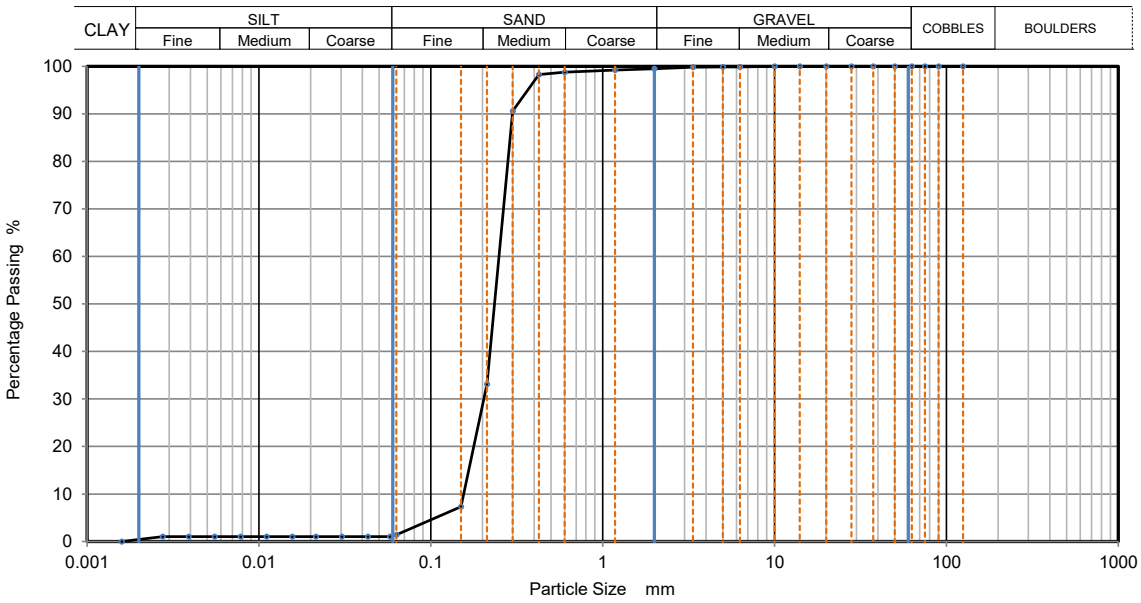
PARTICLE SIZE DISTRIBUTION

Site Name	Phoenix Wharf, Port Talbot			Job Ref	33610
				Borehole/Pit No.	TP114
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	0.80 m
Soil Description	Brown slightly clayey slightly silty SAND with rare fine gravel			Depth Base	1.20 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	04/07/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0578	1
90	100	0.0430	1
75	100	0.0304	1
63	100	0.0214	1
50	100	0.0157	1
37.5	100	0.0111	1
28	100	0.0078	1
20	100	0.0055	1
14	100	0.0039	1
10	100	0.0028	1
6.3	100	0.0016	0
5	100		
3.35	100		
2	100		
1.18	99		
0.6	99	Particle density (assumed)	
0.425	98	2.70 Mg/m3	
0.3	91		
0.212	33		
0.15	7		
0.063	1		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	0.47
Sand	98.13
Silt	1.00
Clay	0.40

Grading Analysis		
D100	mm	
D60	mm	0.249
D30	mm	0.203
D10	mm	0.155
Uniformity Coefficient		1.6
Curvature Coefficient		1.1

Remarks

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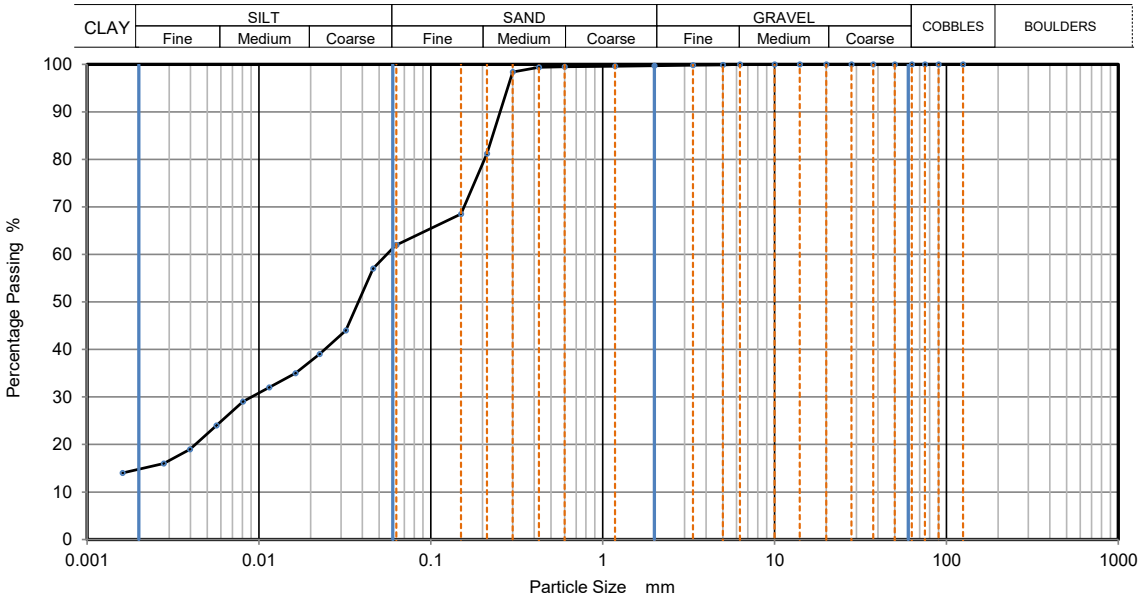
PARTICLE SIZE DISTRIBUTION

Site Name	Phoenix Wharf, Port Talbot			Job Ref	33610
				Borehole/Pit No.	TP116
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	1.40 m
Soil Description	Bluish grey sandy silty CLAY			Depth Base	1.80 m
				Sample Type	B
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	04/07/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0626	62
90	100	0.0462	57
75	100	0.0321	44
63	100	0.0225	39
50	100	0.0163	35
37.5	100	0.0115	32
28	100	0.0081	29
20	100	0.0057	24
14	100	0.0040	19
10	100	0.0028	16
6.3	100	0.0016	14
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100	Particle density (assumed)	
0.425	99	2.70	Mg/m3
0.3	98		
0.212	81		
0.15	69		
0.063	62		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	0.28
Sand	37.67
Silt	47.60
Clay	14.40

Grading Analysis		
D100	mm	
D60	mm	0.0555
D30	mm	0.00899
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

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Date: 30/08/2023

UKAS TESTING

2519

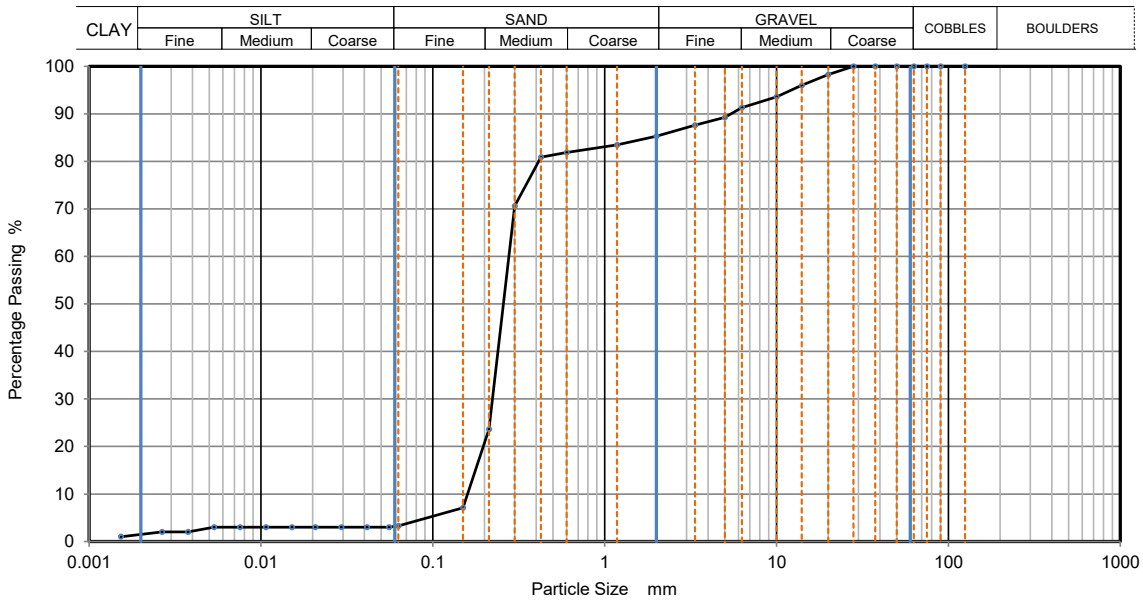
Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

MSF-5-R3

PARTICLE SIZE DISTRIBUTION

Site Name	Phoenix Wharf, Port Talbot			Job Ref	33610
				Borehole/Pit No.	TP122
Project No.	2111006.005	Client	TEC	Sample No.	-
				Depth Top	1.60 m
Soil Description	Grey and greyish brown slightly clayey slightly silty gravelly SAND (gravel is fmc and sub-angular)			Depth Base	- m
				Sample Type	D
				Samples received	14/06/2023
				Schedules received	19/06/2023
Test Method	BS1377:Part 2: 1990, clause 9.0			Project started	19/06/2023
				Date tested	06/07/2023

These results only apply to the items tested



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0557	3
90	100	0.0414	3
75	100	0.0293	3
63	100	0.0207	3
50	100	0.0151	3
37.5	100	0.0107	3
28	100	0.0076	3
20	98	0.0053	3
14	96	0.0038	2
10	94	0.0027	2
6.3	91	0.0015	1
5	89		
3.35	88		
2	85		
1.18	84		
0.6	82	Particle density (assumed)	
0.425	81	2.70 Mg/m3	
0.3	71		
0.212	24		
0.15	7		
0.063	3		

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	14.67
Sand	82.06
Silt	1.60
Clay	1.70

Grading Analysis		
D100	mm	
D60	mm	0.277
D30	mm	0.222
D10	mm	0.159
Uniformity Coefficient		1.7
Curvature Coefficient		1.1

Remarks

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Date: 30/08/2023

2519 Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr) MSF-5-R3

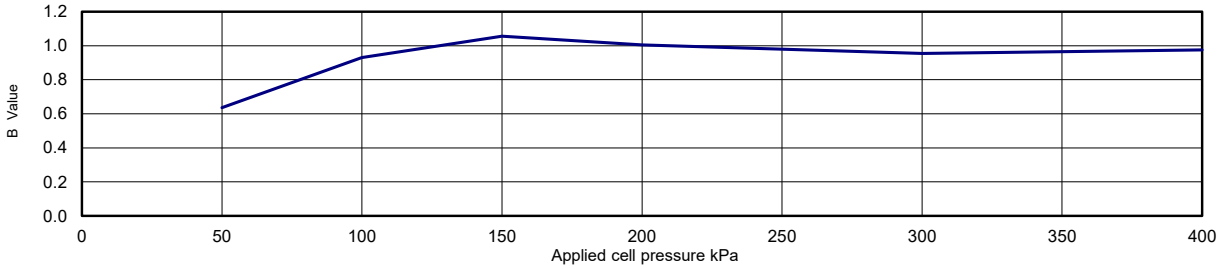
Consolidated Undrained Triaxial Compression Test with measurement of pore pressure (Multistage test on a single specimen)

				Job Ref	33610
				Borehole/Pit No.	BH103
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project ID	2111006.005	Client	TEC	Depth m	7.00
Soil Description	Grey silty CLAY with dark grey stains			Sample Type	U
				Date Scheduled	19.06.2023
Test Method	Multistage test based on BS1377 : Part 8 : 1990, clauses 1 to 6 and 7			Date Started	12.07.2023

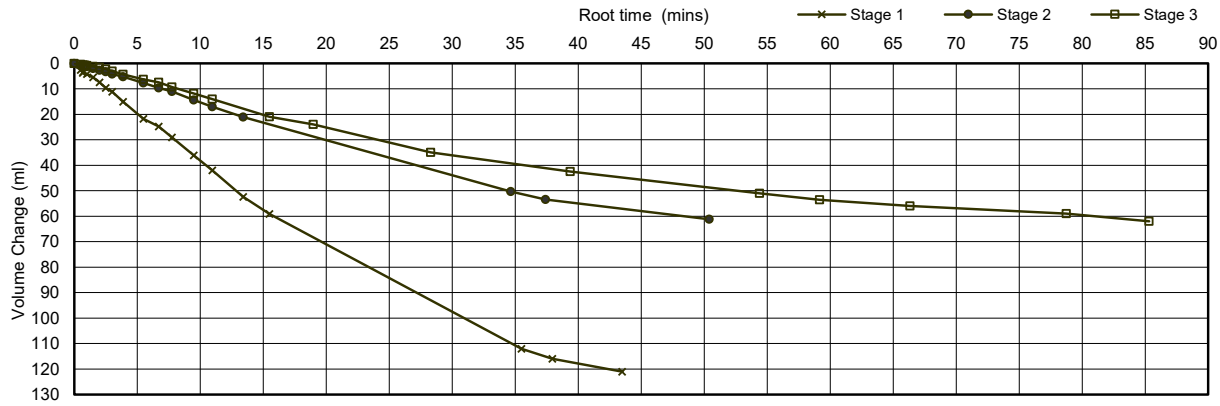
Specimen Type/Preparation	UNDISTURBED As BS 1377

Specimen Details		Initial	Final
Height	mm	210.0	
Diameter	mm	101.0	
Bulk Density	Mg/m³	1.87	1.95
Water Content	%	40	28
Dry density	Mg/m³	1.33	1.52

Saturation Details	Method of Saturation	
	Increments of cell and back pressure	
Cell pressure increments	100	kPa
Differential Pressure	10	kPa
Final Cell Pressure	400	kPa
Final pore water pressure	290	kPa
Final B Value	0.98	



Consolidation Details	Drainage Conditions		from one end and radial boundary			
	Stage No.		1	2	3	
	Cell Pressure applied		365	430	560	kPa
	Back Pressure applied		300	300	300	kPa
	Effective Pressure		65	130	260	kPa
	Pore pressure at start of consolidation		359	400	484	kPa
	Pore pressure at end of consolidation		301	301	305	kPa
	Pore pressure dissipation at end of consolidation		99	99	97	%
Consolidation parameters (see note to BS1377 : pt 8, clause 6.3.4)	Coefficient of Consolidation	Cvi	0.26	0.24	0.24	m2/year
	Coefficient of Compressibility	Mvi	1.208	0.403	0.225	m2/MN
	Coefficient of Permeability (calculated)	kvi	9.6E-11	3.0E-11	1.7E-11	m/s



Test Report by K4 SOILS LABORATORY
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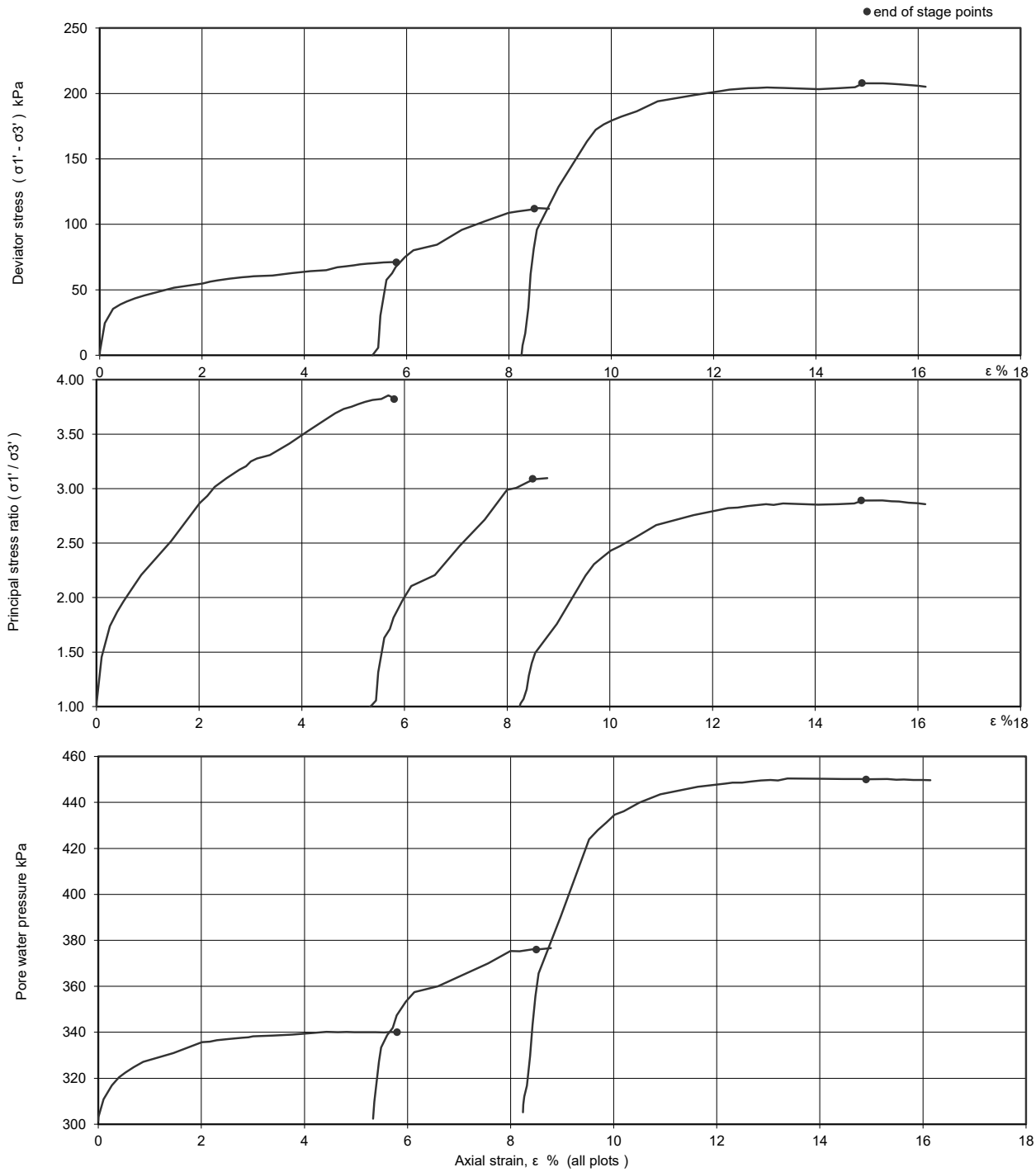
Checked and Aproved
Initials **K.P.**
Date 31/08/2023

UKAS TESTING
2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

	Consolidated Undrained Triaxial Compression Test with measurement of pore pressure (Multistage test on a single specimen)			Job Ref	33610
				Borehole/Pit No.	BH103
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project ID	2111006.005	Client	TEC	Depth m	7.00
Compression stages - graphical data				Sample Type	U
				Date Started	12.07.2023



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Date 31/08/2023

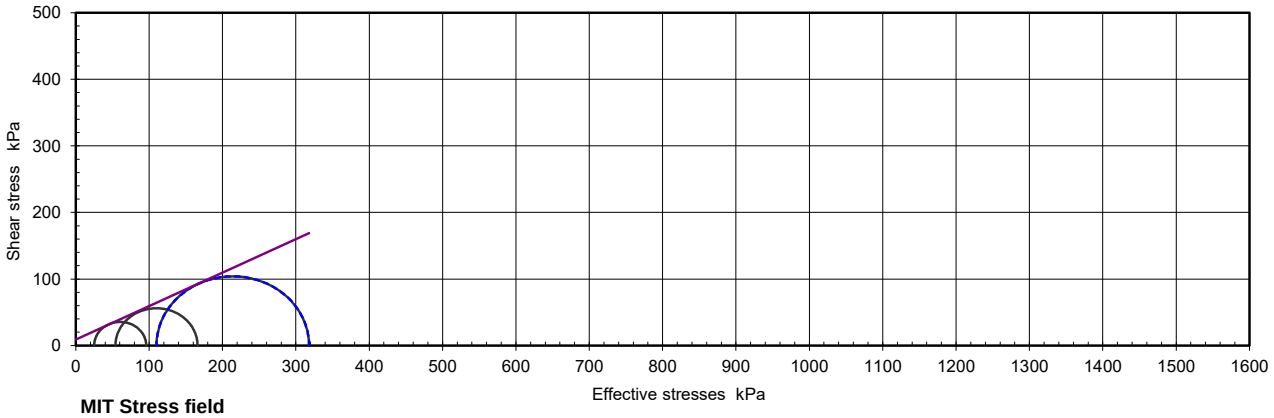
	Consolidated Undrained Triaxial Compression Test with measurement of pore pressure (Multistage test on a single specimen)			Job Ref	33610
				Borehole/Pit No.	BH103
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project ID	2111006.005	Client	TEC	Depth m	7.00
Compression stages - table of results and interpretation				Sample Type	U
				Date Started	12.07.2023

End of stage criterion : Maximum effective principal stress ratio

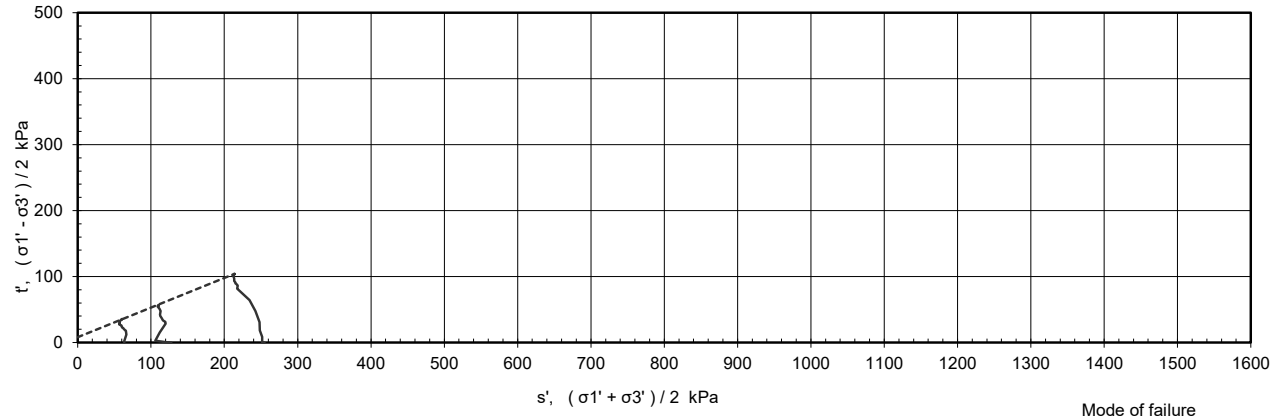
Stage	Cell pressure kPa	Initial pwp kPa	Initial σ3' kPa	Rate of strain %/hr	Axial strain, εf %	(σ1' / σ3') f	(σ1' - σ3') f kPa	uf kPa	σ3' f kPa	σ1' f kPa	Af
1	365	300	65	0.50	5.8	3.82	71	340	25	96	0.56
2	430	300	130	0.50	8.5	3.09	112	376	54	166	0.68
3	560	300	260	0.50	14.9	2.89	208	450	110	318	0.72
Conditions at Maximum Deviator Stress					14.9	2.89	208	450	110	318	0.72

Mohr Circles

_____ peak stress ratio _ _ _ _ peak deviator stress (final stage)

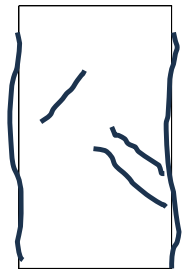


MIT Stress field



Shear Strength Parameters			Linear regression	Manual re-assessment
at peak stress ratio	c '	kPa	8.6	-
	Ø '	degrees	26.7	-

Mode of failure



Remarks

General	Deviator stresses corrected for area change, side drains and 0.2 mm thick rubber membrane/
Stage 1	
Stage 2	
Stage 3	

Test Report by K4 SOILS LABORATORY
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Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

Checked and Aproved
Initials K.P.
Date 31/08/2023

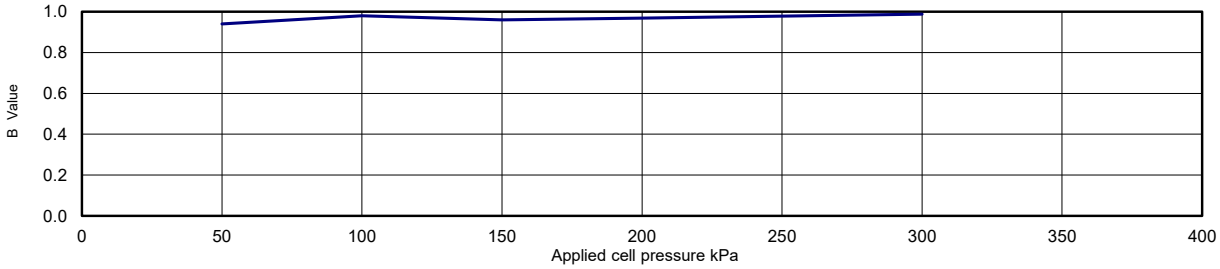
Consolidated Undrained Triaxial Compression Test with measurement of pore pressure (Multistage test on a single specimen)

				Job Ref	33610
				Borehole/Pit No.	BH105
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project ID	2111006.005	Client	TEC	Depth m	10.00
Soil Description	Dark grey brown slightly sandy slightly fibrous peaty CLAY			Sample Type	U
				Date Scheduled	19.06.2023
Test Method	Multistage test based on BS1377 : Part 8 : 1990, clauses 1 to 6 and 7			Date Started	05.07.2023

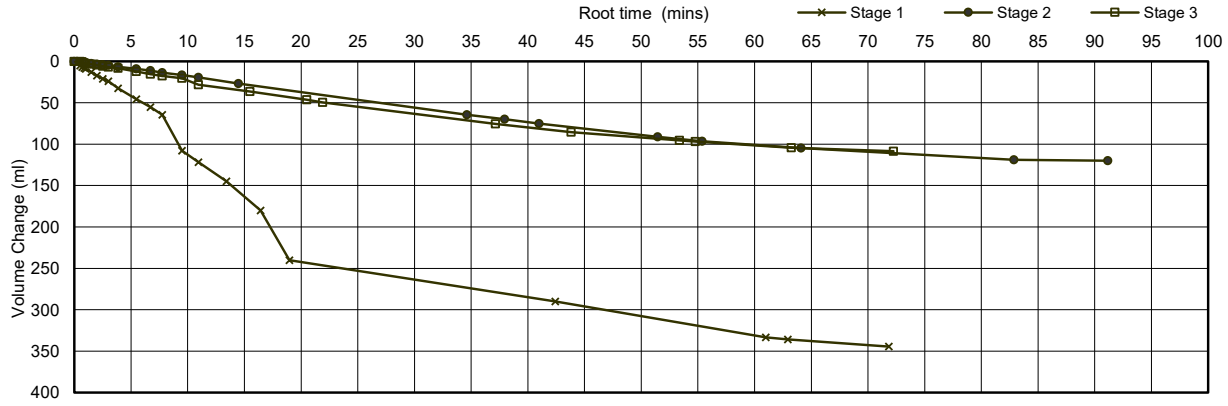
Specimen Type/Preparation	UNDISTURBED As BS 1377

Specimen Details		Initial	Final
Height	mm	210.0	
Diameter	mm	105.0	
Bulk Density	Mg/m³	1.23	1.43
Water Content	%	149	80
Dry density	Mg/m³	0.50	0.79

Saturation Details	Method of Saturation	
	Increments of cell and back pressure	
Cell pressure increments	100	kPa
Differential Pressure	10	kPa
Final Cell Pressure	300	kPa
Final pore water pressure	190	kPa
Final B Value	0.99	



Consolidation Details	Drainage Conditions		from one end and radial boundary			
	Stage No.		1	2	3	
	Cell Pressure applied		390	480	660	kPa
	Back Pressure applied		300	300	300	kPa
	Effective Pressure		90	180	360	kPa
	Pore pressure at start of consolidation		382	437	520	kPa
	Pore pressure at end of consolidation		304	302	303	kPa
	Pore pressure dissipation at end of consolidation		95	98	99	%
Consolidation parameters (see note to BS1377 : pt 8, clause 6.3.4)	Coefficient of Consolidation	Cvi	0.21	0.18	0.17	m2/year
	Coefficient of Compressibility	Mvi	2.681	0.713	0.407	m2/MN
	Coefficient of Permeability (calculated)	kvi	1.7E-10	4.0E-11	2.1E-11	m/s



Test Report by K4 SOILS LABORATORY
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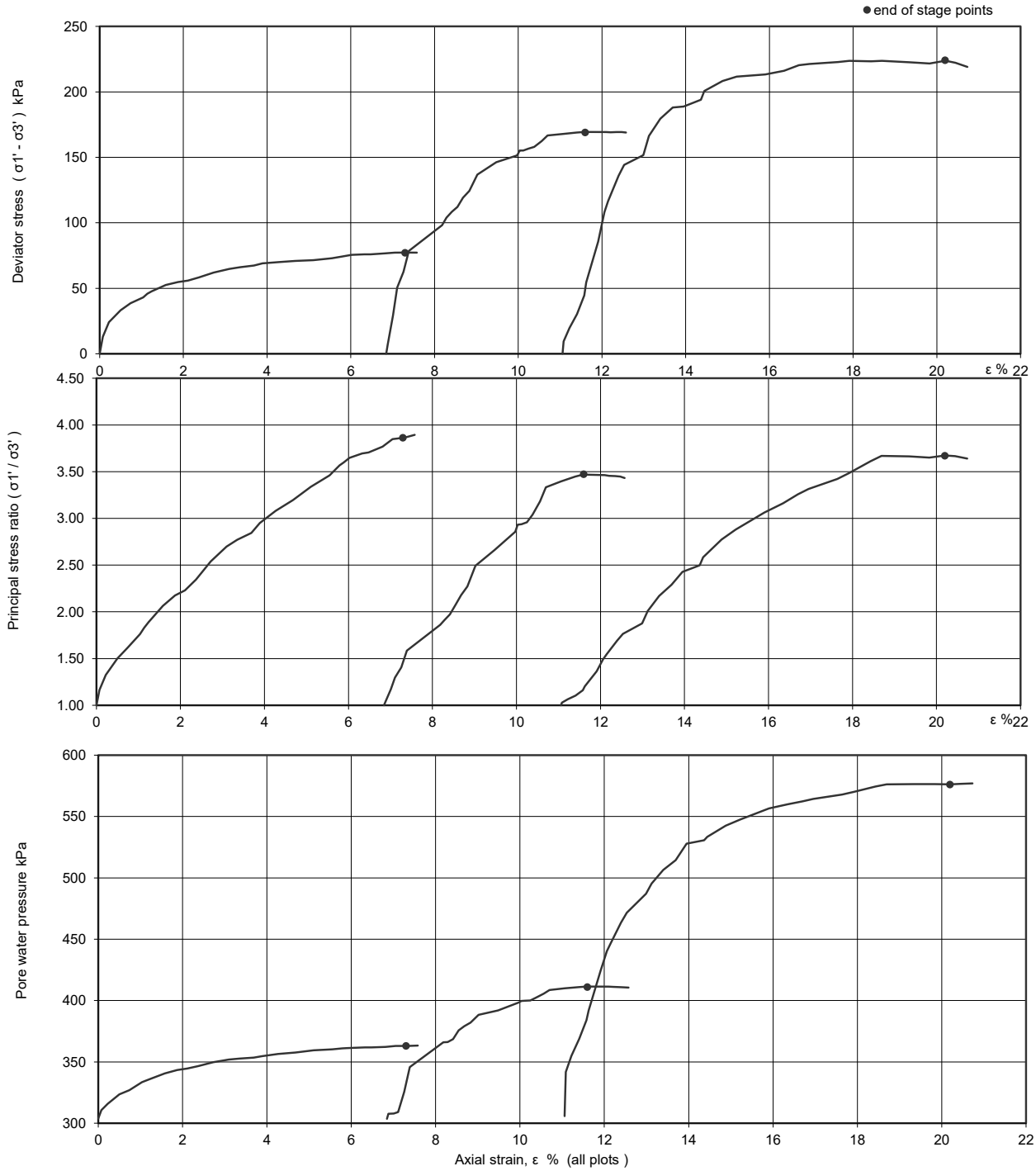
Checked and Aproved
Initials K.P.
Date 31/08/2023

UKAS TESTING 2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

	Consolidated Undrained Triaxial Compression Test with measurement of pore pressure (Multistage test on a single specimen)			Job Ref	33610
				Borehole/Pit No.	BH105
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project ID	2111006.005	Client	TEC	Depth m	10.00
Compression stages - graphical data				Sample Type	U
				Date Started	05.07.2023



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Date 31/08/2023

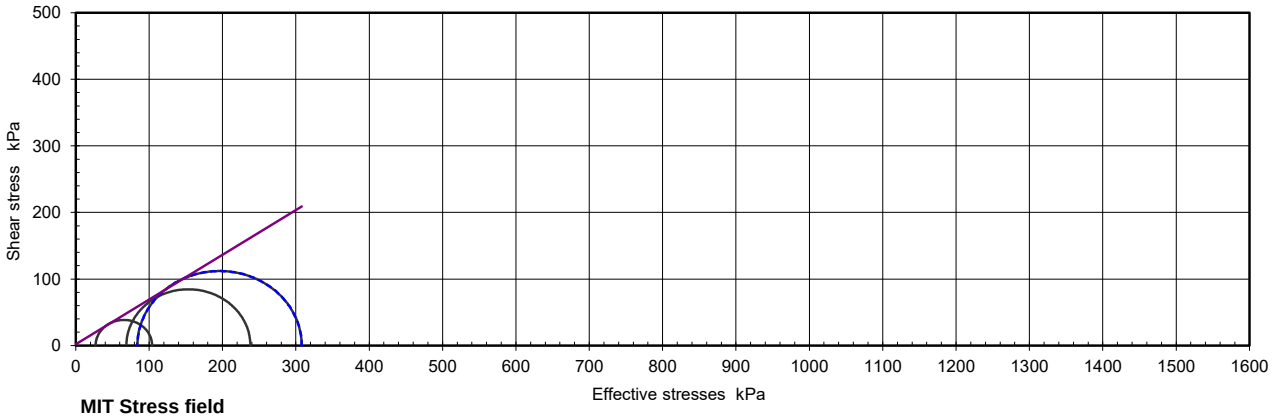
	Consolidated Undrained Triaxial Compression Test with measurement of pore pressure (Multistage test on a single specimen)			Job Ref	33610
				Borehole/Pit No.	BH105
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project ID	2111006.005	Client	TEC	Depth m	10.00
Compression stages - table of results and interpretation				Sample Type	U
				Date Started	05.07.2023

End of stage criterion : Maximum effective principal stress ratio

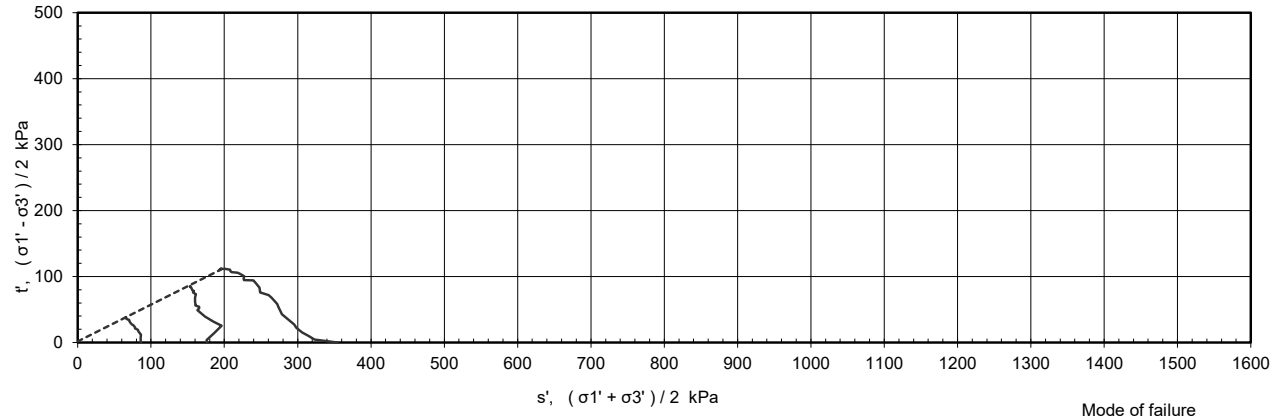
Stage	Cell pressure kPa	Initial pwp kPa	Initial σ3' kPa	Rate of strain %/hr	Axial strain, εf %	(σ1' / σ3') f	(σ1' - σ3') f kPa	uf kPa	σ3' f kPa	σ1' f kPa	Af
1	390	300	90	0.50	7.3	3.86	77	363	27	104	0.81
2	480	300	180	0.50	11.6	3.47	169	411	69	238	0.66
3	660	300	360	0.50	20.2	3.67	224	576	84	307	1.23
Conditions at Maximum Deviator Stress					20.2	3.67	224	576	84	308	1.23

Mohr Circles

_____ peak stress ratio _ _ _ _ peak deviator stress (final stage)

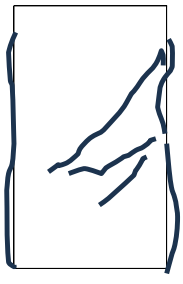


MIT Stress field



Shear Strength Parameters			Linear regression	Manual re-assessment
at peak stress ratio	c '	kPa	1.5	-
	Ø '	degrees	33.9	-

Mode of failure



Remarks

General	Deviator stresses corrected for area change, side drains and 0.25 mm thick rubber membrane/
Stage 1	
Stage 2	
Stage 3	

Test Report by K4 SOILS LABORATORY
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Initials K.P.
Date 31/08/2023

UKAS TESTING 2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

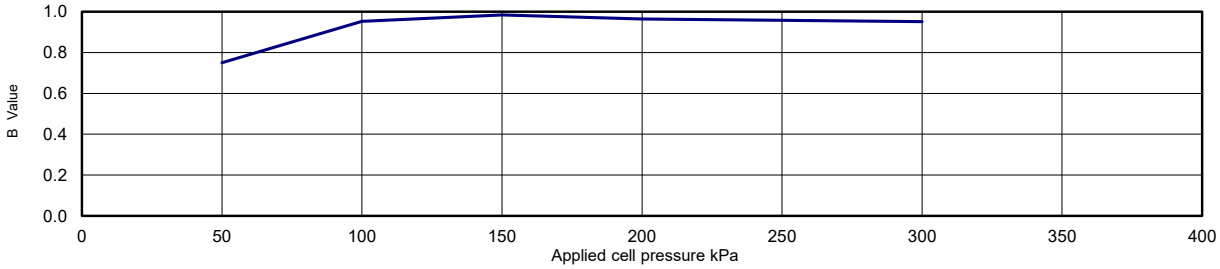
Consolidated Undrained Triaxial Compression Test with measurement of pore pressure (Multistage test on a single specimen)

				Job Ref	33610
				Borehole/Pit No.	BH108
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project ID	2111006.005	Client	TEC	Depth m	4.00
Soil Description	Dark grey and grey blue slightly sandy slightly fibrous slightly peaty CLAY			Sample Type	U
				Date Scheduled	19.06.2023
Test Method	Multistage test based on BS1377 : Part 8 : 1990, clauses 1 to 6 and 7			Date Started	05.07.2023

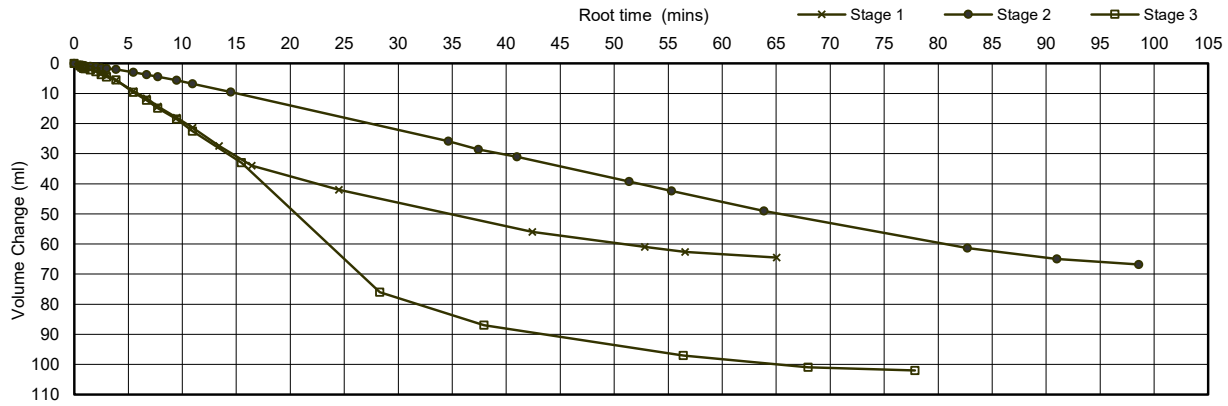
Specimen Type/Preparation	UNDISTURBED As BS 1377

Specimen Details		Initial	Final
Height	mm	210.0	
Diameter	mm	102.0	
Bulk Density	Mg/m³	1.63	1.76
Water Content	%	55	42
Dry density	Mg/m³	1.05	1.24

Saturation Details	Method of Saturation	
	Increments of cell and back pressure	
Cell pressure increments	100	kPa
Differential Pressure	10	kPa
Final Cell Pressure	300	kPa
Final pore water pressure	190	kPa
Final B Value	0.95	



	Drainage Conditions		from one end and radial boundary			
	Stage No.		1	2	3	
Consolidation Details	Cell Pressure applied		335	370	440	kPa
	Back Pressure applied		300	300	300	kPa
	Effective Pressure		35	70	140	kPa
	Pore pressure at start of consolidation		326	357	414	kPa
	Pore pressure at end of consolidation		301	302	301	kPa
	Pore pressure dissipation at end of consolidation		98	96	99	%
Consolidation parameters (see note to BS1377 : pt 8, clause 6.3.4)	Coefficient of Consolidation	C_{vi}	0.20	0.19	0.19	m^2/year
	Coefficient of Compressibility	M_{vi}	1.486	0.791	0.580	m^2/MN
	Coefficient of Permeability (calculated)	k_{vi}	9.1E-11	4.7E-11	3.4E-11	m/s



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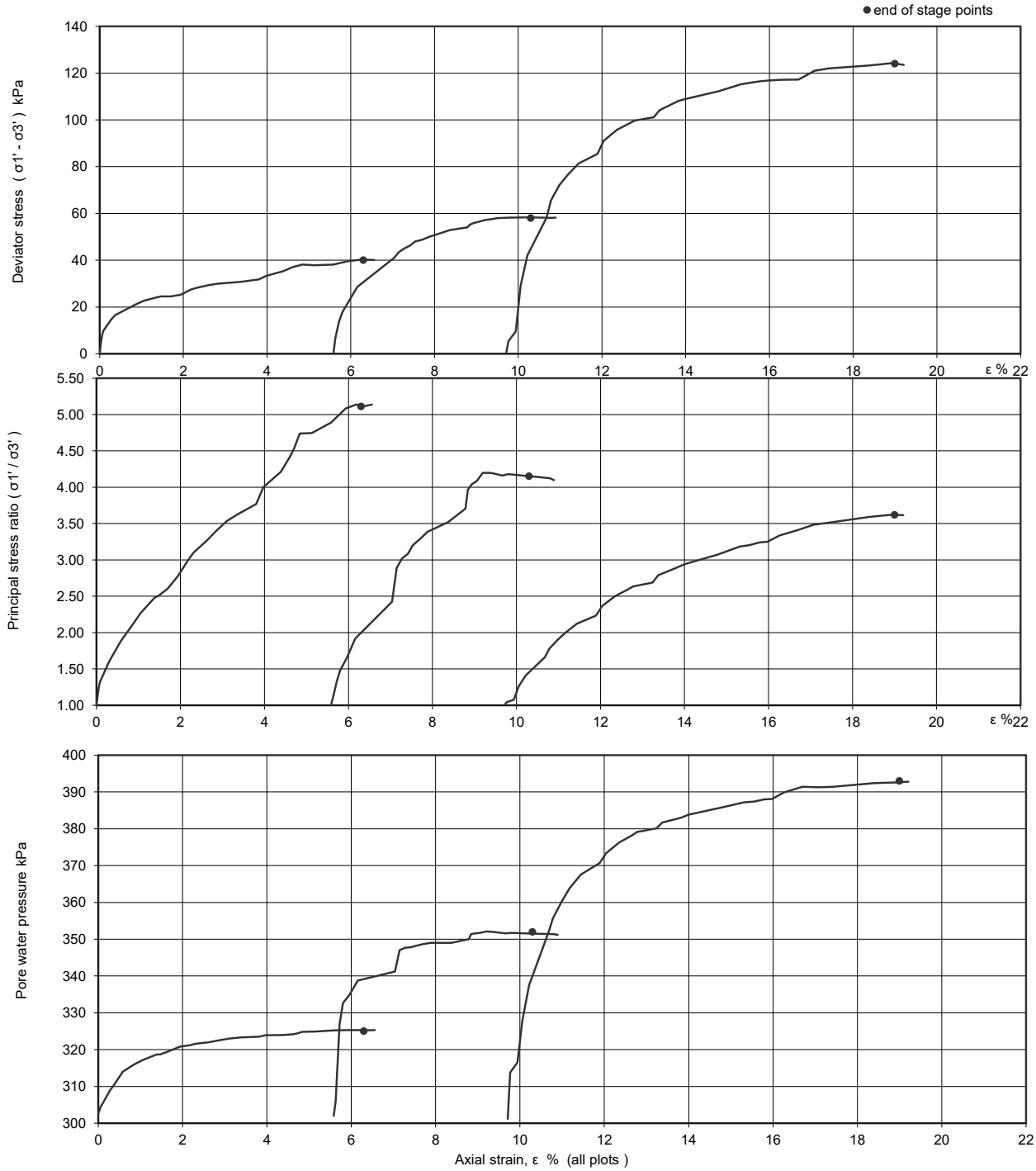
	Consolidated Undrained Triaxial Compression Test with measurement of pore pressure (Multistage test on a single specimen)			Job Ref	33610
				Borehole/Pit No.	BH108
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project ID	2111006.005	Client	TEC	Depth m	4.00
Compression stages - graphical data				Sample Type	U
				Date Started	05.07.2023



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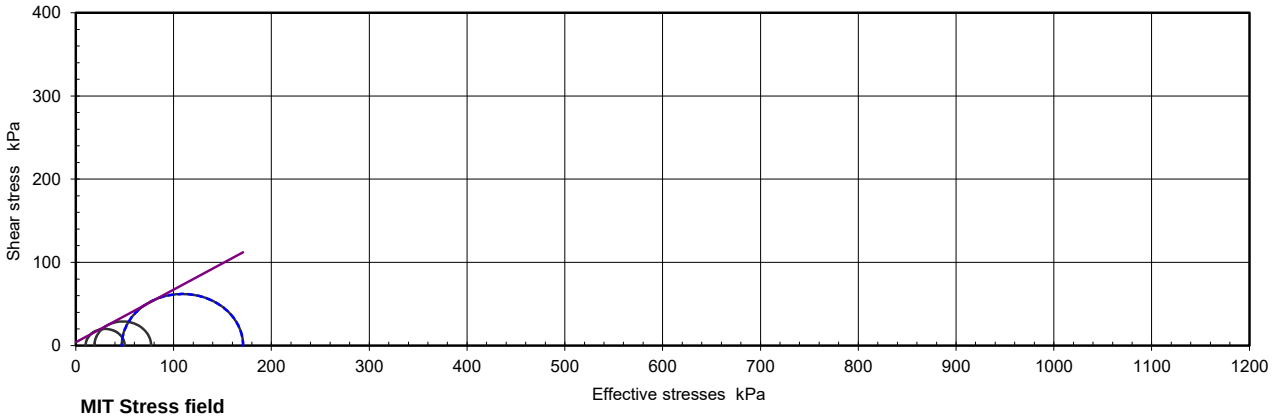
	Consolidated Undrained Triaxial Compression Test with measurement of pore pressure (Multistage test on a single specimen)			Job Ref	33610
				Borehole/Pit No.	BH108
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Project ID	2111006.005	Client	TEC	Depth m	4.00
Compression stages - table of results and interpretation				Sample Type	U
				Date Started	05.07.2023

End of stage criterion : Maximum effective principal stress ratio

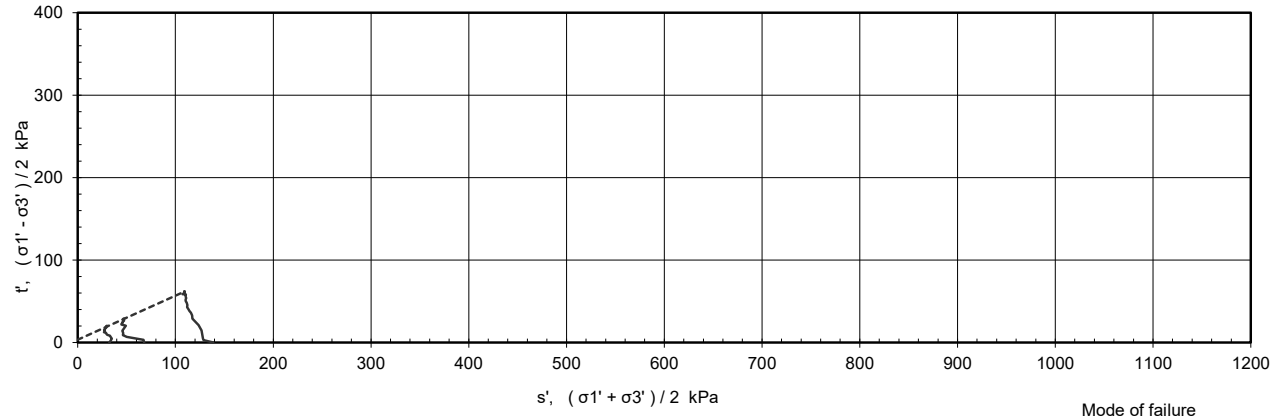
Stage	Cell pressure kPa	Initial pwp kPa	Initial σ_3' kPa	Rate of strain %/hr	Axial strain, ε_f %	$(\sigma_1'/\sigma_3')_f$	$(\sigma_1'-\sigma_3')_f$ kPa	u_f kPa	$\sigma_3'_f$ kPa	$\sigma_1'_f$ kPa	A_f
1	335	300	35	0.50	6.3	5.11	40	325	10	50	0.63
2	370	300	70	0.50	10.3	4.15	58	352	19	77	0.88
3	440	300	140	0.50	19.0	3.62	124	393	47	172	0.74
Conditions at Maximum Deviator Stress					19.0	3.62	124	393	47	171	0.74

Mohr Circles

_____ peak stress ratio _ _ _ _ peak deviator stress (final stage)



MIT Stress field



Shear Strength Parameters			Linear regression	Manual re-assessment
at peak stress ratio	c '	kPa	4.4	-
	Ø '	degrees	32.3	-

Mode of failure

Remarks

General	Deviator stresses corrected for area change, side drains and 0.26 mm thick rubber membrane/
Stage 1	
Stage 2	
Stage 3	

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Determination of shear strength using the Small Shear Box Apparatus

Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Soil Description	Bluish grey and brown sandy silty CLAY			Depth m	6.00
				Sample Type	B
Project No.	2111006.005	Client	TEC	Sample received	14/06/2023
				Schedule received	19/06/2023
Test Method	BS1377 : Part 7 : 1990, clause 4			Date test started	24/07/2023
Preparation Details	Tamped in as received			Date completed	25/07/2023

Job Ref: 33610

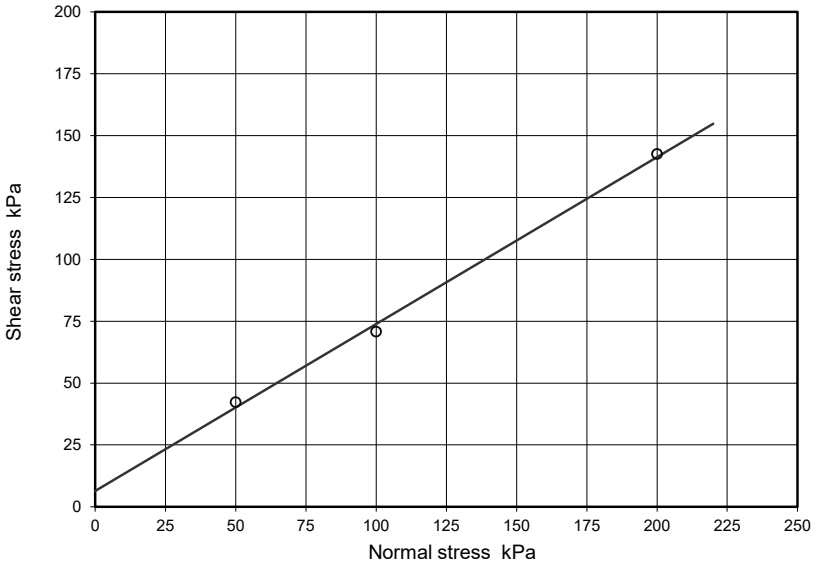
Borehole/Pit No.: BH104

Test Condition: Submerged Particle Density: measured 2.67 Mg/m3

Specimen Details		Test No.	1	2	3				
Initial	Height		20.0	20.0	20.0				mm
	Bulk Density		2.07	2.08	2.07				Mg/m³
	Moisture Content		26	26	26				%
	Dry density		1.65	1.66	1.65				Mg/m³
	Voids ratio		0.618	0.608	0.618				
	Degree of Saturation		110	112	110				%
Consolidation	Consolidation / Normal Stress applied		**50**	**100**	**200**				kPa
	Change in height during consolidation*		-1.166	-1.502	-2.026				mm
	Voids ratio after consolidation		0.524	0.487	0.454				
After test	Final Moisture content		19	18	16				

Shearing stage(s)

Rate of displacement	Peak	0.02000	0.02000	0.02000				mm/min
	Residual							mm/min
Peak values, (o)	Relative horizontal displacement	5.07	4.60	6.23				mm
	Shear stress	42.3	70.8	142.6				kPa
	Vertical Movement at peak shear stress*	-1.59	-1.87	-2.47				mm
Residual values, (x)	No. of traverses (including peak run)							
	Relative horizontal displacement							mm
	Shear stress							kPa
	Vertical movement at residual shear stress*							mm



Shear Strength Parameters

Peak strength, (o)		Regression	Manual
c '	kPa	6.4	-
Ø '	degrees	34	-

Residual strength, (x)			
c 'R	kPa	[0.0]	-
Ø 'R	degrees	[ ]	-

Remarks :

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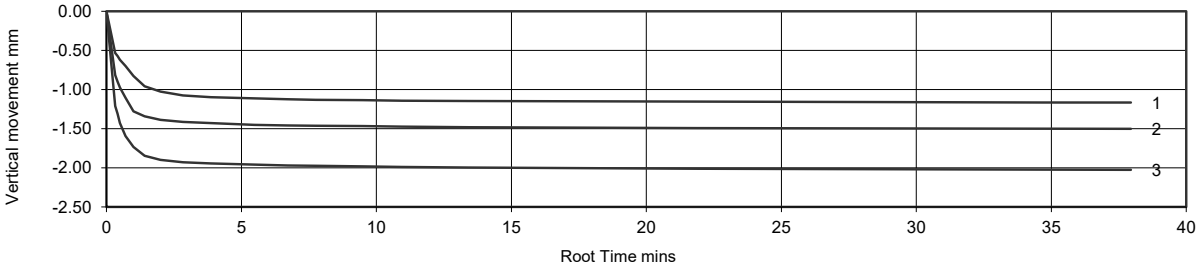
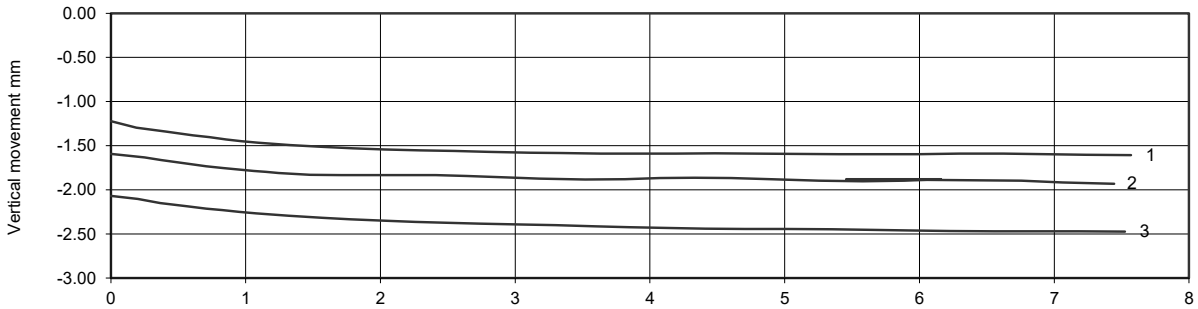
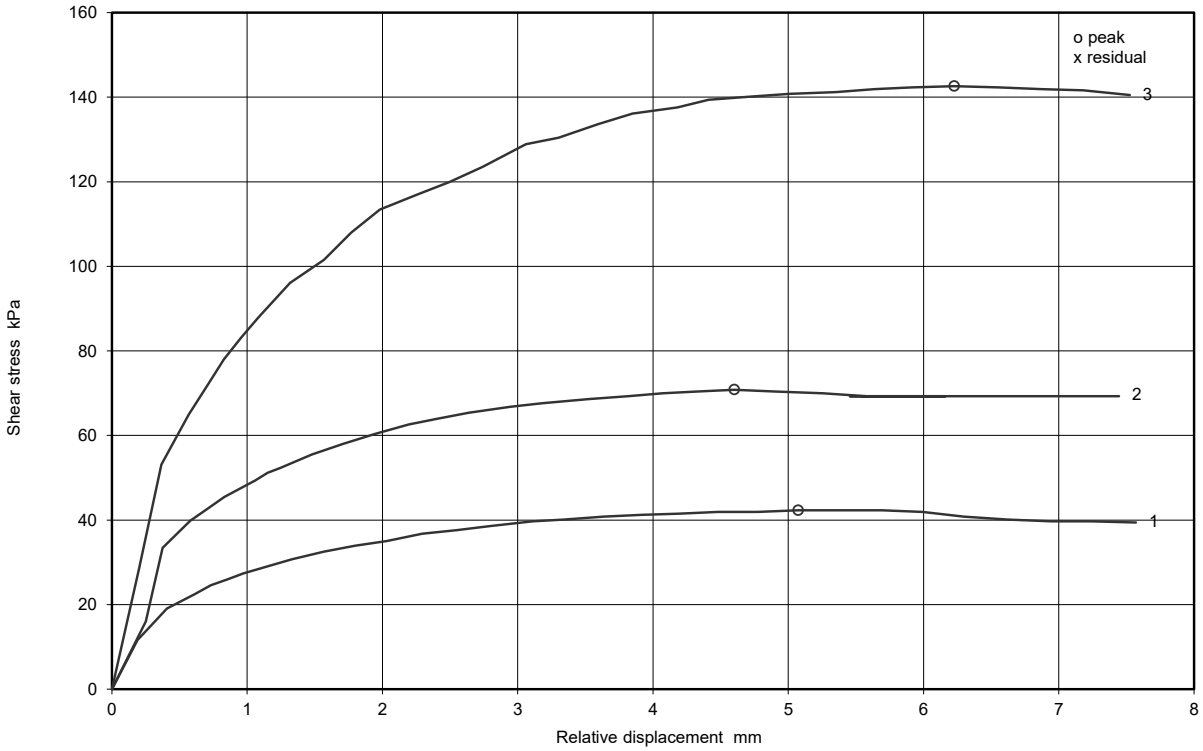
	Determination of shear strength using the Small Shear Box Apparatus			Job Ref	33610
				Borehole/Pit No.	BH104
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Soil Description	Bluish grey and brown sandy silty CLAY			Depth m	6.00
				Sample Type	B
Project No.	2111006.005	Client	TEC	Date of Test	24/07/2023

Consolidation stage(s)



Shearing stage(s)





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Determination of shear strength using the Small Shear Box Apparatus

Site Name	Phoenix Wharf, Port Talbot			Job Ref	33610
				Borehole/Pit No.	BH106
Soil Description	Dark grey slightly gravelly clayey very silty SAND (gravel is fm and sub-angular)			Sample No.	-
				Depth m	4.00
				Sample Type	B
Project No.	2111006.005	Client	TEC	Sample received	14/06/2023
				Schedule received	19/06/2023
Test Method	BS1377 : Part 7 : 1990, clause 4			Date test started	08/08/2023
Preparation Details	Material tamped in as received			Date completed	10/08/2023

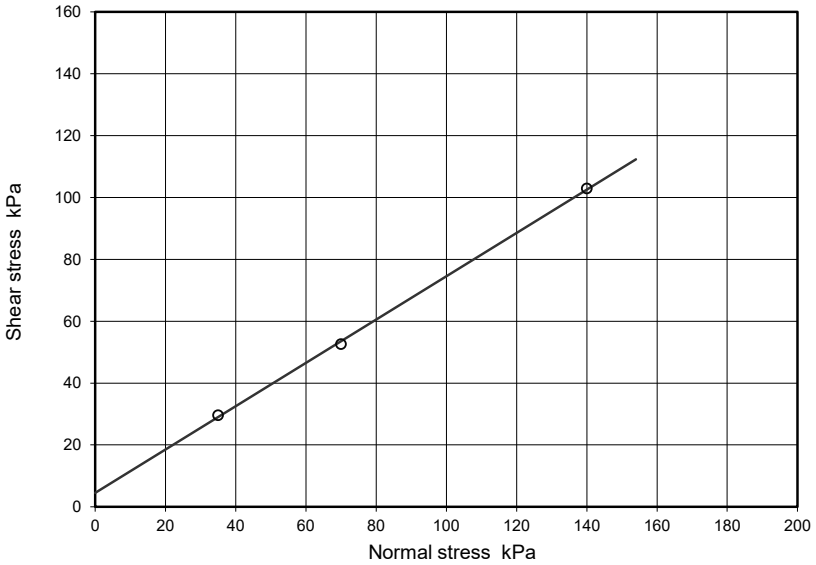
Test Condition: Submerged Particle Density: assumed 2.63 Mg/m3

Specimen Details

		Test No.	1	2	3				
Initial	Height		20.0	20.0	20.0				mm
	Bulk Density		1.86	1.86	1.86				Mg/m³
	Moisture Content		39	39	39				%
	Dry density		1.34	1.34	1.34				Mg/m³
	Voids ratio		0.963	0.963	0.963				
	Degree of Saturation		106	106	106				%
Consolidation	Consolidation / Normal Stress applied		**35**	**70**	**140**				kPa
	Change in height during consolidation*		-3.450	-3.526	-3.976				mm
	Voids ratio after consolidation		0.624	0.617	0.573				
After test	Final Moisture content		26	25	23				

Shearing stage(s)

Rate of displacement	Peak	0.01500	0.01500	0.01500				mm/min
	Residual							mm/min
Peak values, (o)	Relative horizontal displacement	6.95	6.30	7.24				mm
	Shear stress	29.6	52.6	102.9				kPa
	Vertical Movement at peak shear stress*	-4.13	-4.13	-4.66				mm
Residual values, (x)	No. of traverses (including peak run)							
	Relative horizontal displacement							mm
	Shear stress							kPa
	Vertical movement at residual shear stress*							mm



Shear Strength Parameters

Peak strength, (o)		Regression	Manual
c '	kPa	4.5	-
Ø '	degrees	35	-

Residual strength, (x)

c 'R	kPa	[0.0]	-
Ø 'R	degrees	[ ]	-

Remarks :

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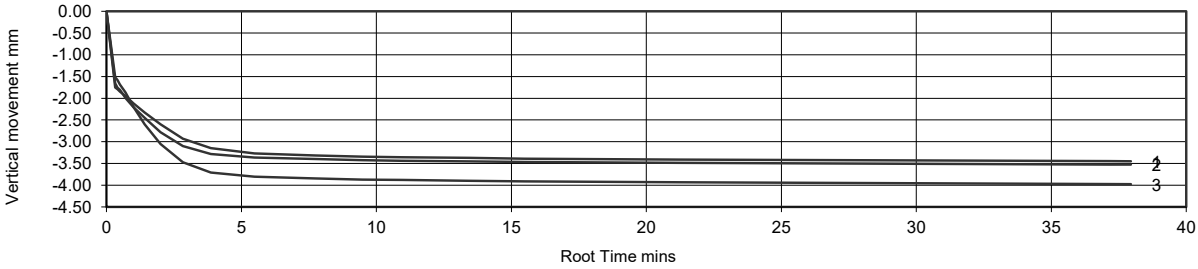
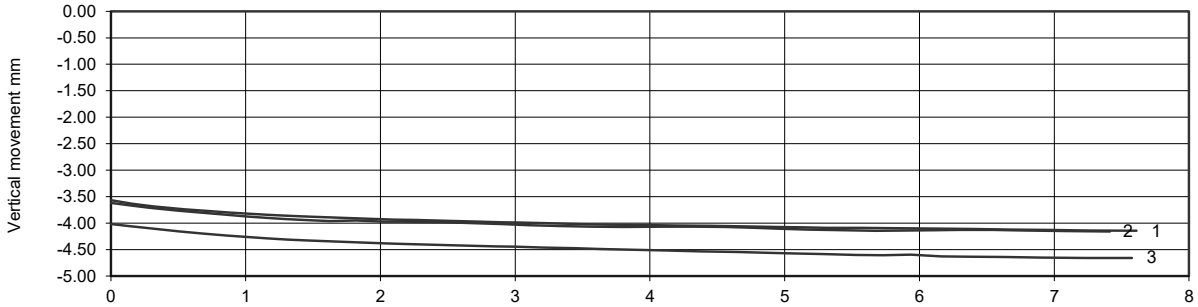
MSF-5-R14 (Rev. 0)

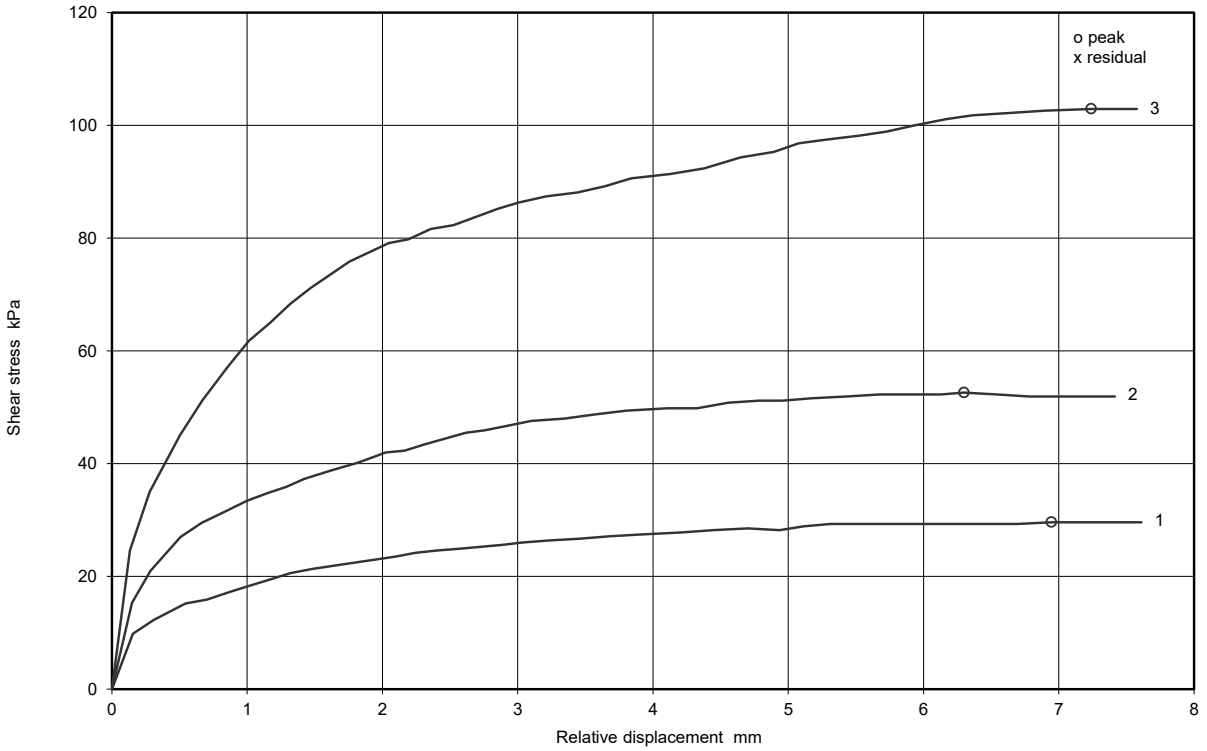
	Determination of shear strength using the Small Shear Box Apparatus			Job Ref	33610
				Borehole/Pit No.	BH106
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Soil Description	Dark grey slightly gravelly clayey very silty SAND (gravel is fm and sub-angular)			Depth m	4.00
				Sample Type	B
Project No.	2111006.005	Client	TEC	Date of Test	08/08/2023

Consolidation stage(s)



Shearing stage(s)





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Determination of shear strength using the Large Shear Box Apparatus

Job Ref	33610				
Borehole/Pit No.	BH107				
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Soil Description	Grey slightly clayey slightly silty sandy GRAVEL with rare cobbles (gravel is fmc and sub-rounded to rounded)			Depth m	16.50
				Sample Type	B
Project No.	2111006.005	Client	TEC	Sample received	14/06/2023
				Schedule received	19/06/2023
Test Method	BS1377 : Part 7 : 1990, clause 5			Date test started	14/08/2023
Preparation Details	Material tamped in as received			Date completed	14/08/2023

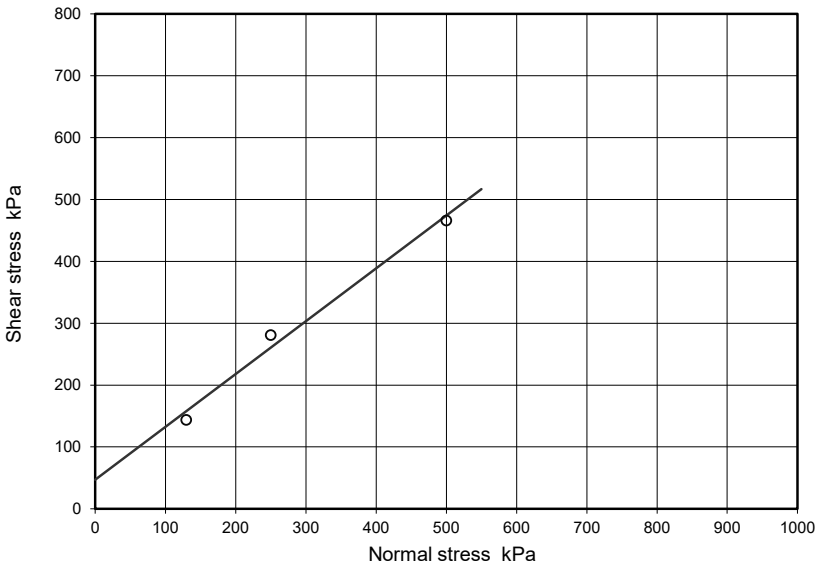
Test Condition: Dry Particle Density: assumed 2.67 Mg/m3

Specimen Details

		Test No. 1	2	3				
Initial	Height	60.0	60.0	60.0				mm
	Bulk Density	2.01	2.01	2.01				Mg/m³
	Moisture Content	5.4	5.4	5.4				%
	Dry density	1.91	1.91	1.91				Mg/m³
	Voids ratio	0.398	0.398	0.398				
	Degree of Saturation	36	36	36				%
Consolidation	Consolidation / Normal Stress applied	**130**	**250**	**500**				kPa
	Change in height during consolidation*	-2.510	-2.730	-4.430				mm
	Voids ratio after consolidation	0.340	0.334	0.295				
After test	Final Moisture content	5.5	5.3	5.5				

Shearing stage(s)

Rate of displacement	Peak	1.00000	1.00000	1.00000				mm/min
	Residual							mm/min
Peak values, (o)	Relative horizontal displacement	24.00	30.00	29.00				mm
	Shear stress	143.6	280.7	466.0				kPa
	Vertical Movement at peak shear stress*	-1.78	-2.00	-5.20				mm
Residual values, (x)	No. of traverses (including peak run)							
	Relative horizontal displacement							mm
	Shear stress							kPa
	Vertical movement at residual shear stress*							mm



Shear Strength Parameters

Peak strength, (o)		Regression	Manual
c '	kPa	47	-
Ø '	degrees	40.5	-

Residual strength, (x)

c 'R	kPa	[0.0]	-
Ø 'R	degrees	[ ]	-

Remarks :

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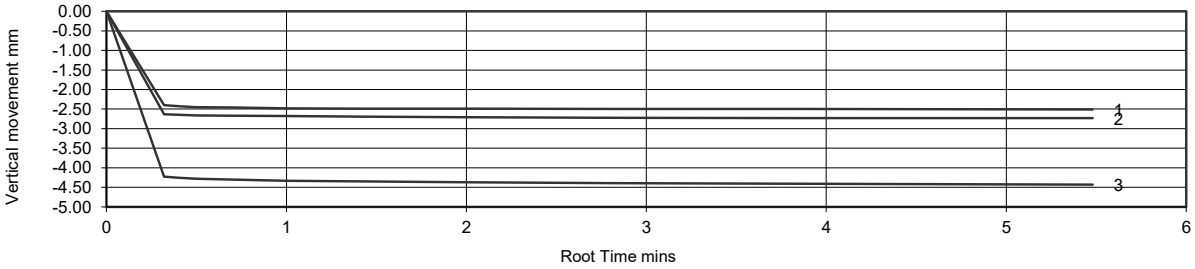
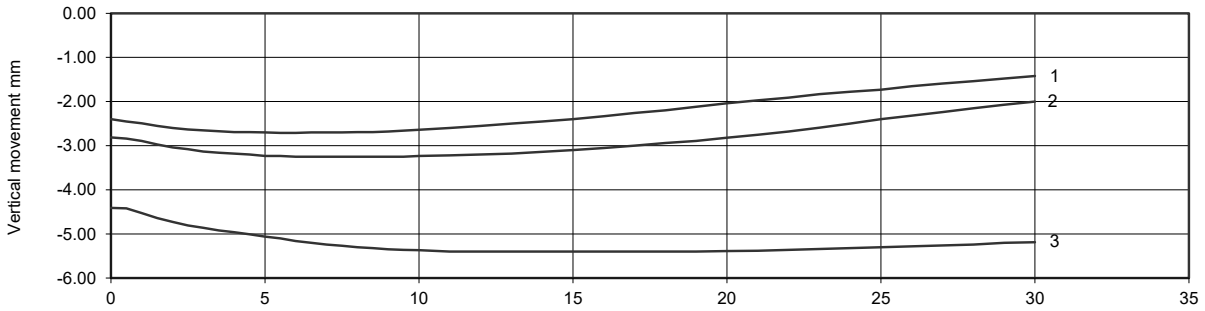
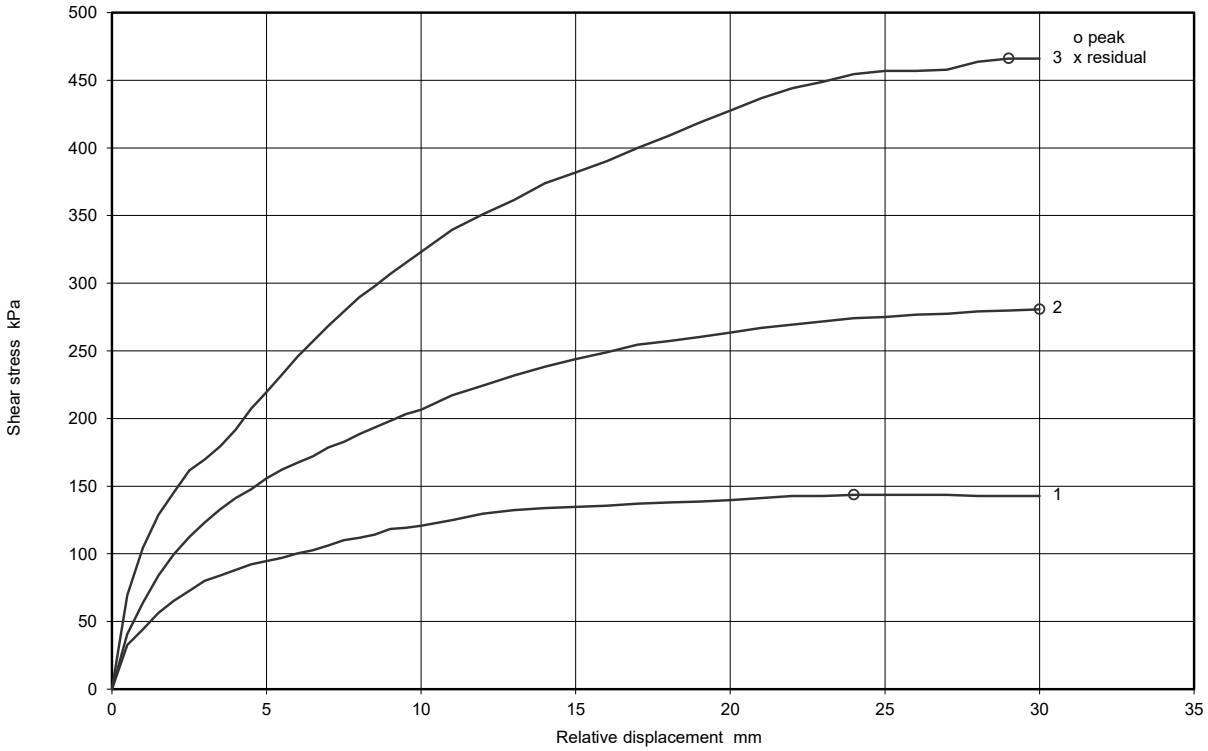
	Determination of shear strength using the Large Shear Box Apparatus			Job Ref	33610
				Borehole/Pit No.	BH107
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Soil Description	Grey slightly clayey slightly silty sandy GRAVEL with rare cobbles (gravel is fmc and sub-rounded to rounded)			Depth m	16.50
				Sample Type	B
Project No.	2111006.005	Client	TEC	Date of Test	14/08/2023

Consolidation stage(s)



Shearing stage(s)





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Determination of shear strength using the Large Shear Box Apparatus

Job Ref	33610				
Borehole/Pit No.	BH111				
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Soil Description	Grey slightly silty sandy GRAVEL with occasional cobbles (gravel is sub-angular to sub-rounded)			Depth m	13.50
				Sample Type	B
Project No.	2111006.005	Client	TEC	Sample received	14/06/2023
				Schedule received	19/06/2023
Test Method	BS1377 : Part 7 : 1990, clause 5			Date test started	18/08/2023
Preparation Details	Material tamped in as received			Date completed	18/08/2023

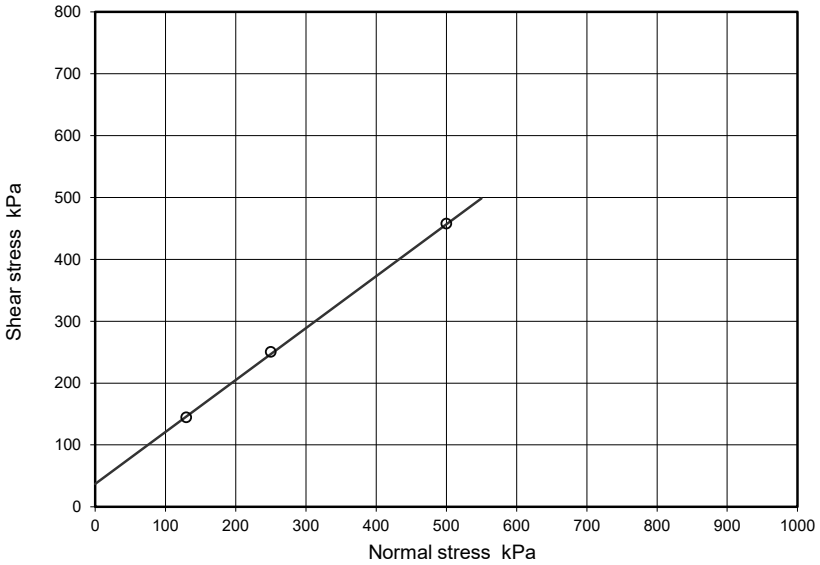
Test Condition: Dry Particle Density: assumed 2.67 Mg/m3

Specimen Details

		Test No. 1	2	3				
Initial	Height	78.0	78.0	78.0				mm
	Bulk Density	1.86	1.86	1.86				Mg/m³
	Moisture Content	8.5	8.5	8.5				%
	Dry density	1.71	1.71	1.71				Mg/m³
	Voids ratio	0.561	0.561	0.561				
	Degree of Saturation	40	40	40				%
Consolidation	Consolidation / Normal Stress applied	**130**	**250**	**500**				kPa
	Change in height during consolidation*	-1.820	-2.450	-3.530				mm
	Voids ratio after consolidation	0.525	0.512	0.490				
After test	Final Moisture content	6.3	5.9	6.9				

Shearing stage(s)

Rate of displacement	Peak	1.00000	1.00000	1.00000				mm/min
	Residual							mm/min
Peak values, (o)	Relative horizontal displacement	18.00	29.00	30.00				mm
	Shear stress	144.5	250.5	457.8				kPa
	Vertical Movement at peak shear stress*	-0.66	-2.34	-3.98				mm
Residual values, (x)	No. of traverses (including peak run)							
	Relative horizontal displacement							mm
	Shear stress							kPa
	Vertical movement at residual shear stress*							mm



Shear Strength Parameters

Peak strength, (o)		Regression	Manual
c '	kPa	37	-
Ø '	degrees	40	-

Residual strength, (x)

c 'R	kPa	[0.0]	-
Ø 'R	degrees	[ ]	-

Remarks :

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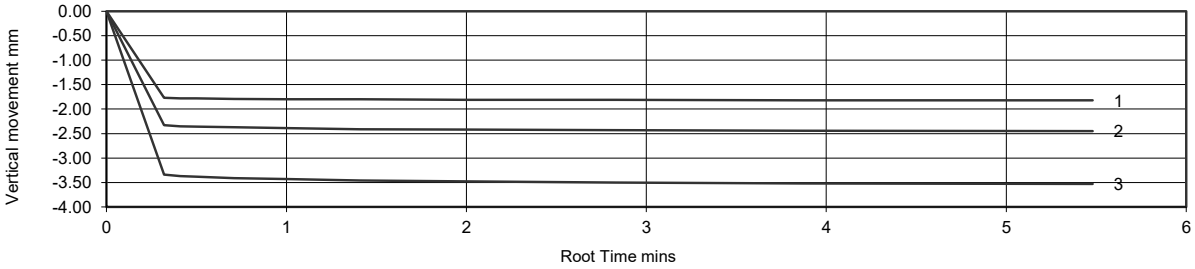
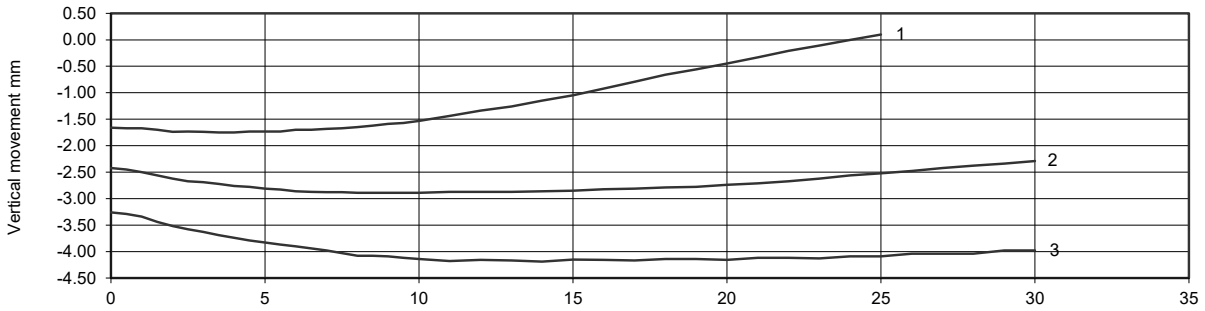
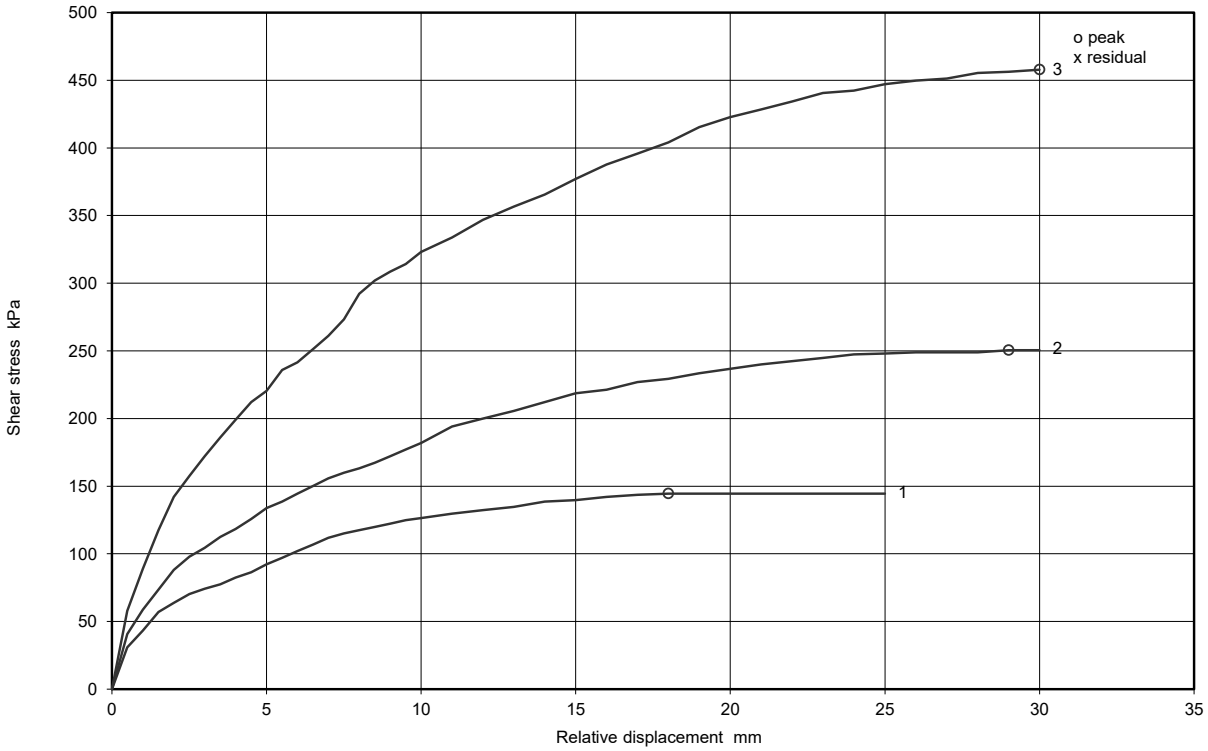
	Determination of shear strength using the Large Shear Box Apparatus			Job Ref	33610
				Borehole/Pit No.	BH111
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Soil Description	Grey slightly silty sandy GRAVEL with occasional cobbles (gravel is sub-angular to sub-rounded)			Depth m	13.50
				Sample Type	B
Project No.	2111006.005	Client	TEC	Date of Test	18/08/2023

Consolidation stage(s)



Shearing stage(s)





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Determination of shear strength using the Small Shear Box Apparatus

Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Soil Description	Dark grey organic silty SAND			Depth m	4.00
				Sample Type	B
Project No.	2111006.005	Client	TEC	Sample received	14/06/2023
				Schedule received	19/06/2023
Test Method	BS1377 : Part 7 : 1990, clause 4			Date test started	04/08/2023
Preparation Details	Material tamped in as received			Date completed	08/08/2023

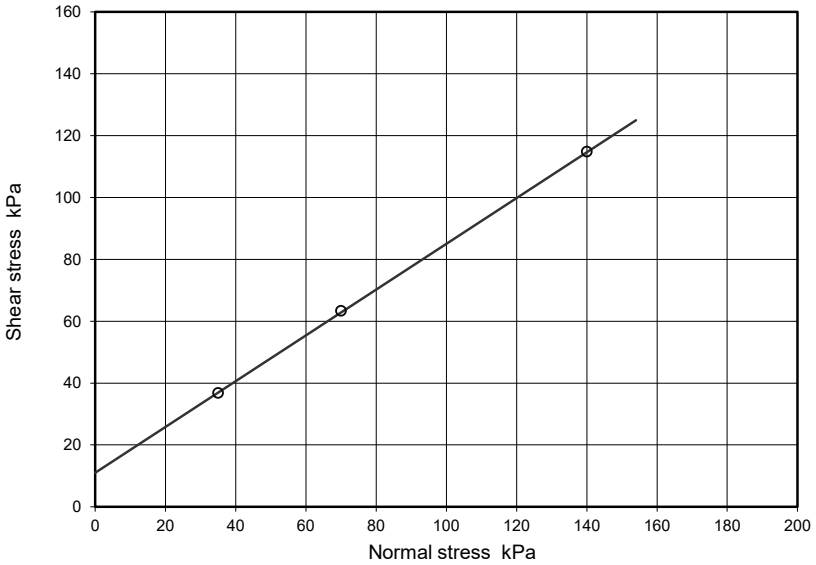
Job Ref	33610
Borehole/Pit No.	BH112

Test Condition: Submerged Particle Density: measured 2.63 Mg/m3

Specimen Details	Test No.	1	2	3				
Initial	Height	20.0	20.0	20.0				mm
	Bulk Density	1.83	1.84	1.83				Mg/m³
	Moisture Content	34	34	34				%
	Dry density	1.37	1.38	1.37				Mg/m³
	Voids ratio	0.920	0.906	0.920				
	Degree of Saturation	96	98	96				%
Consolidation	Consolidation / Normal Stress applied	**35**	**70**	**140**				kPa
	Change in height during consolidation*	-0.257	-0.537	-1.118				mm
	Voids ratio after consolidation	0.895	0.855	0.813				
After test	Final Moisture content	30	30	29				

Shearing stage(s)

Rate of displacement	Peak	0.01000	0.01000	0.01000				mm/min
	Residual							mm/min
Peak values, (o)	Relative horizontal displacement	3.73	3.61	5.30				mm
	Shear stress	36.8	63.3	114.8				kPa
	Vertical Movement at peak shear stress*	-0.10	-0.50	-1.29				mm
Residual values, (x)	No. of traverses (including peak run)							
	Relative horizontal displacement							mm
	Shear stress							kPa
	Vertical movement at residual shear stress*							mm



Shear Strength Parameters

Peak strength, (o)		Regression	Manual
c '	kPa	11	-
Ø '	degrees	36.5	-

Residual strength, (x)			
c 'R	kPa	[0.0]	-
Ø 'R	degrees	[ ]	-

Remarks :

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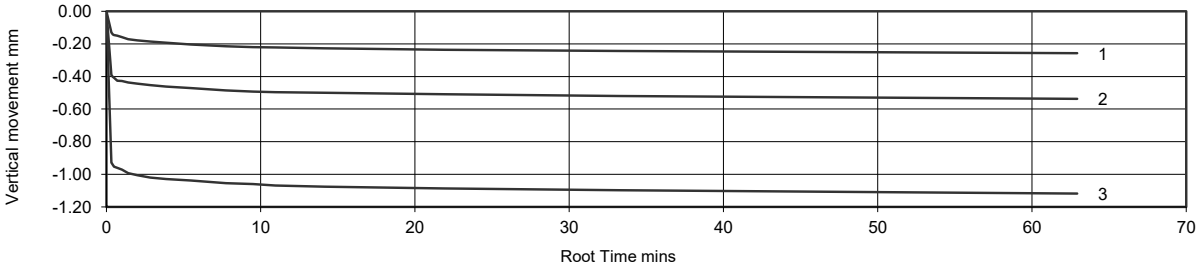
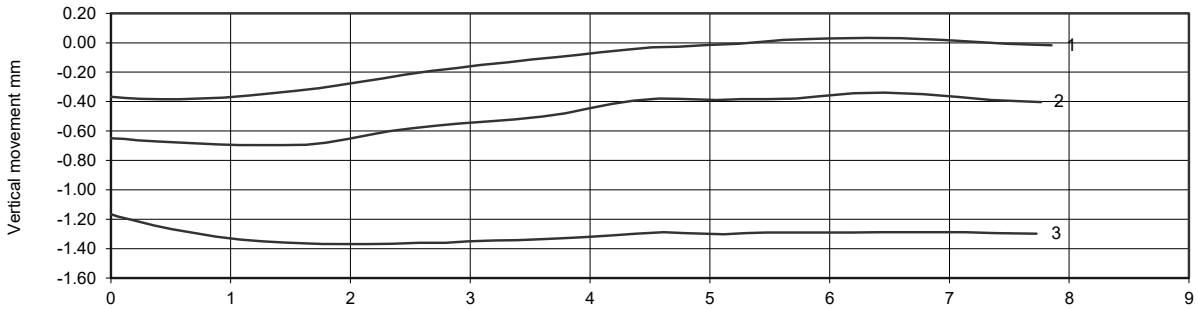
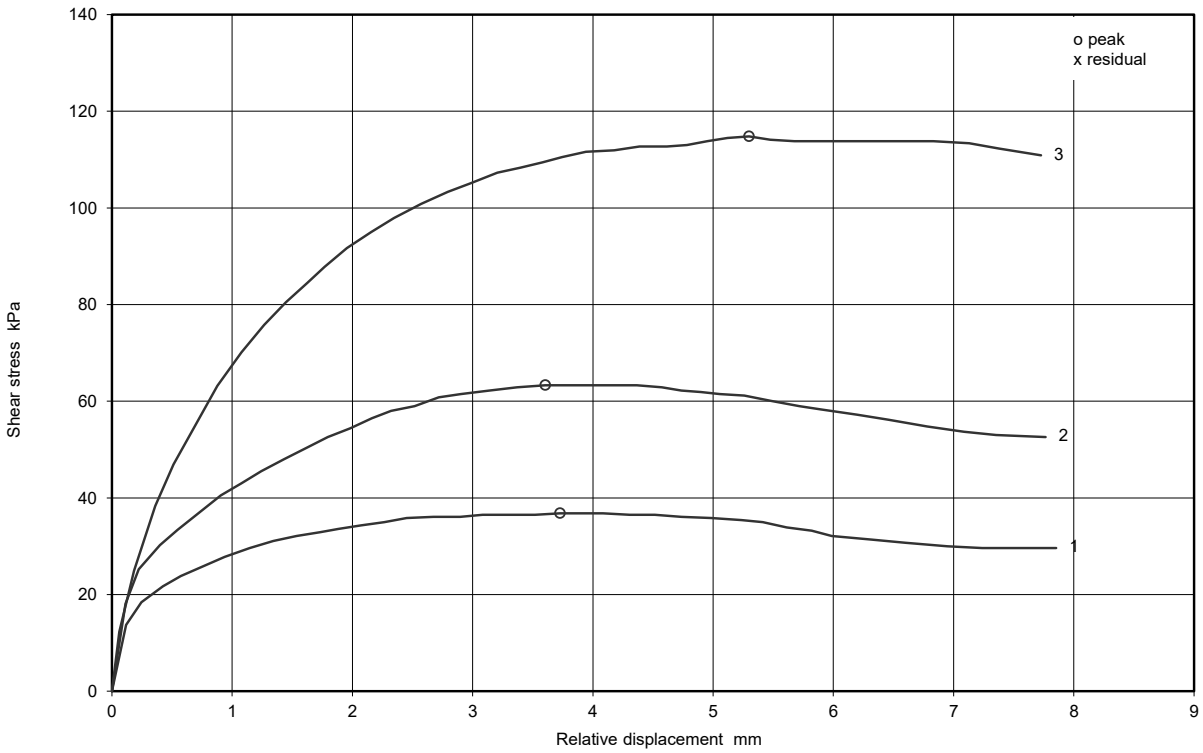
	Determination of shear strength using the Small Shear Box Apparatus			Job Ref	33610
				Borehole/Pit No.	BH112
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Soil Description	Dark grey organic silty SAND			Depth m	4.00
				Sample Type	B
Project No.	2111006.005	Client	TEC	Date of Test	04/08/2023

Consolidation stage(s)



Shearing stage(s)





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Determination of shear strength using the Large Shear Box Apparatus

Job Ref	33610				
Borehole/Pit No.	BH113				
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Soil Description	Grey slightly silty sandy GRAVEL (gravel is fmc and sub-rounded to rounded)			Depth m	13.50
				Sample Type	B
Project No.	2111006.005	Client	TEC	Sample received	14/06/2023
				Schedule received	19/06/2023
Test Method	BS1377 : Part 7 : 1990, clause 5			Date test started	15/08/2023
Preparation Details	Material tamped in as received			Date completed	15/08/2023

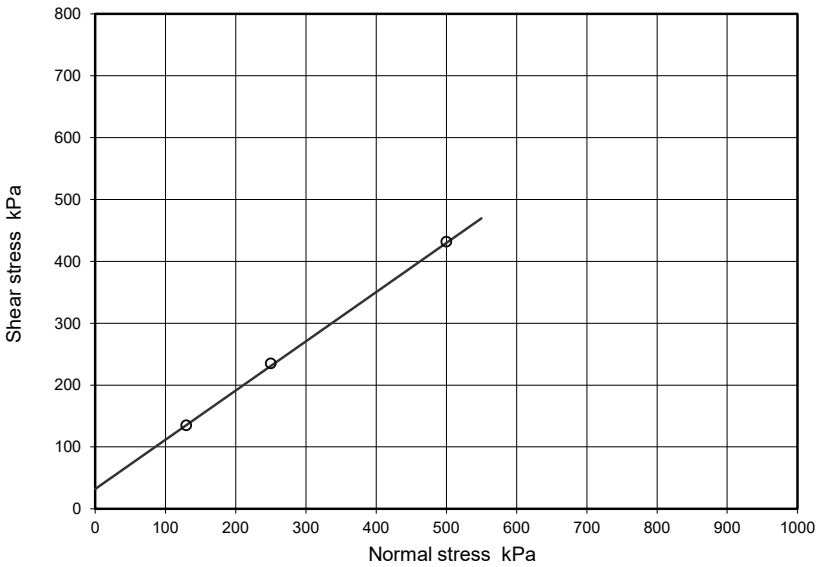
Test Condition: Dry Particle Density: assumed 2.67 Mg/m3

Specimen Details

		Test No. 1	2	3				
Initial	Height	90.0	90.0	90.0				mm
	Bulk Density	1.99	1.99	1.99				Mg/m³
	Moisture Content	8.8	8.8	8.8				%
	Dry density	1.83	1.83	1.83				Mg/m³
	Voids ratio	0.459	0.459	0.459				
	Degree of Saturation	51	51	51				%
Consolidation	Consolidation / Normal Stress applied	**130**	**250**	**500**				kPa
	Change in height during consolidation*	-2.610	-3.140	-4.150				mm
	Voids ratio after consolidation	0.417	0.408	0.392				
After test	Final Moisture content	7.9	7.9	8.0				

Shearing stage(s)

Rate of displacement	Peak	1.00000	1.00000	1.00000				mm/min
	Residual							mm/min
Peak values, (o)	Relative horizontal displacement	22.00	25.00	30.00				mm
	Shear stress	134.7	235.0	431.7				kPa
	Vertical Movement at peak shear stress*	-2.32	-3.36	-5.32				mm
Residual values, (x)	No. of traverses (including peak run)							
	Relative horizontal displacement							mm
	Shear stress							kPa
	Vertical movement at residual shear stress*							mm



Shear Strength Parameters

Peak strength, (o)		Regression	Manual
c '	kPa	32	-
Ø '	degrees	38.5	-

Residual strength, (x)			
c 'R	kPa	[0.0]	-
Ø 'R	degrees	[ ]	-

Remarks :

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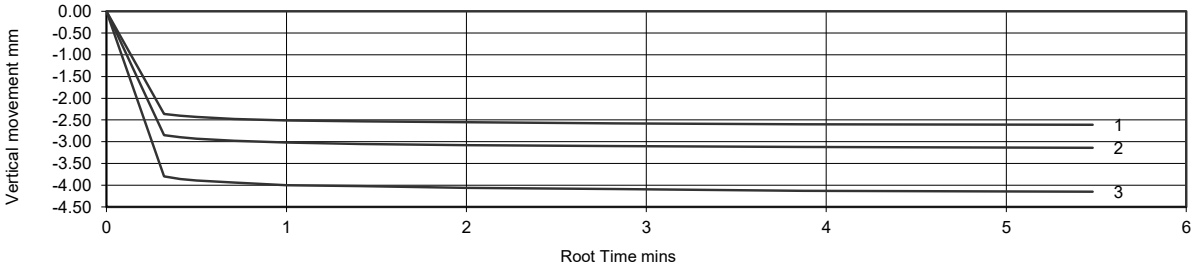
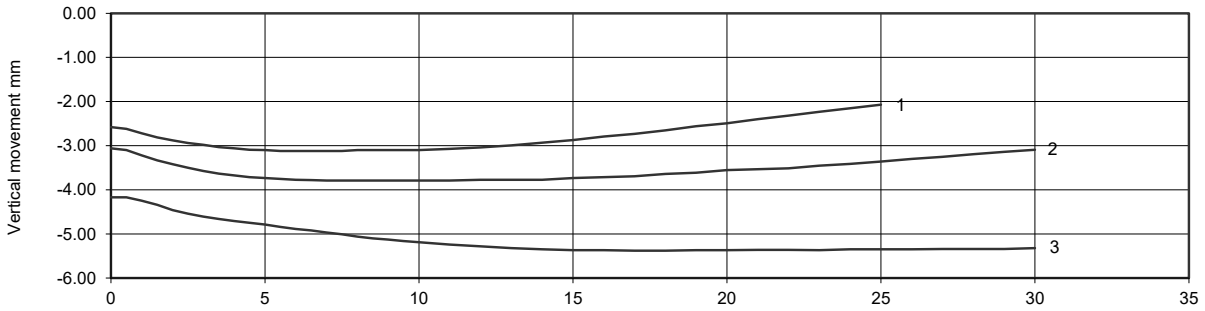
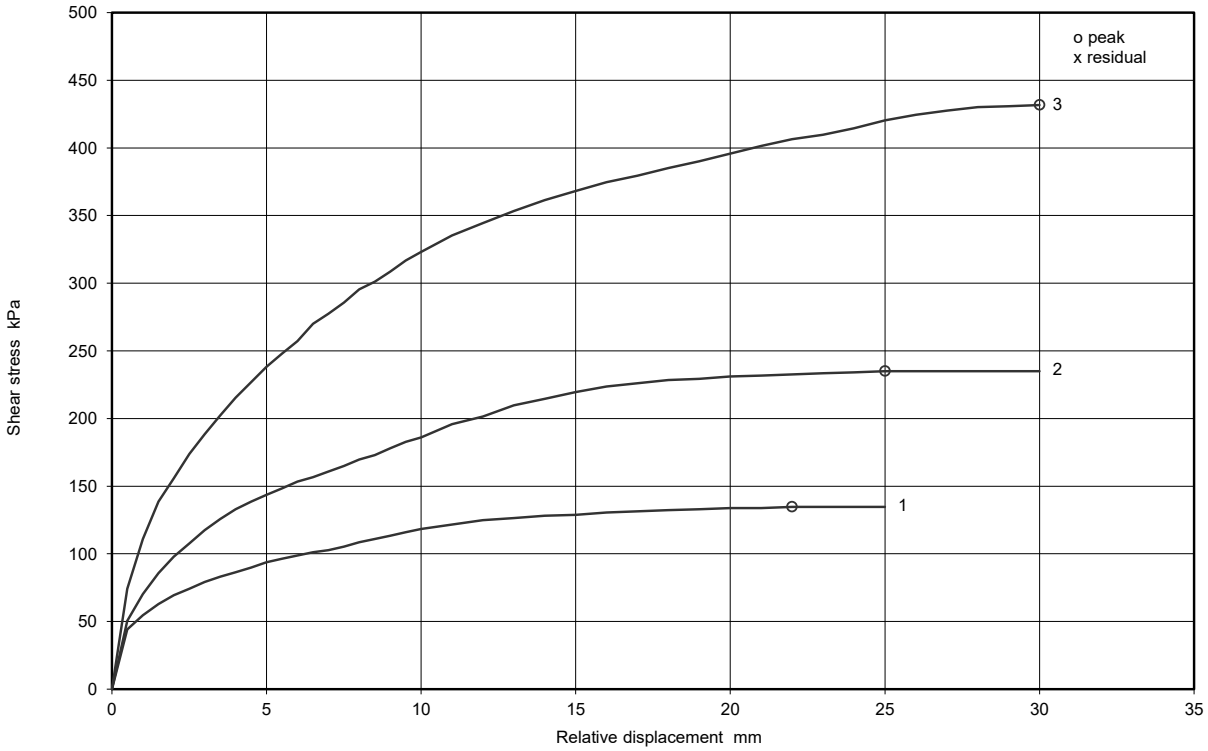
	Determination of shear strength using the Large Shear Box Apparatus			Job Ref	33610
				Borehole/Pit No.	BH113
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Soil Description	Grey slightly silty sandy GRAVEL (gravel is fmc and sub-rounded to rounded)			Depth m	13.50
				Sample Type	B
Project No.	2111006.005	Client	TEC	Date of Test	15/08/2023

Consolidation stage(s)



Shearing stage(s)





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Determination of shear strength using the Small Shear Box Apparatus

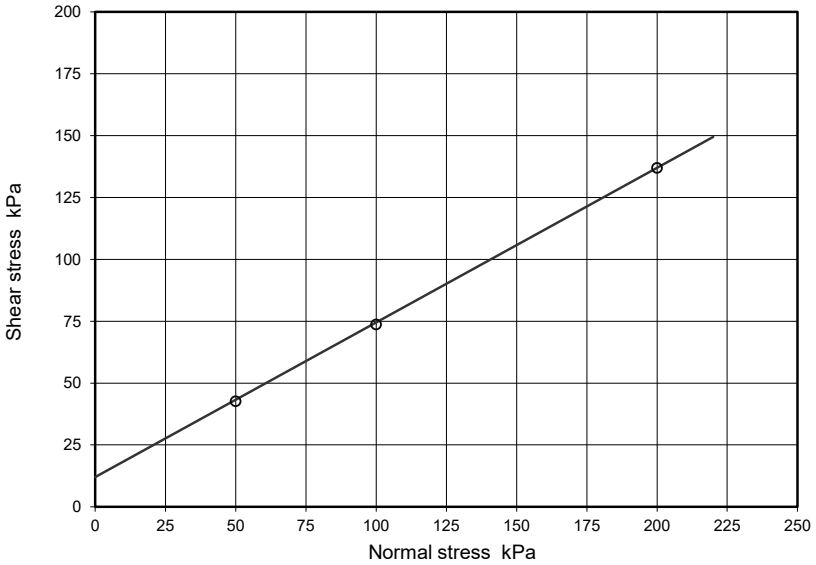
Job Ref	33610				
Borehole/Pit No.	BH115				
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Soil Description	Dark grey and brown slightly gravelly slightly sandy organic silty CLAY with occasional roots and rootlets (gravel is fmc and sub-angular)			Depth m	5.00
				Sample Type	B
Project No.	2111006.005	Client	TEC	Sample received	14/06/2023
				Schedule received	19/06/2023
Test Method	BS1377 : Part 7 : 1990, clause 4			Date test started	10/07/2023
Preparation Details	Tamped in as received			Date completed	11/07/2023

Test Condition: Submerged Particle Density: assumed 2.67 Mg/m3

Specimen Details		Test No.	1	2	3				
Initial	Height		20.0	20.0	20.0				mm
	Bulk Density		1.73	1.75	1.73				Mg/m³
	Moisture Content		47	47	47				%
	Dry density		1.18	1.19	1.18				Mg/m³
	Voids ratio		1.263	1.244	1.263				
	Degree of Saturation		100	101	100				%
Consolidation	Consolidation / Normal Stress applied		**50**	**100**	**200**				kPa
	Change in height during consolidation*		-2.351	-3.177	-3.711				mm
	Voids ratio after consolidation		0.997	0.888	0.843				
After test	Final Moisture content		35	33	30				

Shearing stage(s)

Rate of displacement	Peak	0.00900	0.00900	0.00900				mm/min
	Residual							mm/min
Peak values, (o)	Relative horizontal displacement	6.55	7.50	6.83				mm
	Shear stress	42.6	73.6	136.9				kPa
	Vertical Movement at peak shear stress*	-2.90	-3.87	-4.48				mm
Residual values, (x)	No. of traverses (including peak run)							
	Relative horizontal displacement							mm
	Shear stress							kPa
	Vertical movement at residual shear stress*							mm



Shear Strength Parameters

Peak strength, (o)		Regression	Manual
c '	kPa	12	-
Ø '	degrees	32	-

Residual strength, (x)			
c 'R	kPa	[0.0]	-
Ø 'R	degrees	[ ]	-

Remarks :

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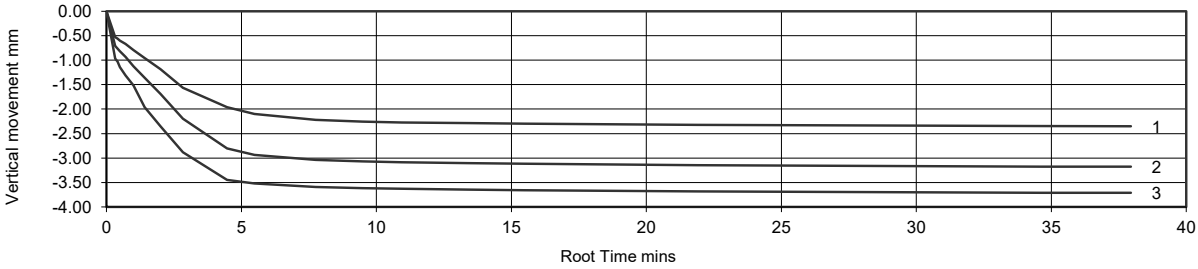
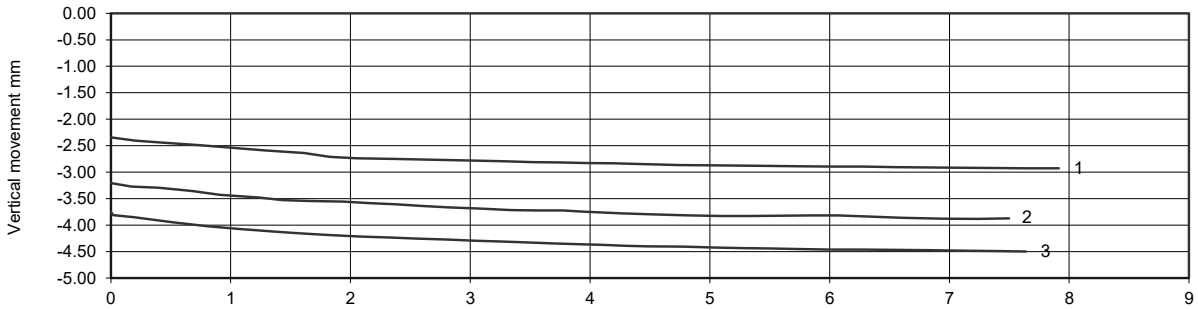
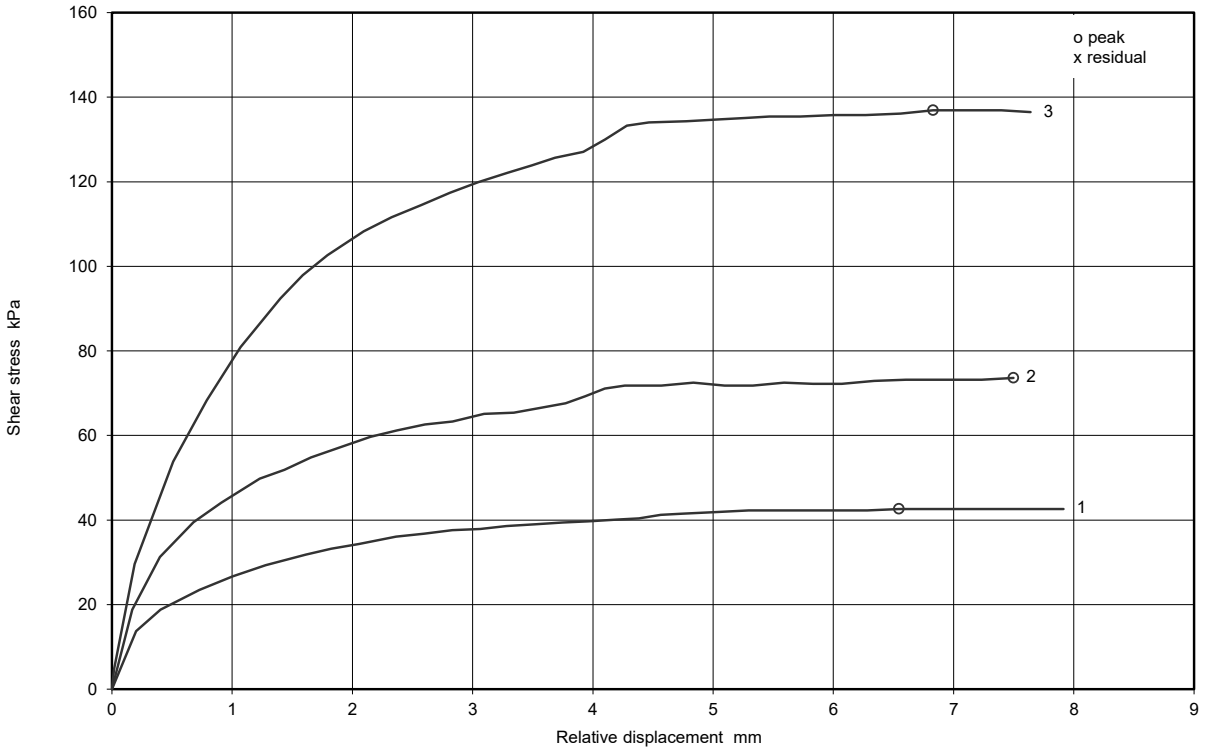
	Determination of shear strength using the Small Shear Box Apparatus			Job Ref	33610
				Borehole/Pit No.	BH115
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Soil Description	Dark grey and brown slightly gravelly slightly sandy organic silty CLAY with occasional roots and rootlets (gravel is fmc and sub-angular)			Depth m	5.00
				Sample Type	B
Project No.	2111006.005	Client	TEC	Date of Test	10/07/2023

Consolidation stage(s)



Shearing stage(s)





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Determination of shear strength using the Small Shear Box Apparatus

Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Soil Description	Greyish brown slightly sandy silty CLAY			Depth m	7.50
				Sample Type	B
Project No.	2111006.005	Client	TEC	Sample received	14/06/2023
				Schedule received	19/06/2023
Test Method	BS1377 : Part 7 : 1990, clause 4			Date test started	13/07/2023
Preparation Details	Tamped in as received			Date completed	18/07/2023

Job Ref: 33610

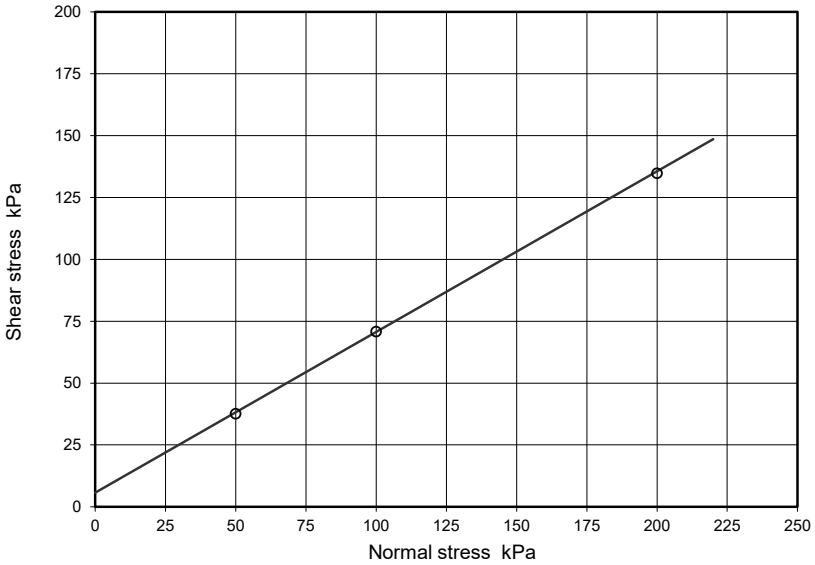
Borehole/Pit No.: BH116

Test Condition: Submerged Particle Density: assumed 2.7 Mg/m3

Specimen Details	Test No.	1	2	3				
Initial	Height	20.0	20.0	20.0				mm
	Bulk Density	1.80	1.80	1.80				Mg/m³
	Moisture Content	46	46	46				%
	Dry density	1.24	1.24	1.24				Mg/m³
	Voids ratio	1.177	1.177	1.177				
	Degree of Saturation	105	105	105				%
Consolidation	Consolidation / Normal Stress applied	**50**	**100**	**200**				kPa
	Change in height during consolidation*	-3.232	-3.416	-4.255				mm
	Voids ratio after consolidation	0.825	0.805	0.714				
After test	Final Moisture content	33	30	28				

Shearing stage(s)

Rate of displacement	Peak	0.00750	0.00750	0.00750				mm/min
	Residual							mm/min
Peak values, (o)	Relative horizontal displacement	5.44	7.44	6.02				mm
	Shear stress	37.6	70.8	134.7				kPa
	Vertical Movement at peak shear stress*	-3.82	-4.16	-4.96				mm
Residual values, (x)	No. of traverses (including peak run)							
	Relative horizontal displacement							mm
	Shear stress							kPa
	Vertical movement at residual shear stress*							mm



Shear Strength Parameters

Peak strength, (o)		Regression	Manual
c '	kPa	5.7	-
Ø '	degrees	33	-

Residual strength, (x)			
c 'R	kPa	[0.0]	-
Ø 'R	degrees	[ ]	-

Remarks :

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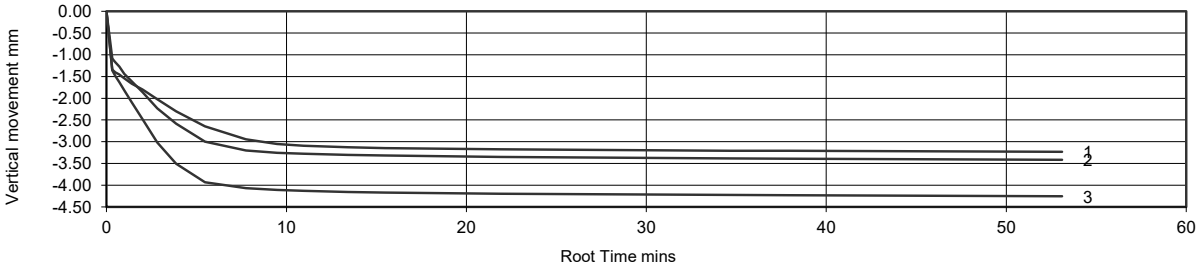
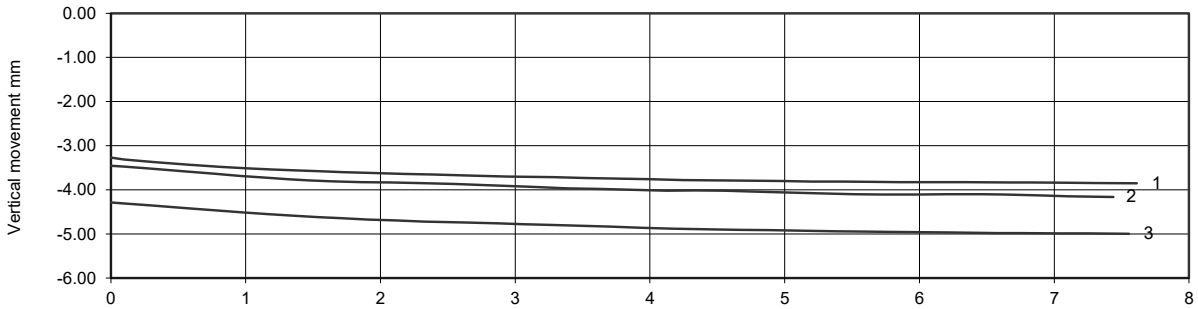
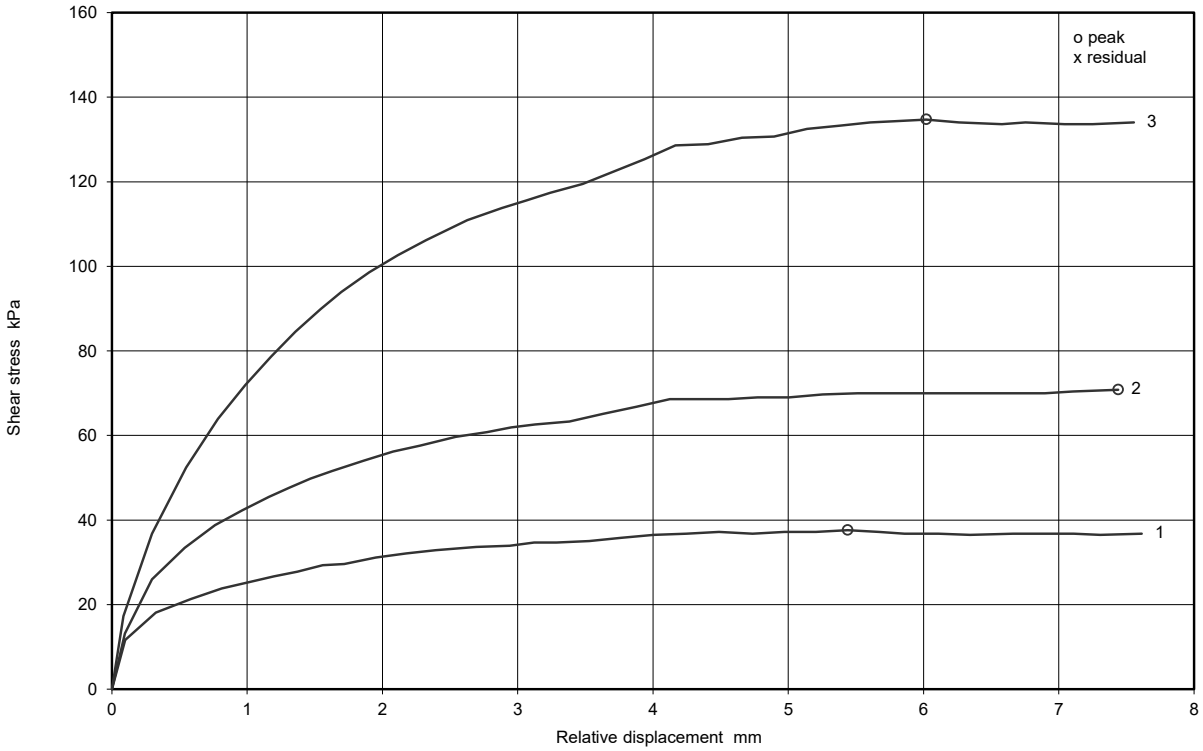
	Determination of shear strength using the Small Shear Box Apparatus			Job Ref	33610
				Borehole/Pit No.	BH116
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Soil Description	Greyish brown slightly sandy silty CLAY			Depth m	7.50
				Sample Type	B
Project No.	2111006.005	Client	TEC	Date of Test	13/07/2023

Consolidation stage(s)



Shearing stage(s)





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Date 26/07/2023

UKAS TESTING 2519

Approved Signatories: K.Phaure (Tech.Mgr) J.Phaure (Lab.Mgr)

Determination of shear strength using the Large Shear Box Apparatus

Job Ref	33610				
Borehole/Pit No.	BH120				
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Soil Description	Grey slightly clayey sandy GRAVEL with occasional cobbles (gravel is fmc and sub-angular to rounded)			Depth m	16.50 - 18.50
				Sample Type	B
Project No.	2111006.005	Client	TEC	Sample received	14/06/2023
				Schedule received	19/06/2023
Test Method	BS1377 : Part 7 : 1990, clause 5			Date test started	08/08/2023
Preparation Details	Compacted in as received			Date completed	09/08/2023

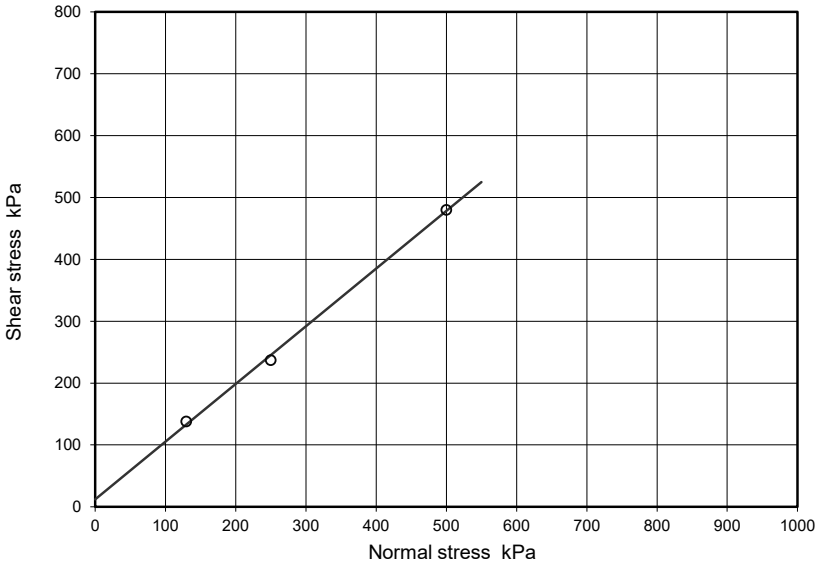
Test Condition: Dry Particle Density: measured 2.7 Mg/m3

Specimen Details

		Test No. 1	2	3				
Initial	Height	120.0	120.0	120.0				mm
	Bulk Density	2.03	2.03	2.03				Mg/m³
	Moisture Content	6.6	6.6	6.6				%
	Dry density	1.90	1.90	1.90				Mg/m³
	Voids ratio	0.421	0.421	0.421				
	Degree of Saturation	42	42	42				%
Consolidation	Consolidation / Normal Stress applied	**130**	**250**	**500**				kPa
	Change in height during consolidation*	-1.170	-1.960	-2.760				mm
	Voids ratio after consolidation	0.407	0.398	0.388				
After test	Final Moisture content	5.9	5.9	6				

Shearing stage(s)

Rate of displacement	Peak	1.00000	1.00000	1.00000				mm/min
	Residual							mm/min
Peak values, (o)	Relative horizontal displacement	7.50	14.00	19.00				mm
	Shear stress	137.9	236.7	479.9				kPa
	Vertical Movement at peak shear stress*	-0.54	-1.55	-2.47				mm
Residual values, (x)	No. of traverses (including peak run)							
	Relative horizontal displacement							mm
	Shear stress							kPa
	Vertical movement at residual shear stress*							mm



Shear Strength Parameters

Peak strength, (o)		Regression	Manual
c '	kPa	12	-
Ø '	degrees	43	-

Residual strength, (x)			
c 'R	kPa	[0.0]	-
Ø 'R	degrees	[ ]	-

Remarks :

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Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU
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Initials K.P.
1
Date 30/08/2023

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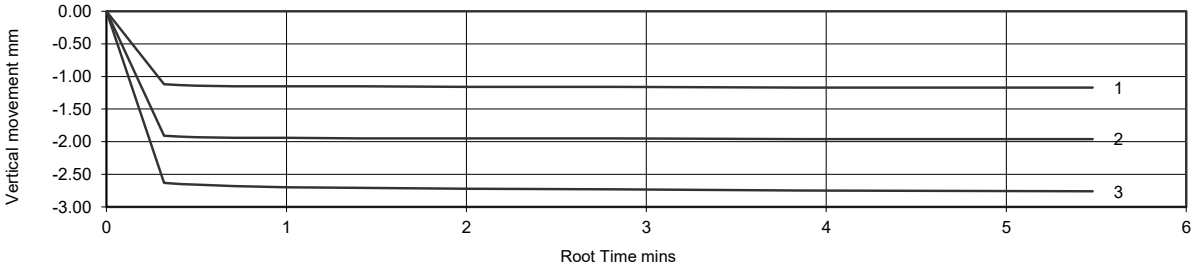
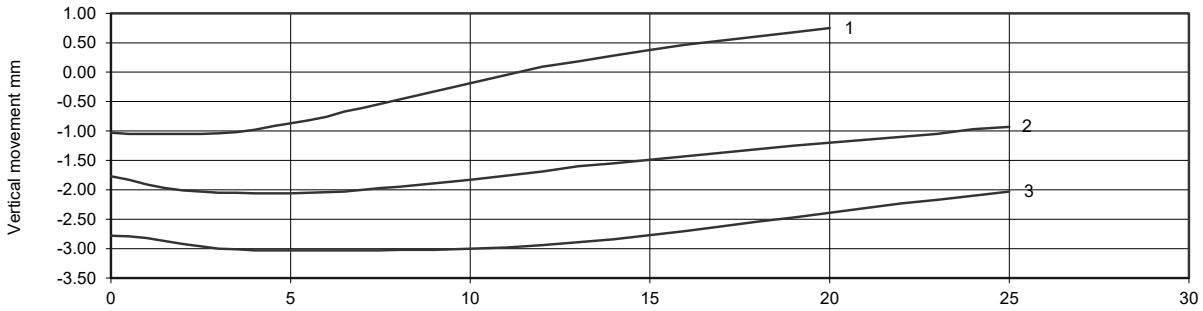
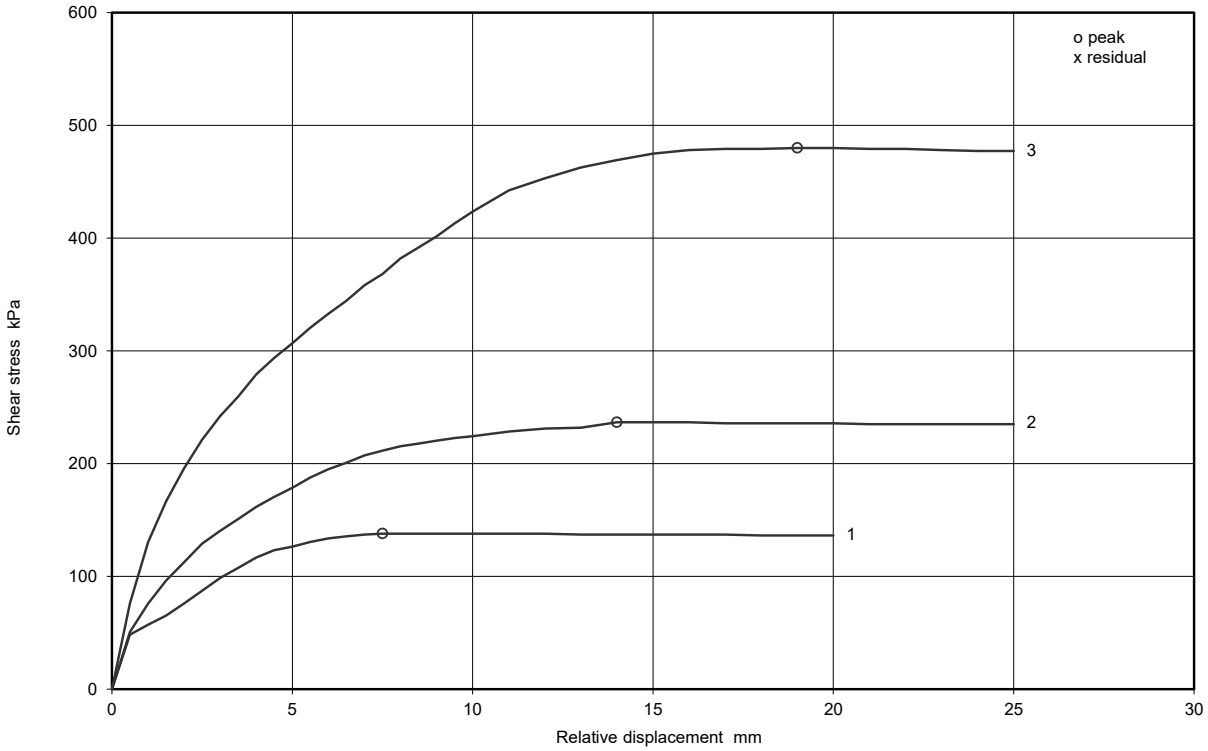
	Determination of shear strength using the Large Shear Box Apparatus			Job Ref	33610
				Borehole/Pit No.	BH120
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Soil Description	Grey slightly clayey sandy GRAVEL with occasional cobbles (gravel is fmc and sub-angular to rounded)			Depth m	16.50 - 18.50
				Sample Type	B
Project No.	2111006.005	Client	TEC	Date of Test	08/08/2023

Consolidation stage(s)



Shearing stage(s)





*Note : Vertical movement/change in height is recorded as negative for reduced height (settlement) and positive for increased height (swell).

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Determination of shear strength using the Small Shear Box Apparatus

Job Ref	33610				
Borehole/Pit No.	CHST102A				
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Soil Description	Brown SAND with rare fm angular gravel			Depth m	1.60
				Sample Type	B
Project No.	2111006.005	Client	TEC	Sample received	14/06/2023
				Schedule received	19/06/2023
Test Method	BS1377 : Part 7 : 1990, clause 4			Date test started	20/07/2023
Preparation Details	Tamped in as received			Date completed	21/07/2023

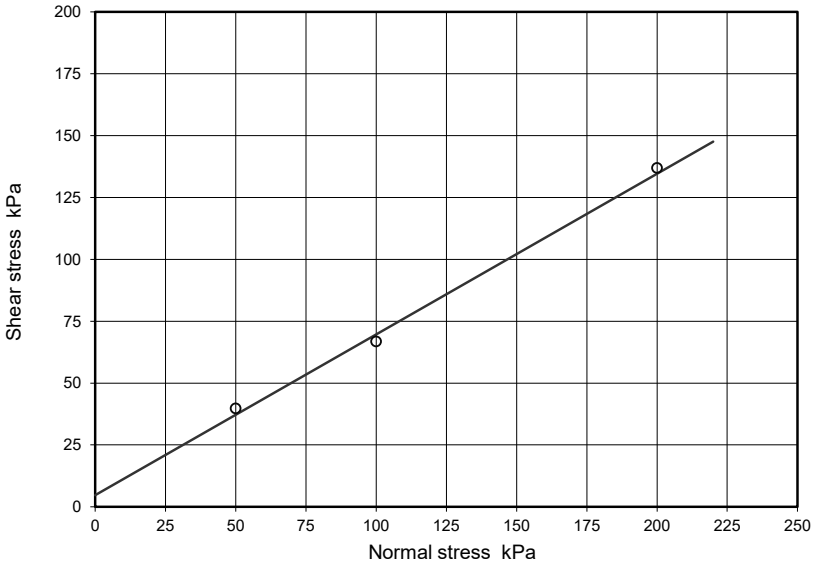
Test Condition: Submerged Particle Density: measured 2.71 Mg/m3

Specimen Details

		Test No. 1	2	3				
Initial	Height	20.0	20.0	20.0				mm
	Bulk Density	1.84	1.84	1.85				Mg/m³
	Moisture Content	20	20	20				%
	Dry density	1.54	1.54	1.55				Mg/m³
	Voids ratio	0.760	0.760	0.748				
	Degree of Saturation	70	70	71				%
Consolidation	Consolidation / Normal Stress applied	**50**	**100**	**200**				kPa
	Change in height during consolidation*	-0.676	-0.775	-0.952				mm
	Voids ratio after consolidation	0.701	0.692	0.665				
After test	Final Moisture content	23	22	22				

Shearing stage(s)

Rate of displacement	Peak	0.01500	0.01500	0.01500				mm/min
	Residual							mm/min
Peak values, (o)	Relative horizontal displacement	6.76	4.64	3.26				mm
	Shear stress	39.7	66.8	136.9				kPa
	Vertical Movement at peak shear stress*	-0.69	-0.91	-1.06				mm
Residual values, (x)	No. of traverses (including peak run)							
	Relative horizontal displacement							mm
	Shear stress							kPa
	Vertical movement at residual shear stress*							mm



Shear Strength Parameters

Peak strength, (o)		Regression	Manual
c '	kPa	4.7	-
Ø '	degrees	33	-

Residual strength, (x)			
c 'R	kPa	[0.0]	-
Ø 'R	degrees	[ ]	-

Remarks :

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Unit 8 Olds Close Olds Approach Watford Herts WD18 9RU
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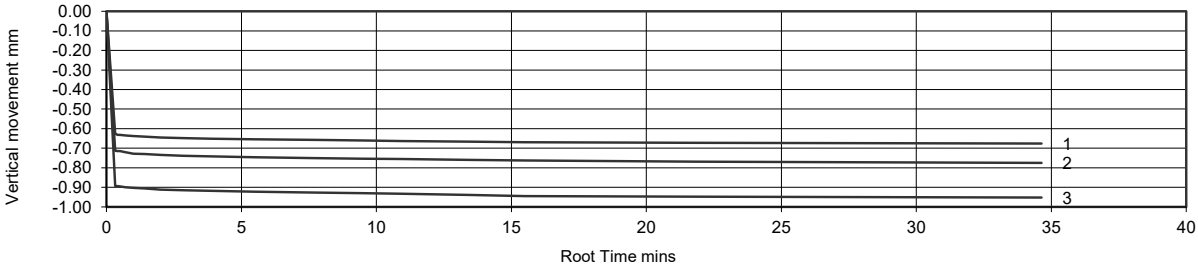
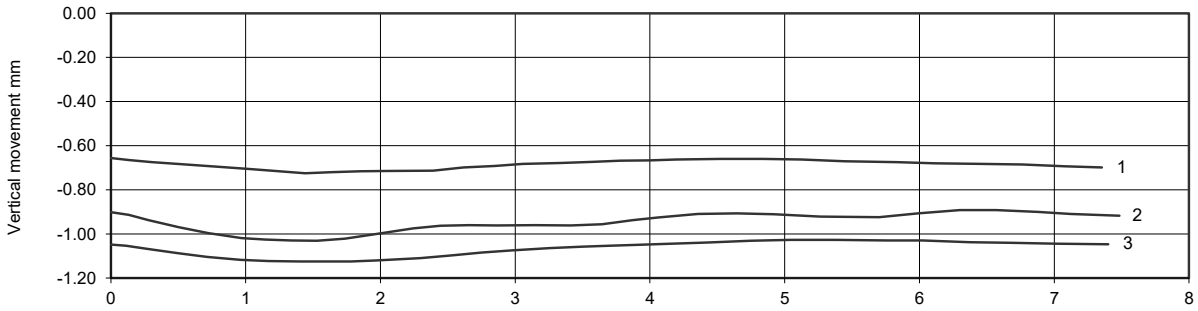
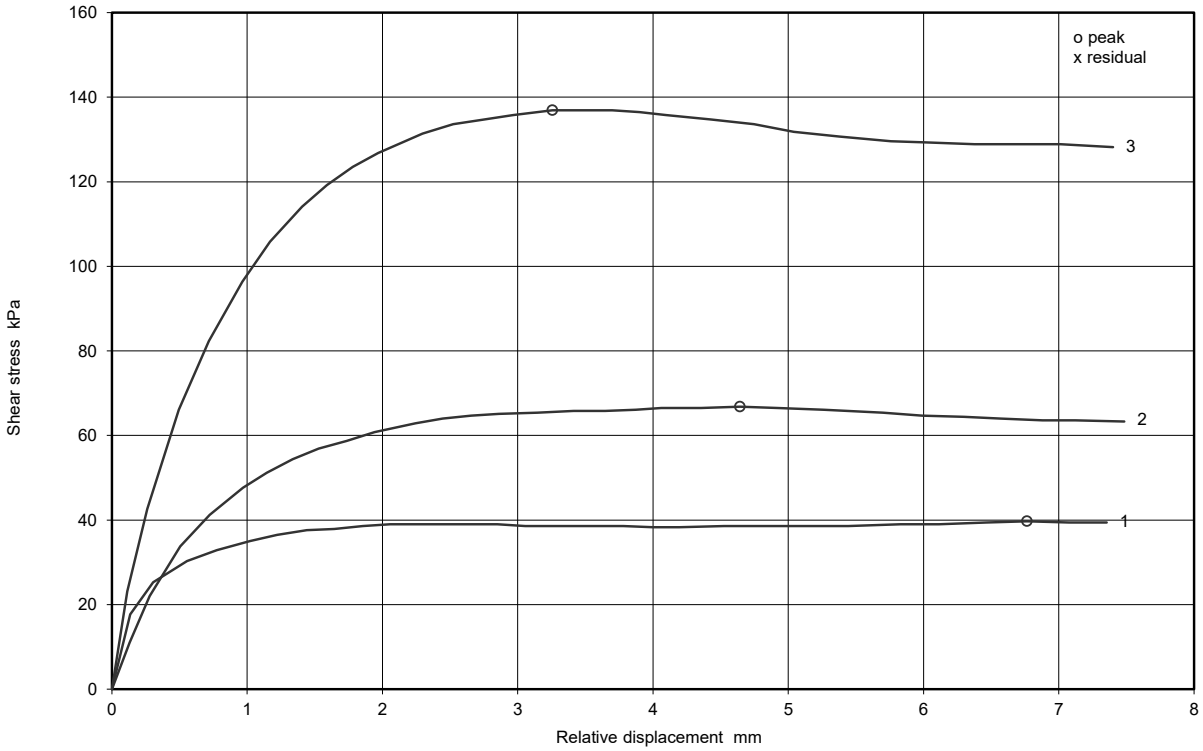
	Determination of shear strength using the Small Shear Box Apparatus			Job Ref	33610
				Borehole/Pit No.	CHST102A
Site Name	Phoenix Wharf, Port Talbot			Sample No.	-
Soil Description	Brown SAND with rare fm angular gravel			Depth m	1.60
				Sample Type	B
Project No.	2111006.005	Client	TEC	Date of Test	20/07/2023

Consolidation stage(s)



Shearing stage(s)





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2683

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	23-47955
Issue:	1
Date of Issue:	12/05/2023
Contact:	Reinier van der Kuip
Customer Details:	TEC The Old Chapel 35A Southover Wells SomersetBA5 1UH
Quotation No:	Q22-03427
Order No:	2111006.005
Customer Reference:	2111006.005
Date Received:	04/05/2023
Date Approved:	12/05/2023
Details:	Phoenix Wharf, Port Talbot
Approved by:	

Tim Reeve, Quality Officer

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683

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Sample Summary

Report No.: 23-47955, issue number 1

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
320703	TP118 1.50	26/04/2023	04/05/2023	Loamy sand	
320704	TP122 1.50	26/04/2023	04/05/2023	Sand	
320705	TP123 1.80	26/04/2023	04/05/2023	Loamy sand	
320706	BH101 4.00	27/03/2023	04/05/2023	Silty clayey loam	fg
320707	BH101 11.00	28/03/2023	04/05/2023	Silty loam	fg
320708	BH102 2.00	03/04/2023	04/05/2023	Sand	f
320709	BH102 4.00	04/04/2023	04/05/2023	Silty clayey loam	f
320710	BH102 14.00	04/04/2023	04/05/2023	Silty clayey loam	f
320711	BH103 5.00	19/04/2023	04/05/2023	Sandy clayey loam	
320712	BH103 11.00	19/04/2023	04/05/2023	Peat	
320713	BH104 3.00	06/04/2023	04/05/2023	Sand	
320714	BH104 15.50	11/04/2023	04/05/2023	Sandy clayey loam	
320715	BH105 12..	29/04/2023	04/05/2023	Silty clayey loam	
320716	BH106 6.20	21/03/2023	04/05/2023	Silty clayey loam	fg
320717	BH106 12.00	22/03/2023	04/05/2023	Loamy sand	fg
320718	BH106 16.00	22/03/2023	04/05/2023	Sand	fg
320719	BH113 2.00	25/04/2023	04/05/2023	Sandy loam	
320720	BH113 6.50	25/04/2023	04/05/2023	Silty clayey loam	
320721	BH113 11.00	26/04/2023	04/05/2023	Silty clayey loam	
320722	BH113 12.50	26/04/2023	04/05/2023	Loamy sand	
320723	BH115 8.00	26/04/2023	04/05/2023	Silty clayey loam	
320724	BH115 19.50	26/04/2023	04/05/2023	Silty loam	
320725	BH117 4.00	14/04/2023	04/05/2023	Silty clayey loam	
320726	BH117 12.10	17/04/2023	04/05/2023	Sand	
320727	BH118 5.00	04/04/2023	04/05/2023	Loamy sand	f
320728	BH118 11.50	05/04/2023	04/05/2023	Silty loam	f
320729	BH118 14.50	05/04/2023	04/05/2023	Sand	f
320730	BH119 6.00	19/04/2023	04/05/2023	Loamy sand	
320731	BH119 9.00	20/04/2023	04/05/2023	Sand	
320732	BH119 10.00	20/04/2023	04/05/2023	Silty loam	
320733	BH116 3.00	13/04/2023	04/05/2023		
320734	BH116 3.90 - 4.10	13/04/2023	04/05/2023		
320735	BH116 14.00	14/04/2023	04/05/2023		

Results Summary

Report No.: 23-47955, issue number 1

			ELAB Reference	320703	320704	320705	320706	320707	320708	320709	320710
			Customer Reference								
			Sample ID								
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sample Location	TP118	TP122	TP123	BH101	BH101	BH102	BH102	BH102
			Sample Depth (m)	1.50	1.50	1.80	4.00	11.00	2.00	4.00	14.00
			Sampling Date	26/04/2023	26/04/2023	26/04/2023	27/03/2023	28/03/2023	03/04/2023	04/04/2023	04/04/2023
Determinand	**Codes**	**Units**	**LOD**								
Soil sample preparation parameters											
Moisture Content	N	%	0.1	26.0	16.3	9.1	29.8	28.6	15.6	21.7	27.7
Material removed	N	%	0.1	45.1	10.7	53.7	31.3	8.6	24.5	15.8	29.8
Description of Inert material removed	N		0	stones, clinker	stones	Stones	Stones	Stones	Stones, wood	stones	Stones
Metals											
Water Soluble Magnesium	N	mg/l	0.1	1.3	0.2	0.3	n/t	n/t	f 0.2	f 0.8	n/t
Anions											
Water Soluble Chloride	M	mg/l	20	< 20	< 20	< 20	n/t	n/t	f < 20	f < 20	n/t
Water Soluble Nitrate	M	mg/l	20	< 20	< 20	< 20	n/t	n/t	f < 20	f < 20	n/t
Water Soluble Sulphate	M	mg/l	20	122	31	53	fg 516	fg 198	f < 20	f 197	f 358
Inorganics											
Total Sulphur	N	%	0.01	0.67	0.05	1.7	fg 1.0	fg 0.48	f 0.05	f 0.72	f 0.47
Acid Soluble Sulphate (SO4)	U	%	0.02	1.43	0.03	0.03	fg 0.15	fg 0.08	f < 0.02	f 0.06	f 0.08
Miscellaneous											
pH	M	pH units	0.1	8.3	9.0	8.9	fg 7.9	fg 8.8	f 8.5	f 8.0	f 8.1

Results Summary

Report No.: 23-47955, issue number 1

			ELAB Reference	320711	320712	320713	320714	320715	320716	320717	320718
			Customer Reference								
			Sample ID								
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sample Location	BH103	BH103	BH104	BH104	BH105	BH106	BH106	BH106
			Sample Depth (m)	5.00	11.00	3.00	15.50	12..	6.20	12.00	16.00
			Sampling Date	19/04/2023	19/04/2023	06/04/2023	11/04/2023	29/04/2023	21/03/2023	22/03/2023	22/03/2023
Determinand	**Codes**	**Units**	**LOD**								
Soil sample preparation parameters											
Moisture Content	N	%	0.1	25.9	66.7	17.0	14.0	34.3	32.4	9.6	13.2
Material removed	N	%	0.1	17.7	22.9	12.8	5.0	21.1	27.5	23.1	39.6
Description of Inert material removed	N		0	stones	stones	stones	stones	stones	stones	stones	stones
Metals											
Water Soluble Magnesium	N	mg/l	0.1	0.4	25.0	n/t	n/t	15.9	f 1.8	n/t	n/t
Anions											
Water Soluble Chloride	M	mg/l	20	211	^ 3680	n/t	n/t	1060	fg 435	n/t	n/t
Water Soluble Nitrate	M	mg/l	20	49	46	n/t	n/t	47	fg 56	n/t	n/t
Water Soluble Sulphate	M	mg/l	20	118	^ 853	< 20	97	258	fg 192	fg 22	fg 56
Inorganics											
Total Sulphur	N	%	0.01	n/t	n/t	0.03	0.18	1.5	fg 0.34	fg 0.02	fg 0.03
Acid Soluble Sulphate (SO4)	U	%	0.02	n/t	n/t	< 0.02	< 0.02	0.16	fg 0.07	fg < 0.02	fg 1.39
Miscellaneous											
pH	M	pH units	0.1	8.7	^ 7.5	8.6	8.6	7.8	fg 8.8	fg 8.8	fg 8.4

Results Summary

Report No.: 23-47955, issue number 1

			ELAB Reference	320719	320720	320721	320722	320723	320724	320725
			Customer Reference							
			Sample ID							
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sample Location	BH113	BH113	BH113	BH113	BH115	BH115	BH117
			Sample Depth (m)	2.00	6.50	11.00	12.50	8.00	19.50	4.00
			Sampling Date	25/04/2023	25/04/2023	26/04/2023	26/04/2023	26/04/2023	26/04/2023	14/04/2023
Determinand	**Codes**	**Units**	**LOD**							
Soil sample preparation parameters										
Moisture Content	N	%	0.1	23.3	25.5	28.0	17.5	34.9	12.0	30.4
Material removed	N	%	0.1	31.0	29.8	36.6	19.7	20.3	25.5	47.3
Description of Inert material removed	N		0	stones, clinker	stones	stones	stones, clinker	stones	stones	stones, clinker
Metals										
Water Soluble Magnesium	N	mg/l	0.1	2.1	1.7	10.0	n/t	1.9	0.7	n/t
Anions										
Water Soluble Chloride	M	mg/l	20	36	954	2500	n/t	613	242	n/t
Water Soluble Nitrate	M	mg/l	20	34	63	53	n/t	48	39	n/t
Water Soluble Sulphate	M	mg/l	20	140	158	203	181	135	66	322
Inorganics										
Total Sulphur	N	%	0.01	0.60	n/t	n/t	1.5	0.41	0.07	0.09
Acid Soluble Sulphate (SO4)	U	%	0.02	0.10	n/t	n/t	0.05	0.07	< 0.02	0.10
Miscellaneous										
pH	M	pH units	0.1	9.2	8.6	8.4	8.2	8.8	8.5	8.0

Results Summary

Report No.: 23-47955, issue number 1

				ELAB Reference	320726	320727	320728	320729	320730	320731	320732
				Customer Reference							
				Sample ID							
				Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Sample Location	BH117	BH118	BH118	BH118	BH119	BH119	BH119
				Sample Depth (m)	12.10	5.00	11.50	14.50	6.00	9.00	10.00
				Sampling Date	17/04/2023	04/04/2023	05/04/2023	05/04/2023	19/04/2023	20/04/2023	20/04/2023
Determinand	**Codes**	**Units**	**LOD**								
Soil sample preparation parameters											
Moisture Content	N	%	0.1		9.7	24.8	30.5	11.5	18.6	9.7	50.3
Material removed	N	%	0.1		19.3	57.4	21.0	13.3	64.8	13.8	37.5
Description of Inert material removed	N		0		stones	stones	stones	stones	clinker	stones	stones
Metals											
Water Soluble Magnesium	N	mg/l	0.1		n/t	n/t	n/t	n/t	1.5	< 0.1	n/t
Anions											
Water Soluble Chloride	M	mg/l	20		n/t	n/t	n/t	n/t	43	45	n/t
Water Soluble Nitrate	M	mg/l	20		n/t	n/t	n/t	n/t	27	22	n/t
Water Soluble Sulphate	M	mg/l	20		35	f 25	f 508	f 36	287	99	1230
Inorganics											
Total Sulphur	N	%	0.01		0.02	f 0.05	f 1.4	f 0.02	1.1	0.02	2.0
Acid Soluble Sulphate (SO4)	U	%	0.02		< 0.02	f < 0.02	f 0.12	f < 0.02	0.06	< 0.02	0.24
Miscellaneous											
pH	M	pH units	0.1		8.9	f 8.1	f 8.1	f 8.9	8.2	8.8	7.7

Method Summary

Report No.: 23-47955, issue number 1

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
pH	M	Air dried sample	12/05/2023	113	Electromeric
Acid Soluble Sulphate	U	Air dried sample	12/05/2023	115	Ion Chromatography
W. Sol Metals	N	Air dried sample	12/05/2023	118	ICPMS
Water soluble anions	M	Air dried sample	11/05/2023	172	Ion Chromatography
Total organic carbon/Total sulphur	N	Air dried sample	11/05/2023	216	IR

Tests marked N are not UKAS accredited

Report Information

Report No.: 23-47955, issue number 1

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"
LOD	LOD refers to limit of detection, except in the case of pH soils and pH waters where it means limit of discrimination.
	Soil sample results are expressed on an air dried basis (dried at < 30°C), and are uncorrected for inert material removed.
	ELAB are unable to provide an interpretation or opinion on the content of this report.
	The results relate only to the sample received.
	PCB congener results may include any coeluting PCBs
	Uncertainty of measurement for the determinands tested are available upon request
	Unless otherwise stated, sample information has been provided by the client. This may affect the validity of the results.

Deviation Codes

a	No date of sampling supplied
b	No time of sampling supplied (Waters Only)
c	Sample not received in appropriate containers
d	Sample not received in cooled condition
e	The container has been incorrectly filled
f	Sample age exceeds stability time (sampling to receipt)
g	Sample age exceeds stability time (sampling to analysis)

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month
All water samples will be retained for 7 days following the date of the test report
Charges may apply to extended sample storage

TPH Classification - HWOL Acronym System

HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
2D	GC-GC - Double coil gas chromatography
#1	EH_Total but with humics mathematically subtracted
#2	EH_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry

Unit A2
Windmill Road
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TN38 9BY
Telephone: (01424) 718618

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THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	23-48109
Issue:	1
Date of Issue:	23/05/2023
Contact:	Reinier van der Kuip
Customer Details:	TEC The Old Chapel 35A Southover Wells SomersetBA5 1UH
Quotation No:	Q22-03427
Order No:	2111006.005
Customer Reference:	2111006
Date Received:	16/05/2023
Date Approved:	23/05/2023
Details:	Pheonix Wharf, Port Talbot
Approved by:	

Tim Reeve, Quality Officer

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Sample Summary

Report No.: 23-48109, issue number 1

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
321933	BH115 2.20	04/05/2023	16/05/2023	Silty loam	
321934	BH115 18.00	04/05/2023	16/05/2023	Sandy loam	
321935	BH110 2.00	04/05/2023	16/05/2023	Silty loam	
321936	BH110 5.00	04/05/2023	16/05/2023	Clayey loam	
321937	BH110 11.00	05/05/2023	16/05/2023	Silty clayey loam	
321938	BH112 3.00	05/05/2023	16/05/2023		

Results Summary

Report No.: 23-48109, issue number 1

ELAB Reference				321933	321934	321935	321936	321937
Customer Reference								
Sample ID								
Sample Type				DISTURBED	DISTURBED	DISTURBED	DISTURBED	DISTURBED
Sample Location				BH115	BH115	BH110	BH110	BH110
Sample Depth (m)				2.20	18.00	2.00	5.00	11.00
Sampling Date				04/05/2023	04/05/2023	04/05/2023	04/05/2023	05/05/2023
Determinand	**Codes**	**Units**	**LOD**					
Soil sample preparation parameters								
Moisture Content	N	%	0.1	27.6	8.0	26.9	23.7	37.7
Material removed	N	%	0.1	< 0.1	39.1	< 0.1	< 0.1	< 0.1
Description of Inert material removed	N		0	None	Stones	None	None	None
Metals								
Water Soluble Magnesium	N	mg/l	0.1	1.7	n/t	1.4	n/t	23.7
Anions								
Water Soluble Chloride	M	mg/l	20	< 20	n/t	303	n/t	3200
Water Soluble Nitrate	N	mg/l	20	26	n/t	45	n/t	54
Water Soluble Sulphate	M	mg/l	20	1460	40	268	65	1010
Inorganics								
Total Sulphur	N	%	0.01	0.73	0.01	0.77	0.02	2.4
Acid Soluble Sulphate (SO4)	U	%	0.02	0.63	0.02	0.09	0.02	0.26
Miscellaneous								
pH	M	pH units	0.1	8.7	9.3	8.6	8.6	7.1

Tests marked N are not UKAS accredited.
The Environmental Laboratory Ltd. Reg. No. 3882193

Method Summary

Report No.: 23-48109, issue number 1

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
pH	M	Air dried sample	19/05/2023	113	Electromeric
Acid Soluble Sulphate	U	Air dried sample	19/05/2023	115	Ion Chromatography
W. Sol Metals	N	Air dried sample	22/05/2023	118	ICPMS
Water soluble anions	M	Air dried sample	18/05/2023	172	Ion Chromatography
Total organic carbon/Total sulphur	N	Air dried sample	22/05/2023	216	IR

Tests marked N are not UKAS accredited

Report Information

Report No.: 23-48109, issue number 1

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
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SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
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>	means "greater than"
LOD	LOD refers to limit of detection, except in the case of pH soils and pH waters where it means limit of discrimination.
	Soil sample results are expressed on an air dried basis (dried at < 30°C), and are uncorrected for inert material removed.
	ELAB are unable to provide an interpretation or opinion on the content of this report.
	The results relate only to the sample received.
	PCB congener results may include any coeluting PCBs
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Deviation Codes

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Sample Retention and Disposal

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TPH Classification - HWOL Acronym System

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UKAS TESTING
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THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	23-48215
Issue:	1
Date of Issue:	31/05/2023
Contact:	Reinier van der Kuip
Customer Details:	TEC The Old Chapel 35A Southover Wells SomersetBA5 1UH
Quotation No:	Q22-03427
Order No:	2111006.005
Customer Reference:	2111006.005
Date Received:	23/05/2023
Date Approved:	31/05/2023
Details:	Phoenix Wharf, Port Talbot
Approved by:	

Tim Reeve, Quality Officer

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Sample Summary

Report No.: 23-48215, issue number 1

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
322980	BH101 2.00	19/05/2023	23/05/2023	Silty clayey loam	
322981	BH103 12.00	19/05/2023	23/05/2023	Silty loam	
322982	BH104 12.00	19/05/2023	23/05/2023	Silty loam	
322983	BH110 7.50	19/05/2023	23/05/2023	Silty clayey loam	
322984	BH113 10.50	19/05/2023	23/05/2023	Silty loam	
322985	BH113 11.50	19/05/2023	23/05/2023	Silty loam	
322986	BH114 2.50	19/05/2023	23/05/2023	Silty loam	
322987	BH115 5.50	19/05/2023	23/05/2023	Sandy silty loam	
322988	BH115 11.00	19/05/2023	23/05/2023	Silty loam	
322989	BH115 12.00	19/05/2023	23/05/2023	Silty clayey loam	
322990	BH117 9.50	19/05/2023	23/05/2023	Silty clayey loam	
322991	BH117 10.00	19/05/2023	23/05/2023	Silty loam	
322992	BH118 8.00	19/05/2023	23/05/2023	Silty clayey loam	
322993	BH118 10.50	19/05/2023	23/05/2023	Silty loam	

Results Summary

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Report No.: 23-48215, issue number 1

ELAB Reference				322980	322981	322982	322983	322984	322985	322986	322987	322988	322989	322990
Customer Reference														
Sample ID														
Sample Type				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Location				BH101	BH103	BH104	BH110	BH113	BH113	BH114	BH115	BH115	BH115	BH117
Sample Depth (m)				2.00	12.00	12.00	7.50	10.50	11.50	2.50	5.50	11.00	12.00	9.50
Sampling Date				19/05/2023	19/05/2023	19/05/2023	19/05/2023	19/05/2023	19/05/2023	19/05/2023	19/05/2023	19/05/2023	19/05/2023	19/05/2023
Determinand	**Codes**	**Units**	**LOD**											
Soil sample preparation parameters														
Moisture Content	N	%	0.1	29.8	41.6	23.1	28.8	41.0	23.7	23.9	25.7	31.6	28.2	23.8
Material removed	N	%	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Description of Inert material removed	N		0	None	None	None	None	None	None	None	None	None	None	None
Miscellaneous														
Soil Organic Matter	U	%	0.1	4.6	8.9	5.4	2.5	20	4.6	15	3.3	17	3.5	2.0

Results Summary

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Report No.: 23-48215, issue number 1

ELAB Reference				322991	322992	322993
Customer Reference						
Sample ID						
Sample Type				SOIL	SOIL	SOIL
Sample Location				BH117	BH118	BH118
Sample Depth (m)				10.00	8.00	10.50
Sampling Date				19/05/2023	19/05/2023	19/05/2023
Determinand	**Codes**	**Units**	**LOD**			
Soil sample preparation parameters						
Moisture Content	N	%	0.1	42.2	19.5	53.0
Material removed	N	%	0.1	< 0.1	< 0.1	< 0.1
Description of Inert material removed	N		0	None	None	None
Miscellaneous						
Soil Organic Matter	U	%	0.1	39	0.8	37

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Method Summary

Report No.: 23-48215, issue number 1

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
Soil organic matter	U	Air dried sample	31/05/2023	BS1377:P3	Titrimetry

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Report Information

Report No.: 23-48215, issue number 1

Key

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SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"
LOD	LOD refers to limit of detection, except in the case of pH soils and pH waters where it means limit of discrimination.
	Soil sample results are expressed on an air dried basis (dried at < 30°C), and are uncorrected for inert material removed.
	ELAB are unable to provide an interpretation or opinion on the content of this report.
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Deviation Codes

a	No date of sampling supplied
b	No time of sampling supplied (Waters Only)
c	Sample not received in appropriate containers
d	Sample not received in cooled condition
e	The container has been incorrectly filled
f	Sample age exceeds stability time (sampling to receipt)
g	Sample age exceeds stability time (sampling to analysis)

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Sample Retention and Disposal

All soil samples will be retained for a period of one month
All water samples will be retained for 7 days following the date of the test report
Charges may apply to extended sample storage

TPH Classification - HWOL Acronym System

HS	Headspace analysis
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CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
2D	GC-GC - Double coil gas chromatography
#1	EH_Total but with humics mathematically subtracted
#2	EH_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry

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THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	23-48216
Issue:	1
Date of Issue:	31/05/2023
Contact:	Reinier van der Kuip
Customer Details:	TEC The Old Chapel 35A Southover Wells SomersetBA5 1UH
Quotation No:	Q22-03427
Order No:	2111006.005
Customer Reference:	2111006.005
Date Received:	23/05/2023
Date Approved:	31/05/2023
Details:	Phoenix Wharf, Port Talbot
Approved by:	

Tim Reeve, Quality Officer

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Sample Summary

Report No.: 23-48216, issue number 1

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
322994	TP101 0.80	15/05/2023	23/05/2023	Sandy loam	
322995	TP102 1.80	15/05/2023	23/05/2023	Sandy clayey loam	
322996	TP106 1.00	15/05/2023	23/05/2023	Clayey loam	
322997	TP108 1.20	15/05/2023	23/05/2023	Sandy loam	
322998	TP110 1.80	15/05/2023	23/05/2023	Sand	
322999	TP112 1.80	15/05/2023	23/05/2023	Loamy sand	
323000	TP115 2.20	15/05/2023	23/05/2023	Loamy sand	
323001	TP128 2.50	15/05/2023	23/05/2023	Silty loam	

Results Summary

Report No.: 23-48216, issue number 1

			ELAB Reference	322994	322995	322996	322997	322998	322999	323000	323001
			Customer Reference								
			Sample ID								
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sample Location	TP101	TP102	TP106	TP108	TP110	TP112	TP115	TP128
			Sample Depth (m)	0.80	1.80	1.00	1.20	1.80	1.80	2.20	2.50
			Sampling Date	15/05/2023	15/05/2023	15/05/2023	15/05/2023	15/05/2023	15/05/2023	15/05/2023	15/05/2023
Determinand	**Codes**	**Units**	**LOD**								
Soil sample preparation parameters											
Moisture Content	N	%	0.1	15.5	24.4	26.1	21.1	13.3	9.2	18.3	34.9
Material removed	N	%	0.1	39.5	< 0.1	< 0.1	16.9	< 0.1	99.8	< 0.1	< 0.1
Description of Inert material removed	N		0	Stones	None	None	Stones	None	All Stone	None	None
Metals											
Water Soluble Magnesium	N	mg/l	0.1	0.7	n/t	0.4	0.6	n/t	1.1	n/t	2.1
Anions											
Water Soluble Chloride	M	mg/l	20	33	n/t	< 20	25	n/t	50	n/t	289
Water Soluble Nitrate	M	mg/l	20	< 20	n/t	< 20	< 20	n/t	24	n/t	41
Water Soluble Sulphate	M	mg/l	20	96	24	68	103	< 20	195	60	262
Inorganics											
Total Sulphur	N	%	0.01	0.29	0.03	0.29	0.08	0.02	0.32	0.02	0.86
Acid Soluble Sulphate (SO4)	U	%	0.02	0.21	0.03	0.07	0.08	0.02	0.06	0.02	0.10
Miscellaneous											
pH	M	pH units	0.1	9.3	8.5	8.3	9.0	8.7	8.5	8.4	8.1

Method Summary

Report No.: 23-48216, issue number 1

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
pH	M	Air dried sample	31/05/2023	113	Electromeric
Acid Soluble Sulphate	U	Air dried sample	30/05/2023	115	Ion Chromatography
W. Sol Metals	N	Air dried sample	30/05/2023	300	ICPMS
Water soluble anions	M	Air dried sample	26/05/2023	172	Ion Chromatography
Total organic carbon/Total sulphur	N	Air dried sample	26/05/2023	216	IR

Tests marked N are not UKAS accredited

Report Information

Report No.: 23-48216, issue number 1

Key

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Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

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1D	GC - Single coil gas chromatography
Total	Aliphatics & Aromatics
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AR	Aromatics only
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THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	23-48415
Issue:	1
Date of Issue:	22/06/2023
Contact:	Reinier van der Kuip
Customer Details:	TEC The Old Chapel 35A Southover Wells SomersetBA5 1UH
Quotation No:	Q22-03427
Order No:	2111006.005
Customer Reference:	2111006.005
Date Received:	06/06/2023
Date Approved:	22/06/2023
Details:	Phoenix Wharf, Port Talbot
Approved by:	

Tim Reeve, Quality Officer

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Sample Summary

Report No.: 23-48415, issue number 1

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
325217	BH108 2.00	19/05/2023	06/06/2023	Sandy loam	
325218	BH108 10.00	19/05/2023	06/06/2023	Sandy loam	
325219	TP103A 0.50	24/05/2023	06/06/2023	Loamy sand	
325220	DS109 1.40 - 1.60	24/05/2023	06/06/2023	Sand	

Results Summary

Report No.: 23-48415, issue number 1

			ELAB Reference	325217	325218	325219	325220
			Customer Reference				
			Sample ID				
			Sample Type	SOIL	SOIL	SOIL	SOIL
			Sample Location	BH108	BH108	TP103A	DS109
			Sample Depth (m)	2.00	10.00	0.50	1.40 - 1.60
			Sampling Date	19/05/2023	19/05/2023	24/05/2023	24/05/2023
Determinand	**Codes**	**Units**	**LOD**				
Soil sample preparation parameters							
Moisture Content	N	%	0.1	27.7	53.6	10.6	15.8
Material removed	N	%	0.1	23.8	28.4	25.6	< 0.1
Description of Inert material removed	N		0	Stones	Wood	Stones	None
Metals							
Water Soluble Magnesium	N	mg/l	0.1	0.8	0.7	< 0.1	n/t
Anions							
Water Soluble Chloride	M	mg/l	20	248	2950	306	n/t
Water Soluble Nitrate	M	mg/l	20	72	125	62	n/t
Water Soluble Sulphate	M	mg/l	20	106	849	48	< 20
Inorganics							
Total Sulphur	N	%	0.01	0.54	2.7	2.0	1.4
Acid Soluble Sulphate (SO4)	U	%	0.02	0.08	0.21	0.13	0.02
Miscellaneous							
pH	M	pH units	0.1	7.8	7.6	8.2	8.5

Method Summary

Report No.: 23-48415, issue number 1

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
pH	M	Air dried sample	12/06/2023	113	Electromeric
Acid Soluble Sulphate	U	Air dried sample	13/06/2023	115	Ion Chromatography
W. Sol Metals	N	Air dried sample	21/06/2023	300	ICPMS
Water soluble anions	M	Air dried sample	09/06/2023	172	Ion Chromatography
Total organic carbon/Total sulphur	N	Air dried sample	08/06/2023	216	IR

Tests marked N are not UKAS accredited

Report Information

Report No.: 23-48415, issue number 1

Key

U	hold UKAS accreditation
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n/t	Not tested
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	PCB congener results may include any coeluting PCBs
	Uncertainty of measurement for the determinands tested are available upon request
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Deviation Codes

a	No date of sampling supplied
b	No time of sampling supplied (Waters Only)
c	Sample not received in appropriate containers
d	Sample not received in cooled condition
e	The container has been incorrectly filled
f	Sample age exceeds stability time (sampling to receipt)
g	Sample age exceeds stability time (sampling to analysis)

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month
All water samples will be retained for 7 days following the date of the test report
Charges may apply to extended sample storage

TPH Classification - HWOL Acronym System

HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
2D	GC-GC - Double coil gas chromatography
#1	EH_Total but with humics mathematically subtracted
#2	EH_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry

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UKAS TESTING
2683

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	23-48909
Issue:	1
Date of Issue:	11/07/2023
Contact:	James Phaure
Customer Details:	K4 Soils Laboratory Ltd Unit 8 Watford HertfordshireWD18 9RU
Quotation No:	Q22-03477
Order No:	Not Supplied
Customer Reference:	33610
Date Received:	05/07/2023
Date Approved:	11/07/2023
Details:	Pheonix Wharf, Port Talbot
Approved by:	

Tim Reeve, Quality Officer

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683

This report may only be reproduced in full

Sample Summary

Report No.: 23-48909, issue number 1

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
329522	BH116 0.50	Not Provided	05/07/2023	Sandy silty loam	a
329523	TP102 0.60	Not Provided	05/07/2023	Loamy sand	a
329524	TP103A 1.20	Not Provided	05/07/2023	Sandy loam	a
329525	TP104 1.00	Not Provided	05/07/2023	Sandy clayey loam	a

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Results Summary

Report No.: 23-48909, issue number 1

			ELAB Reference	329522	329523	329524	329525
			Customer Reference				
			Sample ID				
			Sample Type	BULK	BULK	BULK	BULK
			Sample Location	BH116	TP102	TP103A	TP104
			Sample Depth (m)	0.50	0.60	1.20	1.00
			Sampling Date	Not Provided	Not Provided	Not Provided	Not Provided
Determinand	**Codes**	**Units**	**LOD**				
Soil sample preparation parameters							
Moisture Content	N	%	0.1	14.0	15.8	10.9	13.5
Material removed	N	%	0.1	47.2	< 0.1	27.9	< 0.1
Description of Inert material removed	N		0	Stones & Wood	None	Stones	None
Miscellaneous							
Soil Organic Matter	U	%	0.1	6.0	0.6	2.2	0.5

2683

Method Summary

Report No.: 23-48909, issue number 1

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
Soil organic matter	U	Air dried sample	10/07/2023	BS1377:P3	Titrimetry

2683

Report Information

Report No.: 23-48909, issue number 1

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"
LOD	LOD refers to limit of detection, except in the case of pH soils and pH waters where it means limit of discrimination.

Soil sample results are expressed on an air dried basis (dried at < 30°C), and are uncorrected for inert material removed.

ELAB are unable to provide an interpretation or opinion on the content of this report.

The results relate only to the sample received.

PCB congener results may include any coeluting PCBs

Uncertainty of measurement for the determinands tested are available upon request

Unless otherwise stated, sample information has been provided by the client. This may affect the validity of the results.

Deviation Codes

a	No date of sampling supplied
b	No time of sampling supplied (Waters Only)
c	Sample not received in appropriate containers
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e	The container has been incorrectly filled
f	Sample age exceeds stability time (sampling to receipt)
g	Sample age exceeds stability time (sampling to analysis)

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month

All water samples will be retained for 7 days following the date of the test report

Charges may apply to extended sample storage

TPH Classification - HWOL Acronym System

HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics & Aromatics
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MS	Mass Spectrometry

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THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number:	23-49204
Issue:	1
Date of Issue:	27/07/2023
Contact:	Reinier van der Kuip
Customer Details:	TEC The Old Chapel 35A Southover Wells SomersetBA5 1UH
Quotation No:	Q22-03427
Order No:	211006.005
Customer Reference:	211006.005
Date Received:	25/07/2023
Date Approved:	27/07/2023
Details:	Phoenix Wharf, Port Talbot
Approved by:	

Tim Reeve, Quality Officer

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Sample Summary

Report No.: 23-49204, issue number 1

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
332111	BH117 19.00	21/07/2023	25/07/2023	Loamy sand	
332112	BH118 15.50	21/07/2023	25/07/2023	Loamy sand	
332113	BH118 16.50	21/07/2023	25/07/2023	Loamy sand	
332114	BH118 17.50	21/07/2023	25/07/2023	Loamy sand	

Results Summary

2683

Report No.: 23-49204, issue number 1

			ELAB Reference	332111	332112	332113	332114
			Customer Reference				
			Sample ID				
			Sample Type	SOIL	SOIL	SOIL	SOIL
			Sample Location	BH117	BH118	BH118	BH118
			Sample Depth (m)	19.00	15.50	16.50	17.50
			Sampling Date	21/07/2023	21/07/2023	21/07/2023	21/07/2023
Determinand	**Codes**	**Units**	**LOD**				
Soil sample preparation parameters							
Moisture Content	N	%	0.1	14.8	7.9	14.1	6.7
Material removed	N	%	0.1	< 0.1	33.2	< 0.1	< 0.1
Description of Inert material removed	N		0	None	Stones	None	None
Anions							
Water Soluble Sulphate	M	mg/l	20	33	39	51	26
Inorganics							
Total Sulphur	N	%	0.01	0.01	0.01	0.02	< 0.01
Acid Soluble Sulphate (SO4)	U	%	0.02	0.03	0.04	0.04	0.02
Miscellaneous							
pH	M	pH units	0.1	8.8	9.1	8.9	8.9

Method Summary

Report No.: 23-49204, issue number 1

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
pH	M	Air dried sample	26/07/2023	113	Electromeric
Acid Soluble Sulphate	U	Air dried sample	27/07/2023	115	Ion Chromatography
Water soluble anions	M	Air dried sample	26/07/2023	172	Ion Chromatography
Total organic carbon/Total sulphur	N	Air dried sample	26/07/2023	216	IR

Tests marked N are not UKAS accredited

Report Information

Report No.: 23-49204, issue number 1

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LOD	LOD refers to limit of detection, except in the case of pH soils and pH waters where it means limit of discrimination.
	Soil sample results are expressed on an air dried basis (dried at < 30°C), and are uncorrected for inert material removed.
	ELAB are unable to provide an interpretation or opinion on the content of this report.
	The results relate only to the sample received.
	PCB congener results may include any coeluting PCBs
	Uncertainty of measurement for the determinands tested are available upon request
	Unless otherwise stated, sample information has been provided by the client. This may affect the validity of the results.

Deviation Codes

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Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

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TPH Classification - HWOL Acronym System

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+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry

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BA5 1UH

12 July 2023
Report No : GEO/38312/01

For the attention of Mr R van der Kuip

Date samples received 19/06/2023
Date written instructions received 21/06/2023
Date testing commenced 22/06/2023
Date of sample disposal 09/08/2023

Our ref **GEO / 38312**
Your Ref **2111006.005**

Project **PHOENIX WHARF, PORT TALBOT**

Further to your instructions we have pleasure in enclosing the results of the tests you requested in the attached figures.

LABORATORY TEST REPORT

Item No	Test Quantity	Description
1	6	Thermal Conductivity

Any opinions or interpretations expressed herein are outside the scope of UKAS accreditation. All results contained in this report are provisional unless signed by an approved signatory. The results contained in this report relate only to samples received in the laboratory and are tested 'as received' unless otherwise stated. This report should not be reproduced, except in full, without the written approval of the laboratory. The results reported are applicable only to the test items received by the laboratory.

All the necessary data required by the documented test procedures has been recorded and will be stored for a period of not less than 6 years. This data will be issued to yourselves at your request. All samples will be disposed of after the date shown above. Written confirmation will be required to retain the samples beyond this period and a storage charge may be applied.

We trust that the above meets your requirements and should you require any further information or assistance, please do not hesitate to contact us.

Yours faithfully
on behalf of **GEOLABS Limited**

S Burke
Senior Technician

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Registered Office: Bucknalls Lane Garston Watford Hertfordshire WD25 9XX Registered in England and Wales No: 3177641

ASTM D5334-22a

THERMAL CONDUCTIVITY OF SOIL AND SOFT ROCK BY THERMAL NEEDLE PROBE

Location	BH102
Sample Ref	B1
Sample Depth (m)	0.50
Sample Type	B

Description:

Very soft brown mottled dark brown slightly sandy gravelly silty CLAY with numerous rootlets. Sand is fine. Gravel is fine.

Date tested: 12/07/2023

Equipment and methodology details

Decagon Devices KD2 Pro Thermal Conductivity meter with TR-1 needle probe. The KD2 Pro complies fully with ASTM D5334-22a. Data is recorded every second over a 60 second period to an internal microprocessor and an alogrithm used to calculate the best fit of the steady state data and the thermal conductivity derived. This obviates the need for a graphical plot of temperature against time.

Sample details

Sample diameter	67.00 mm
Sample length	170.00 mm
Sample mass	1775.66 g

Bulk Density	2.96 Mg/m³
Dry Density	2.59 Mg/m³
Water Content*	14.3 %

Test Temperature	19.92 ºC

Calibration factor	0.98

Sample preparation

Sample remoulded to maximum achievable density.

The probe has been inserted by pushing into the specimen.

Thermal Conductivity **1.29 W/(m·k)**

Thermal Resistivity **0.78 (m·k)/W**

Tested by AD
Checked and Approved by

S Burke
12/07/2023

Project Number:
GEO / 38312

Project Name:
PHOENIX WHARF, PORT TALBOT
2111006.005

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ASTM D5334-22a

THERMAL CONDUCTIVITY OF SOIL AND SOFT ROCK BY THERMAL NEEDLE PROBE

Location	BH106
Sample Ref	BS4
Sample Depth (m)	1.00
Sample Type	B

Description:
Very soft greenish grey very sandy CLAY with rare fine gravel. Sand is fine to medium.

Date tested: 12/07/2023

Equipment and methodology details

Decagon Devices KD2 Pro Thermal Conductivity meter with TR-1 needle probe. The KD2 Pro complies fully with ASTM D5334-22a. Data is recorded every second over a 60 second period to an internal microprocessor and an alogrithm used to calculate the best fit of the steady state data and the thermal conductivity derived. This obviates the need for a graphical plot of temperature against time.

Sample details

Sample diameter	67.00 mm
Sample length	170.00 mm
Sample mass	1170.02 g

Bulk Density	1.95 Mg/m³
Dry Density	1.56 Mg/m³
Water Content*	25.3 %

Test Temperature	19.74 ºC

Calibration factor	1.02

Sample preparation

Sample remoulded to maximum achievable density.

The probe has been inserted by pushing into the specimen.

Thermal Conductivity **2.30 W/(m·k)**

Thermal Resistivity **0.43 (m·k)/W**

Tested by AD
Checked and Approved by
S Burke
12/07/2023

Project Number:
GEO / 38312

Project Name:
PHOENIX WHARF, PORT TALBOT
2111006.005

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ASTM D5334-22a

THERMAL CONDUCTIVITY OF SOIL AND SOFT ROCK BY THERMAL NEEDLE PROBE

Location	BH107
Sample Ref	B7
Sample Depth (m)	3.50
Sample Type	B

Description:
Soft to firm brown sandy silty CLAY with occasional rootlets. Sand is fine.

Date tested: 12/07/2023

Equipment and methodology details

Decagon Devices KD2 Pro Thermal Conductivity meter with TR-1 needle probe. The KD2 Pro complies fully with ASTM D5334-22a. Data is recorded every second over a 60 second period to an internal microprocessor and an alogrithm used to calculate the best fit of the steady state data and the thermal conductivity derived. This obviates the need for a graphical plot of temperature against time.

Sample details

Sample diameter	67.00 mm
Sample length	170.00 mm
Sample mass	1087.50 g

Bulk Density	1.81 Mg/m³
Dry Density	1.38 Mg/m³
Water Content*	31.1 %

Test Temperature	20.33 ºC

Calibration factor	0.98

Sample preparation

Sample remoulded to maximum achievable density.

The probe has been inserted by pushing into the specimen.

Thermal Conductivity **1.64 W/(m·k)**

Thermal Resistivity **0.61 (m·k)/W**

Tested by AD
Checked and Approved by
S Burke
12/07/2023

Project Number:
GEO / 38312

Project Name:
PHOENIX WHARF, PORT TALBOT
2111006.005

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ASTM D5334-22a

THERMAL CONDUCTIVITY OF SOIL AND SOFT ROCK BY THERMAL NEEDLE PROBE

Location	BH114
Sample Ref	BS6
Sample Depth (m)	2.20
Sample Type	B

Description:
Soft black slightly gravelly organic sandy CLAY. Sand is fine.

Date tested: 12/07/2023

Equipment and methodology details

Decagon Devices KD2 Pro Thermal Conductivity meter with TR-1 needle probe. The KD2 Pro complies fully with ASTM D5334-22a. Data is recorded every second over a 60 second period to an internal microprocessor and an alogrithm used to calculate the best fit of the steady state data and the thermal conductivity derived. This obviates the need for a graphical plot of temperature against time.

Sample details

Sample diameter	67.00 mm
Sample length	170.00 mm
Sample mass	867.24 g

Bulk Density	1.45 Mg/m³
Dry Density	1.10 Mg/m³
Water Content*	31.4 %

Test Temperature	21.72 ºC

Calibration factor	0.98

Sample preparation

Sample remoulded to maximum achievable density.

The probe has been inserted by pushing into the specimen.

Thermal Conductivity **0.61 W/(m·k)**

Thermal Resistivity **1.65 (m·k)/W**

Tested by AD
Checked and Approved by

S Burke
12/07/2023

Project Number:
GEO / 38312

Project Name:
PHOENIX WHARF, PORT TALBOT
2111006.005

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ASTM D5334-22a

THERMAL CONDUCTIVITY OF SOIL AND SOFT ROCK BY THERMAL NEEDLE PROBE

Location	BH12
Sample Ref	B5
Sample Depth (m)	2.50
Sample Type	B

Description:
Very soft dark grey very sandy gravelly silty CLAY. Sand is fine to medium.

Date tested: 12/07/2023

Equipment and methodology details

Decagon Devices KD2 Pro Thermal Conductivity meter with TR-1 needle probe. The KD2 Pro complies fully with ASTM D5334-22a. Data is recorded every second over a 60 second period to an internal microprocessor and an alogrithm used to calculate the best fit of the steady state data and the thermal conductivity derived. This obviates the need for a graphical plot of temperature against time.

Sample details

Sample diameter	67.00 mm
Sample length	170.00 mm
Sample mass	1046.02 g

Bulk Density	1.75 Mg/m³
Dry Density	1.27 Mg/m³
Water Content*	37.9 %

Test Temperature	19.66 ºC

Calibration factor	0.98

Sample preparation

Sample remoulded to maximum achievable density.

The probe has been inserted by pushing into the specimen.

Thermal Conductivity **1.66 W/(m·k)**

Thermal Resistivity **0.60 (m·k)/W**

Tested by AD
Checked and Approved by
S Burke
12/07/2023

Project Number:
GEO / 38312

Project Name:
PHOENIX WHARF, PORT TALBOT
2111006.005

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ASTM D5334-22a

THERMAL CONDUCTIVITY OF SOIL AND SOFT ROCK BY THERMAL NEEDLE PROBE

Location	TP110
Sample Depth (m)	1.00
Sample Type	B

Description:
Very soft slightly gravelly silty very sandy CLAY. Gravel is fine. Sand is fine to medium.

Date tested: 12/07/2023

Equipment and methodology details

Decagon Devices KD2 Pro Thermal Conductivity meter with TR-1 needle probe. The KD2 Pro complies fully with ASTM D5334-22a. Data is recorded every second over a 60 second period to an internal microprocessor and an alogrithm used to calculate the best fit of the steady state data and the thermal conductivity derived. This obviates the need for a graphical plot of temperature against time.

Sample details

Sample diameter	67.00 mm
Sample length	170.00 mm
Sample mass	1020.63 g

Bulk Density	1.70 Mg/m³
Dry Density	1.49 Mg/m³
Water Content*	14.4 %

Test Temperature	19.91 ºC

Calibration factor	0.97

Sample preparation

Sample remoulded to maximum achievable density.

The probe has been inserted by pushing into the specimen.

Thermal Conductivity **1.67 W/(m·k)**

Thermal Resistivity **0.60 (m·k)/W**

Tested by AD
Checked and Approved by
S Burke
12/07/2023

Project Number:
GEO / 38312

Project Name:
PHOENIX WHARF, PORT TALBOT
2111006.005

GEOLABS®

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

Analytical Report Number : 23-39646

Project / Site name:	Phoenix Wharf, Port Talbot (Project Dragon)	Samples received on:	16/06/2023
Your job number:	2111006.005	Samples instructed on/ Analysis started on:	16/06/2023
Your order number:		Analysis completed by:	29/06/2023
Report Issue Number:	1	Report issued on:	29/06/2023
Samples Analysed:	18 water samples		

Signed:

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

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

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

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

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

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

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number: 23-39646
Project / Site name: Phoenix Wharf, Port Talbot (Project Dragon)

Lab Sample Number				2716053	2716054	2716055	2716056	2716057
Sample Reference				BH01	BH03A	BH04	BH103	BH104
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2023	13/06/2023	13/06/2023	13/06/2023	13/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
General Inorganics								
pH (L005B)	pH Units	N/A	ISO 17025	7.5	6.9	7.5	7.4	7.5
Electrical Conductivity at 20 °C (L031B)	µS/cm	10	ISO 17025	3100	5200	3300	5600	6300
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Complex Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Sulphate as SO4	µg/l	45	ISO 17025	193000	317000	186000	106000	64900
Sulphide	µg/l	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chloride	mg/l	0.15	ISO 17025	830	1700*	840	1900*	1900*
Ammoniacal Nitrogen as NH4	µg/l	15	ISO 17025	3600	2200	1900	3700	4200
Total Organic Carbon (TOC)	mg/l	0.1	ISO 17025	3.56	3.28	4	4.46	1.03
Total Phenols								
Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Speciated PAHs								
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Total PAH								
Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16

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Analytical Report Number: 23-39646
Project / Site name: Phoenix Wharf, Port Talbot (Project Dragon)

Lab Sample Number				2716053	2716054	2716055	2716056	2716057
Sample Reference				BH01	BH03A	BH04	BH103	BH104
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2023	13/06/2023	13/06/2023	13/06/2023	13/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Heavy Metals / Metalloids								
Boron (dissolved)	µg/l	10	ISO 17025	550	680	900	1200	620
Calcium (dissolved)	mg/l	0.012	ISO 17025	92	46	17	34	280
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Iron (dissolved)	mg/l	0.004	ISO 17025	0.03	0.01	0.012	0.07	< 0.004
Magnesium (dissolved)	mg/l	0.005	ISO 17025	96	93	52	88	130
Phosphorus (dissolved)	µg/l	20	ISO 17025	743	631	836	830	645
Potassium (dissolved)	mg/l	0.025	ISO 17025	44	38	42	69	70
Selenium (dissolved)	µg/l	4	ISO 17025	-	< 4.0	-	< 4.0	< 4.0
Sodium (dissolved)	mg/l	0.01	ISO 17025	580	930*	550*	1400	1100*
Antimony (dissolved)	µg/l	0.4	ISO 17025	0.8	0.5	0.8	0.7	1.2
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.77	0.41	4.88	4.51	0.61
Barium (dissolved)	µg/l	0.06	ISO 17025	77	26	29	89	930
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.08	0.28	0.09	0.03	0.03
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.2	< 0.2	0.3	< 0.2	0.2
Cobalt (dissolved)	µg/l	0.2	ISO 17025	3.1	2.9	0.7	1.3	1.1
Copper (dissolved)	µg/l	0.5	ISO 17025	3.7	2.4	4	4.1	1.7
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Manganese (dissolved)	µg/l	0.05	ISO 17025	1800	3100	930	1300	350
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	1.6	0.67	4.2	3.4	9.3
Nickel (dissolved)	µg/l	0.5	ISO 17025	2.9	2.6	1.7	1.8	3.8
Selenium (dissolved)	µg/l	0.6	ISO 17025	3.7	-	3.6	-	-
Tin (dissolved)	µg/l	0.2	ISO 17025	1.3	0.9	0.42	0.43	0.38
Vanadium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	1.3	0.7	< 0.2
Zinc (dissolved)	µg/l	0.5	ISO 17025	4.6	3.6	6.6	8.3	2.2
Monoaromatics & Oxygenates								
Benzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Toluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Ethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
p & m-xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
o-xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0

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Analytical Report Number: 23-39646
Project / Site name: Phoenix Wharf, Port Talbot (Project Dragon)

Lab Sample Number				2716053	2716054	2716055	2716056	2716057
Sample Reference				BH01	BH03A	BH04	BH103	BH104
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2023	13/06/2023	13/06/2023	13/06/2023	13/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Petroleum Hydrocarbons								
Mineral Oil (C10 - C40) EH_1D_AL_MS	µg/l	10	NONE	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
Diesel Range Organics (C10 - C25) EH_1D_TOTAL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH1 (C10 - C40) EH_1D_TOTAL_MS	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
TPH2 (C6 - C10) HS_1D_TOTAL	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C5 - C6 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10 HS_1D_AL	µg/l	1	ISO 17025	< 1.0##	< 1.0##	< 1.0##	< 1.0##	< 1.0##
TPH-CWG - Aliphatic >C10 - C12 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35) HS+EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C5 - C7 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35) HS+EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10

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Lab Sample Number				2716053	2716054	2716055	2716056	2716057
Sample Reference				BH01	BH03A	BH04	BH103	BH104
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2023	13/06/2023	13/06/2023	13/06/2023	13/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
VOCs								
Chloromethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Chloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Bromomethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Vinyl Chloride	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Trichlorofluoromethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1-Dichloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Cis-1,2-dichloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1-Dichloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
2,2-Dichloropropane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Trichloromethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1,1-Trichloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dichloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1-Dichloropropene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Trans-1,2-dichloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Benzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Tetrachloromethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dichloropropane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Trichloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Dibromomethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Bromodichloromethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Cis-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Trans-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Toluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1,2-Trichloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,3-Dichloropropane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Dibromochloromethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Tetrachloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dibromoethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Chlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1,1,2-Tetrachloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Ethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
p & m-Xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Styrene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Tribromomethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
o-Xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1,2,2-Tetrachloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Isopropylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Bromobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
n-Propylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
2-Chlorotoluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
4-Chlorotoluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,3,5-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
tert-Butylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2,4-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
sec-Butylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,3-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
p-Isopropyltoluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,4-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0

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Analytical Report Number: 23-39646
Project / Site name: Phoenix Wharf, Port Talbot (Project Dragon)

Lab Sample Number				2716053	2716054	2716055	2716056	2716057
Sample Reference				BH01	BH03A	BH04	BH103	BH104
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2023	13/06/2023	13/06/2023	13/06/2023	13/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Butylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dibromo-3-chloropropane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2,4-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Hexachlorobutadiene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2,3-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0

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Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2023	13/06/2023	13/06/2023	13/06/2023	13/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
SVOCs								
Aniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Chlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachloroethane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Isophorone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Nitrophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dimethylphthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibenzofuran	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Diethyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Nitroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Azobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Carbazole	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Anthraquinone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

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Analytical Report Number: 23-39646
Project / Site name: Phoenix Wharf, Port Talbot (Project Dragon)

Lab Sample Number				2716053	2716054	2716055	2716056	2716057
Sample Reference				BH01	BH03A	BH04	BH103	BH104
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2023	13/06/2023	13/06/2023	13/06/2023	13/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
3&4-Methylphenol	µg/l	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number: 23-39646
Project / Site name: Phoenix Wharf, Port Talbot (Project Dragon)

Lab Sample Number				2716058	2716059	2716060	2716061	2716062
Sample Reference				BH105	BH106	BH107	BH108	BH110
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2023	13/06/2023	13/06/2023	13/06/2023	13/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
General Inorganics								
pH (L005B)	pH Units	N/A	ISO 17025	7.3	7.3	7.6	7.7	7.2
Electrical Conductivity at 20 °C (L031B)	µS/cm	10	ISO 17025	6200	7300	5500	8600	6100
Total Cyanide	µg/l	10	ISO 17025	< 10	10	< 10	< 10	< 10
Complex Cyanide	µg/l	10	ISO 17025	< 10	10	< 10	< 10	< 10
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Sulphate as SO4	µg/l	45	ISO 17025	134000	189000	208000	102000	146000
Sulphide	µg/l	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chloride	mg/l	0.15	ISO 17025	1700*	2100*	2000*	2700*	1700*
Ammoniacal Nitrogen as NH4	µg/l	15	ISO 17025	5000	5700	4800	7500	3100
Total Organic Carbon (TOC)	mg/l	0.1	ISO 17025	3.42	2.98	3.49	3.56	2.91
Total Phenols								
Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Speciated PAHs								
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Total PAH								
Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16

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Analytical Report Number: 23-39646
Project / Site name: Phoenix Wharf, Port Talbot (Project Dragon)

Lab Sample Number				2716058	2716059	2716060	2716061	2716062
Sample Reference				BH105	BH106	BH107	BH108	BH110
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2023	13/06/2023	13/06/2023	13/06/2023	13/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Heavy Metals / Metalloids								
Boron (dissolved)	µg/l	10	ISO 17025	1000	520	770	1400	750
Calcium (dissolved)	mg/l	0.012	ISO 17025	38	120	87	82	57
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Iron (dissolved)	mg/l	0.004	ISO 17025	0.057	0.013	0.013	0.023	0.024
Magnesium (dissolved)	mg/l	0.005	ISO 17025	95	190	100	200	120
Phosphorus (dissolved)	µg/l	20	ISO 17025	617	771	659	1000	706
Potassium (dissolved)	mg/l	0.025	ISO 17025	60	66	48	110	50
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Sodium (dissolved)	mg/l	0.01	ISO 17025	1400*	1600*	1200*	1600*	1400*
Antimony (dissolved)	µg/l	0.4	ISO 17025	0.7	0.8	0.7	0.8	0.7
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.72	1.51	0.45	3.47	0.31
Barium (dissolved)	µg/l	0.06	ISO 17025	72	110	63	130	68
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.15	0.03	0.06	0.07	0.04
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	0.2	0.4	< 0.2
Cobalt (dissolved)	µg/l	0.2	ISO 17025	1.6	2.3	4.4	2.8	8.2
Copper (dissolved)	µg/l	0.5	ISO 17025	4.7	4	4.2	3	2.3
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Manganese (dissolved)	µg/l	0.05	ISO 17025	3700	4300	4400	3000	7900
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	2	2.4	3.2	3.9	1.6
Nickel (dissolved)	µg/l	0.5	ISO 17025	1.5	2.3	2.5	1.9	2.3
Selenium (dissolved)	µg/l	0.6	ISO 17025	-	-	-	-	-
Tin (dissolved)	µg/l	0.2	ISO 17025	0.33	0.35	0.22	0.35	< 0.20
Vanadium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.5	< 0.2	0.6	< 0.2
Zinc (dissolved)	µg/l	0.5	ISO 17025	7.8	13	17	14	14
Monoaromatics & Oxygenates								
Benzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
Toluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
Ethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
p & m-xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
o-xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^

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Analytical Report Number: 23-39646
Project / Site name: Phoenix Wharf, Port Talbot (Project Dragon)

Lab Sample Number				2716058	2716059	2716060	2716061	2716062
Sample Reference				BH105	BH106	BH107	BH108	BH110
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2023	13/06/2023	13/06/2023	13/06/2023	13/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Petroleum Hydrocarbons								
Mineral Oil (C10 - C40) EH_1D_AL_MS	µg/l	10	NONE	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
Diesel Range Organics (C10 - C25) EH_1D_TOTAL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH1 (C10 - C40) EH_1D_TOTAL_MS	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
TPH2 (C6 - C10) HS_1D_TOTAL	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C5 - C6 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0##	< 1.0##	< 1.0##
TPH-CWG - Aliphatic >C6 - C8 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0##	< 1.0##	< 1.0##
TPH-CWG - Aliphatic >C8 - C10 HS_1D_AL	µg/l	1	ISO 17025	< 1.0##	< 1.0##	< 1.0##	< 1.0##	< 1.0##
TPH-CWG - Aliphatic >C10 - C12 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35) HS+EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C5 - C7 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35) HS+EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10

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Analytical Report Number: 23-39646
Project / Site name: Phoenix Wharf, Port Talbot (Project Dragon)

Lab Sample Number				2716058	2716059	2716060	2716061	2716062
Sample Reference				BH105	BH106	BH107	BH108	BH110
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2023	13/06/2023	13/06/2023	13/06/2023	13/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
VOCs								
Chloromethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
Chloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
Bromomethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
Vinyl Chloride	µg/l	3	NONE	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
Trichlorofluoromethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
1,1-Dichloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
Cis-1,2-dichloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
1,1-Dichloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
2,2-Dichloropropane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
Trichloromethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
1,1,1-Trichloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
1,2-Dichloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
1,1-Dichloropropene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
Trans-1,2-dichloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
Benzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
Tetrachloromethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
1,2-Dichloropropane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
Trichloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
Dibromomethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
Bromodichloromethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
Cis-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
Trans-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
Toluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
1,1,2-Trichloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
1,3-Dichloropropane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
Dibromochloromethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
Tetrachloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
1,2-Dibromoethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
Chlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
1,1,1,2-Tetrachloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
Ethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
p & m-Xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
Styrene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
Tribromomethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
o-Xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
1,1,2,2-Tetrachloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
Isopropylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
Bromobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
n-Propylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
2-Chlorotoluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
4-Chlorotoluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
1,3,5-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
tert-Butylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
1,2,4-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
sec-Butylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
1,3-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
p-Isopropyltoluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
1,2-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
1,4-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^

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Analytical Report Number: 23-39646
Project / Site name: Phoenix Wharf, Port Talbot (Project Dragon)

Lab Sample Number				2716058	2716059	2716060	2716061	2716062
Sample Reference				BH105	BH106	BH107	BH108	BH110
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2023	13/06/2023	13/06/2023	13/06/2023	13/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Butylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
1,2-Dibromo-3-chloropropane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
1,2,4-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
Hexachlorobutadiene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^
1,2,3-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0^	< 3.0^	< 3.0^

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Analytical Report Number: 23-39646
Project / Site name: Phoenix Wharf, Port Talbot (Project Dragon)

Lab Sample Number				2716058	2716059	2716060	2716061	2716062
Sample Reference				BH105	BH106	BH107	BH108	BH110
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2023	13/06/2023	13/06/2023	13/06/2023	13/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
SVOCs								
Aniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Chlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachloroethane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Isophorone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Nitrophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dimethylphthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibenzofuran	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Diethyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Nitroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Azobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Carbazole	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Anthraquinone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

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Analytical Report Number: 23-39646
Project / Site name: Phoenix Wharf, Port Talbot (Project Dragon)

Lab Sample Number				2716058	2716059	2716060	2716061	2716062
Sample Reference				BH105	BH106	BH107	BH108	BH110
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2023	13/06/2023	13/06/2023	13/06/2023	13/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
3&4-Methylphenol	µg/l	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number: 23-39646
Project / Site name: Phoenix Wharf, Port Talbot (Project Dragon)

Lab Sample Number				2716063	2716064	2716065	2716066	2716067
Sample Reference				BH111	BH112	BH113	BH115	BH116
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2023	13/06/2023	13/06/2023	13/06/2023	13/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
General Inorganics								
pH (L005B)	pH Units	N/A	ISO 17025	7.6	7.5	7.7	7.5	7.4
Electrical Conductivity at 20 °C (L031B)	µS/cm	10	ISO 17025	3200	2600	10000	5100	2500
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Complex Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Sulphate as SO4	µg/l	45	ISO 17025	135000	9900	391000	75400	221000
Sulphide	µg/l	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chloride	mg/l	0.15	ISO 17025	910	560	2400*	1400*	540
Ammoniacal Nitrogen as NH4	µg/l	15	ISO 17025	5000	2700	3600	16000	2300
Total Organic Carbon (TOC)	mg/l	0.1	ISO 17025	3.26	8.55	1.97	11.7	2.52
Total Phenols								
Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Speciated PAHs								
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	0.24	< 0.01	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	0.25	< 0.01	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	0.17	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	2.15	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	0.54	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	3.6	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	3.3	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	1.69	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	1.66	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	2.33	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	0.67	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	1.97	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	1.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	0.29	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	1.25	< 0.01	< 0.01	< 0.01
Total PAH								
Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	21.1	< 0.16	< 0.16	< 0.16

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Analytical Report Number: 23-39646
Project / Site name: Phoenix Wharf, Port Talbot (Project Dragon)

Lab Sample Number				2716063	2716064	2716065	2716066	2716067
Sample Reference				BH111	BH112	BH113	BH115	BH116
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2023	13/06/2023	13/06/2023	13/06/2023	13/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Heavy Metals / Metalloids								
Boron (dissolved)	µg/l	10	ISO 17025	700	390	380	1200	380
Calcium (dissolved)	mg/l	0.012	ISO 17025	30	120	290	71	170
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Iron (dissolved)	mg/l	0.004	ISO 17025	0.14	0.14	0.048	0.036	0.005
Magnesium (dissolved)	mg/l	0.005	ISO 17025	77	47	270	120	81
Phosphorus (dissolved)	µg/l	20	ISO 17025	601	732	620	906	721
Potassium (dissolved)	mg/l	0.025	ISO 17025	59	24	63	64	33
Selenium (dissolved)	µg/l	4	ISO 17025	-	-	< 4.0	< 4.0	-
Sodium (dissolved)	mg/l	0.01	ISO 17025	800	440	1800*	950*	360
Antimony (dissolved)	µg/l	0.4	ISO 17025	0.7	1.9	1	0.7	1.1
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.97	3.58	1.44	10.5	13.3
Barium (dissolved)	µg/l	0.06	ISO 17025	56	130	100	46	74
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.04	< 0.02	0.04	0.05	0.1
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.2	< 0.2	0.4	0.3
Cobalt (dissolved)	µg/l	0.2	ISO 17025	2.2	2	2.4	2.2	4.4
Copper (dissolved)	µg/l	0.5	ISO 17025	2.1	1	0.7	6.4	36
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.3	< 0.2	< 0.2	< 0.2
Manganese (dissolved)	µg/l	0.05	ISO 17025	2100	3400	1400	800	1000
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	2.9	10	3.3	1.1	8.7
Nickel (dissolved)	µg/l	0.5	ISO 17025	1.7	4.6	4.2	3.5	9.2
Selenium (dissolved)	µg/l	0.6	ISO 17025	3.5	2.6	-	-	2.5
Tin (dissolved)	µg/l	0.2	ISO 17025	< 0.20	0.23	0.57	0.5	< 0.20
Vanadium (dissolved)	µg/l	0.2	ISO 17025	0.3	2.2	0.4	1.2	0.3
Zinc (dissolved)	µg/l	0.5	ISO 17025	3.5	4.2	11	21	4.8
Monoaromatics & Oxygenates								
Benzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Toluene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Ethylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
p & m-xylene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
o-xylene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^

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Analytical Report Number: 23-39646
Project / Site name: Phoenix Wharf, Port Talbot (Project Dragon)

Lab Sample Number				2716063	2716064	2716065	2716066	2716067
Sample Reference				BH111	BH112	BH113	BH115	BH116
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2023	13/06/2023	13/06/2023	13/06/2023	13/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Petroleum Hydrocarbons								
Mineral Oil (C10 - C40) EH_1D_AL_MS	µg/l	10	NONE	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
Diesel Range Organics (C10 - C25) EH_1D_TOTAL_MS	µg/l	10	NONE	< 10	140	< 10	< 10	< 10
TPH1 (C10 - C40) EH_1D_TOTAL_MS	µg/l	10	ISO 17025	< 10	180	< 10	< 10	< 10
TPH2 (C6 - C10) HS_1D_TOTAL	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C5 - C6 HS_1D_AL	µg/l	1	ISO 17025	< 1.0##	< 1.0##	< 1.0##	< 1.0##	< 1.0##
TPH-CWG - Aliphatic >C6 - C8 HS_1D_AL	µg/l	1	ISO 17025	< 1.0##	< 1.0##	< 1.0##	< 1.0##	< 1.0##
TPH-CWG - Aliphatic >C8 - C10 HS_1D_AL	µg/l	1	ISO 17025	< 1.0##	< 1.0##	< 1.0##	< 1.0##	< 1.0##
TPH-CWG - Aliphatic >C10 - C12 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35) HS+EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C5 - C7 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16 EH_1D_AR_MS	µg/l	10	NONE	< 10	25	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21 EH_1D_AR_MS	µg/l	10	NONE	< 10	40	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35 EH_1D_AR_MS	µg/l	10	NONE	< 10	110	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35) HS+EH_1D_AR_MS	µg/l	10	NONE	< 10	180	< 10	< 10	< 10

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Analytical Report Number: 23-39646
Project / Site name: Phoenix Wharf, Port Talbot (Project Dragon)

Lab Sample Number				2716063	2716064	2716065	2716066	2716067
Sample Reference				BH111	BH112	BH113	BH115	BH116
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2023	13/06/2023	13/06/2023	13/06/2023	13/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
VOCs								
Chloromethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Chloroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Bromomethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Vinyl Chloride	µg/l	3	NONE	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Trichlorofluoromethane	µg/l	3	NONE	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,1-Dichloroethene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Cis-1,2-dichloroethene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,1-Dichloroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
2,2-Dichloropropane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Trichloromethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,1,1-Trichloroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,2-Dichloroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,1-Dichloropropene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Trans-1,2-dichloroethene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Benzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Tetrachloromethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,2-Dichloropropane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Trichloroethene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Dibromomethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Bromodichloromethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Cis-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Trans-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Toluene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,1,2-Trichloroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,3-Dichloropropane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Dibromochloromethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Tetrachloroethene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,2-Dibromoethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Chlorobenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,1,1,2-Tetrachloroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Ethylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
p & m-Xylene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Styrene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Tribromomethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
o-Xylene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,1,2,2-Tetrachloroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Isopropylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Bromobenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
n-Propylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
2-Chlorotoluene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
4-Chlorotoluene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,3,5-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
tert-Butylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,2,4-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
sec-Butylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,3-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
p-Isopropyltoluene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,2-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,4-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^

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Analytical Report Number: 23-39646
Project / Site name: Phoenix Wharf, Port Talbot (Project Dragon)

Lab Sample Number				2716063	2716064	2716065	2716066	2716067
Sample Reference				BH111	BH112	BH113	BH115	BH116
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2023	13/06/2023	13/06/2023	13/06/2023	13/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Butylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,2-Dibromo-3-chloropropane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,2,4-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Hexachlorobutadiene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,2,3-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^

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Analytical Report Number: 23-39646
Project / Site name: Phoenix Wharf, Port Talbot (Project Dragon)

Lab Sample Number				2716063	2716064	2716065	2716066	2716067
Sample Reference				BH111	BH112	BH113	BH115	BH116
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2023	13/06/2023	13/06/2023	13/06/2023	13/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
SVOCs								
Aniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Chlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachloroethane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Isophorone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Nitrophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	0.24	< 0.01	< 0.01	< 0.01
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dimethylphthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	0.25	< 0.01	< 0.01	< 0.01
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibenzofuran	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Diethyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Nitroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	µg/l	0.01	ISO 17025	< 0.01	0.17	< 0.01	< 0.01	< 0.01
Azobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	2.2	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	0.54	< 0.01	< 0.01	< 0.01
Carbazole	µg/l	0.05	NONE	< 0.05	0.33	< 0.05	< 0.05	< 0.05
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Anthraquinone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	3.6	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	3.3	< 0.01	< 0.01	< 0.01
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	1.7	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	1.7	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	2.3	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	0.67	< 0.01	< 0.01	< 0.01

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Analytical Report Number: 23-39646
Project / Site name: Phoenix Wharf, Port Talbot (Project Dragon)

Lab Sample Number				2716063	2716064	2716065	2716066	2716067
Sample Reference				BH111	BH112	BH113	BH115	BH116
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2023	13/06/2023	13/06/2023	13/06/2023	13/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	2	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	1	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	0.29	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	1.3	< 0.01	< 0.01	< 0.01
3&4-Methylphenol	µg/l	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number: 23-39646
Project / Site name: Phoenix Wharf, Port Talbot (Project Dragon)

Lab Sample Number				2716068	2716069	2716070
Sample Reference				BH117	BH119	BH120
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2023	13/06/2023	13/06/2023
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status			
General Inorganics						
pH (L005B)	pH Units	N/A	ISO 17025	7.4	7.5	7.2
Electrical Conductivity at 20 °C (L031B)	µS/cm	10	ISO 17025	7400	1800	4900
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10
Complex Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10
Sulphate as SO4	µg/l	45	ISO 17025	128000	336000	246000
Sulphide	µg/l	5	NONE	< 5.0	< 5.0	< 5.0
Chloride	mg/l	0.15	ISO 17025	2100*	260	1400*
Ammoniacal Nitrogen as NH4	µg/l	15	ISO 17025	3300	950	4000
Total Organic Carbon (TOC)	mg/l	0.1	ISO 17025	0.33	2.93	3.91
Total Phenols						
Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10	< 10	< 10
Speciated PAHs						
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Total PAH						
Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16	< 0.16

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Analytical Report Number: 23-39646
Project / Site name: Phoenix Wharf, Port Talbot (Project Dragon)

Lab Sample Number				2716068	2716069	2716070
Sample Reference				BH117	BH119	BH120
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2023	13/06/2023	13/06/2023
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status			
Heavy Metals / Metalloids						
Boron (dissolved)	µg/l	10	ISO 17025	310	230	650
Calcium (dissolved)	mg/l	0.012	ISO 17025	260	250	91
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0
Iron (dissolved)	mg/l	0.004	ISO 17025	0.11	0.039	0.008
Magnesium (dissolved)	mg/l	0.005	ISO 17025	160	59	100
Phosphorus (dissolved)	µg/l	20	ISO 17025	569	723	717
Potassium (dissolved)	mg/l	0.025	ISO 17025	63	15	38
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0	-	< 4.0
Sodium (dissolved)	mg/l	0.01	ISO 17025	1300	120	980*
Antimony (dissolved)	µg/l	0.4	ISO 17025	0.8	0.8	0.7
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.75	3.36	1.5
Barium (dissolved)	µg/l	0.06	ISO 17025	370	72	60
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1	< 0.1
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	0.02	0.05
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.3	< 0.2	< 0.2
Cobalt (dissolved)	µg/l	0.2	ISO 17025	0.6	0.6	6
Copper (dissolved)	µg/l	0.5	ISO 17025	0.9	3.3	2.5
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	< 0.2
Manganese (dissolved)	µg/l	0.05	ISO 17025	430	850	4700
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	0.63	4.4	1.8
Nickel (dissolved)	µg/l	0.5	ISO 17025	1.3	3	3.6
Selenium (dissolved)	µg/l	0.6	ISO 17025	-	< 0.6	-
Tin (dissolved)	µg/l	0.2	ISO 17025	< 0.20	0.28	0.33
Vanadium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.3	< 0.2
Zinc (dissolved)	µg/l	0.5	ISO 17025	3.1	6.2	16
Monoaromatics & Oxygenates						
Benzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
Toluene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
Ethylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
p & m-xylene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
o-xylene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^

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Analytical Report Number: 23-39646
Project / Site name: Phoenix Wharf, Port Talbot (Project Dragon)

Lab Sample Number				2716068	2716069	2716070
Sample Reference				BH117	BH119	BH120
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2023	13/06/2023	13/06/2023
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status			
Petroleum Hydrocarbons						
Mineral Oil (C10 - C40) EH_1D_AL_MS	µg/l	10	NONE	< 10.0	< 10.0	< 10.0
Diesel Range Organics (C10 - C25) EH_1D_TOTAL_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH1 (C10 - C40) EH_1D_TOTAL_MS	µg/l	10	ISO 17025	< 10	< 10	< 10
TPH2 (C6 - C10) HS_1D_TOTAL	µg/l	10	ISO 17025	< 10	< 10	< 10
TPH-CWG - Aliphatic >C5 - C6 HS_1D_AL	µg/l	1	ISO 17025	< 1.0##	< 1.0##	< 1.0##
TPH-CWG - Aliphatic >C6 - C8 HS_1D_AL	µg/l	1	ISO 17025	< 1.0##	< 1.0##	< 1.0##
TPH-CWG - Aliphatic >C8 - C10 HS_1D_AL	µg/l	1	ISO 17025	< 1.0##	< 1.0##	< 1.0##
TPH-CWG - Aliphatic >C10 - C12 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35) HS+EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic >C5 - C7 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35) HS+EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10

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Analytical Report Number: 23-39646
Project / Site name: Phoenix Wharf, Port Talbot (Project Dragon)

Lab Sample Number				2716068	2716069	2716070
Sample Reference				BH117	BH119	BH120
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2023	13/06/2023	13/06/2023
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status			
VOCs						
Chloromethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
Chloroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
Bromomethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
Vinyl Chloride	µg/l	3	NONE	< 3.0^	< 3.0^	< 3.0^
Trichlorofluoromethane	µg/l	3	NONE	< 3.0^	< 3.0^	< 3.0^
1,1-Dichloroethene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
Cis-1,2-dichloroethene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
1,1-Dichloroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
2,2-Dichloropropane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
Trichloromethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
1,1,1-Trichloroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
1,2-Dichloroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
1,1-Dichloropropene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
Trans-1,2-dichloroethene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
Benzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
Tetrachloromethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
1,2-Dichloropropane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
Trichloroethene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
Dibromomethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
Bromodichloromethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
Cis-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
Trans-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
Toluene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
1,1,2-Trichloroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
1,3-Dichloropropane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
Dibromochloromethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
Tetrachloroethene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
1,2-Dibromoethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
Chlorobenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
1,1,1,2-Tetrachloroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
Ethylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
p & m-Xylene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
Styrene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
Tribromomethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
o-Xylene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
1,1,2,2-Tetrachloroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
Isopropylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
Bromobenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
n-Propylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
2-Chlorotoluene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
4-Chlorotoluene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
1,3,5-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
tert-Butylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
1,2,4-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
sec-Butylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
1,3-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
p-Isopropyltoluene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
1,2-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
1,4-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^

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Analytical Report Number: 23-39646
Project / Site name: Phoenix Wharf, Port Talbot (Project Dragon)

Lab Sample Number				2716068	2716069	2716070
Sample Reference				BH117	BH119	BH120
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2023	13/06/2023	13/06/2023
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status			
Butylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
1,2-Dibromo-3-chloropropane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
1,2,4-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
Hexachlorobutadiene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^
1,2,3-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^

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Lab Sample Number				2716068	2716069	2716070
Sample Reference				BH117	BH119	BH120
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2023	13/06/2023	13/06/2023
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status			
SVOCs						
Aniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Phenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2-Chlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Hexachloroethane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Nitrobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
4-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Isophorone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2-Nitrophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
4-Chloroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Dimethylphthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Dibenzofuran	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Diethyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
4-Nitroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Azobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Carbazole	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Anthraquinone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01

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Analytical Report Number: 23-39646
Project / Site name: Phoenix Wharf, Port Talbot (Project Dragon)

Lab Sample Number				2716068	2716069	2716070
Sample Reference				BH117	BH119	BH120
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				13/06/2023	13/06/2023	13/06/2023
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status			
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
3&4-Methylphenol	µg/l	0.1	NONE	< 0.10	< 0.10	< 0.10

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number : 23-39646
Project / Site name: Phoenix Wharf, Port Talbot (Project Dragon)

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
Complex cyanide in water	Determination of complex cyanide by calculation. Accredited matrices SW, PW, GW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry.Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Mineral Oil (Waters) C10 - C40	Determination of dichloromethane extractable hydrocarbons in water by GC-MS.	In-house method	L070-PL	W	NONE
Monohydric phenols in water	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphide in water	Determination of sulphide in water by ion selective electrode.	In-house method	L029-PL	W	NONE
Sulphate in water	Determination of sulphate in water after filtration by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Semi-volatile organic compounds in water	Determination of semi-volatile organic compounds in leachate by extraction in dichloromethane followed by GC-MS.	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
TPH2 (Waters)	Determination of hydrocarbons C6-C10 by headspace GC-MS. Accredited Matrices SW, PW. GW.	In-house method based on USEPA8260	L088-PL	W	ISO 17025
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025

Analytical Report Number : 23-39646
Project / Site name: Phoenix Wharf, Port Talbot (Project Dragon)

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Total organic carbon in water	Determination of dissolved organic carbon in water by TOC/DOC NDIR analyser. Accredited matrices: SW PW GW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	ISO 17025
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Ammonium as NH4 in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the colorimetric salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
DRO (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS.	In-house method	L070-PL	W	NONE
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
TPH1 (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS.	In-house method	L070-PL	W	ISO 17025
Chloride in water	Determination of Chloride (diissolved) colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025

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

Analytical Report Number : 23-39646
Project / Site name: Phoenix Wharf, Port Talbot (Project Dragon)

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

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

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

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

*Result was reported from high dilution and should be interpreted with care
##Quality control parameter has a high recovery (outside of limit); however the associated result is below the reporting limit, other checks applied prior to reporting the data have been accepted. The result should be considered as being deviating and may be compromised.
^ Data reported unaccredited due to quality control parameter failure associated with this result; The result should be considered as being deviating and may be compromised.

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Analytical Report Number : 23-41879

Project / Site name:	Phoenix Wharf, Port Talbot	Samples received on:	28/06/2023
Your job number:	2111006.005	Samples instructed on/ Analysis started on:	29/06/2023
Your order number:		Analysis completed by:	10/07/2023
Report Issue Number:	1	Report issued on:	10/07/2023
Samples Analysed:	6 water samples		

Signed:

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

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

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

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

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

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

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

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

Analytical Report Number: 23-41879
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2729531	2729532	2729533	2729534	2729535
Sample Reference				WS06	WS07	WS10	WS11	BH02
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
General Inorganics								
pH (L099)	pH Units	N/A	ISO 17025	7.4	7.3	7.3	7.2	7.3
Electrical Conductivity at 20 °C (L031B)	µS/cm	10	ISO 17025	860	770	790	880	6300
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Complex Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Sulphide	µg/l	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chloride	mg/l	0.15	ISO 17025	120	74	35	21	3300$$
Ammoniacal Nitrogen as NH4	µg/l	15	ISO 17025	1300	1400	2700	2100	7400
Total Organic Carbon (TOC)	mg/l	0.1	ISO 17025	3.84	3.63	2.89	3.51	6.3
Total Phenols								
Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Speciated PAHs								
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	1.31	0.41	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	0.35	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	2.01	0.56	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	1.85	0.51	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	1.11	0.25	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	1.18	0.27	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	1.3	0.34	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	0.56	0.1	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	1.05	0.23	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	0.59	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	0.73	< 0.01	< 0.01	< 0.01	< 0.01
Total PAH								
Total EPA-16 PAHs	µg/l	0.16	ISO 17025	12	2.67	< 0.16	< 0.16	< 0.16

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Analytical Report Number: 23-41879
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2729531	2729532	2729533	2729534	2729535
Sample Reference				WS06	WS07	WS10	WS11	BH02
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Heavy Metals / Metalloids								
Boron (dissolved)	µg/l	10	ISO 17025	340	230	190	150	830
Calcium (dissolved)	mg/l	0.012	ISO 17025	77	75	160	180	120
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Iron (dissolved)	mg/l	0.004	ISO 17025	0.08	0.018	0.1	0.1	0.053
Magnesium (dissolved)	mg/l	0.005	ISO 17025	37	24	22	20	220
Phosphorus (dissolved)	µg/l	20	ISO 17025	267	285	327	250	1440
Potassium (dissolved)	mg/l	0.025	ISO 17025	9.9	11	10	9	75
Selenium (dissolved)	µg/l	4	ISO 17025	-	-	-	-	< 4.0
Sodium (dissolved)	mg/l	0.01	ISO 17025	74	55	20	12	1100
Antimony (dissolved)	µg/l	0.4	ISO 17025	1.9	1.5	14	0.6	0.5
Arsenic (dissolved)	µg/l	0.15	ISO 17025	11.1	11.6	28.8	1.84	162
Barium (dissolved)	µg/l	0.06	ISO 17025	280	240	300	56	110
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.09	0.03	0.36	0.13	0.04
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	< 0.2	< 0.2	0.7
Cobalt (dissolved)	µg/l	0.2	ISO 17025	7	7.4	0.9	1.2	0.4
Copper (dissolved)	µg/l	0.5	ISO 17025	6.3	3.9	4.9	4.5	0.9
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Manganese (dissolved)	µg/l	0.05	ISO 17025	1200	860	2900	770	1700
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	13	13	5.7	1.4	0.29
Nickel (dissolved)	µg/l	0.5	ISO 17025	8	7.3	8	3.1	3.8
Selenium (dissolved)	µg/l	0.6	ISO 17025	< 0.6	1.1	0.9	1.1	-
Tin (dissolved)	µg/l	0.2	ISO 17025	0.36	< 0.20	< 0.20	< 0.20	0.76
Vanadium (dissolved)	µg/l	0.2	ISO 17025	5.1	1.4	0.5	0.6	2.9
Zinc (dissolved)	µg/l	0.5	ISO 17025	62	85	8.1	3.5	4.6
Monoaromatics & Oxygenates								
Benzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Toluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Ethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
p & m-xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
o-xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0

Analytical Report Number: 23-41879
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2729531	2729532	2729533	2729534	2729535
Sample Reference				WS06	WS07	WS10	WS11	BH02
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Petroleum Hydrocarbons								
Mineral Oil (C10 - C40) EH_1D_AL_MS	µg/l	10	NONE	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
Diesel Range Organics (C10 - C25) EH_1D_TOTAL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH1 (C10 - C40) EH_1D_TOTAL_MS	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
TPH2 (C6 - C10) HS_1D_TOTAL	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C5 - C6 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35) HS+EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C5 - C7 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35) HS+EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
VOCs								
Chloromethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Chloroethane##	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Bromomethane##	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Vinyl Chloride	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Trichlorofluoromethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1-Dichloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Trans 1,2-dichloroethylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1-Dichloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
2,2-Dichloropropane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Chloroform	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1,1-Trichloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dichloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1-Dichloropropene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Cis-1,2-dichloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Benzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Carbontetrachloride	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dichloropropane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Trichloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Dibromomethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Bromodichloromethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Cis-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Trans-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Toluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1,2-Trichloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,3-Dichloropropane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Dibromochloromethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Tetrachloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0

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Analytical Report Number: 23-41879
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2729531	2729532	2729533	2729534	2729535
Sample Reference				WS06	WS07	WS10	WS11	BH02
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
1,2-Dibromoethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Chlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1,1,2-Tetrachloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Ethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
p & m-Xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Styrene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Bromoform	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
o-Xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Isopropylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1,2,2-Tetrachloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Bromobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
n-Propylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
2-Chlorotoluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
4-Chlorotoluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,3,5-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
tert-Butylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2,4-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
sec-Butylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,3-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
p-Isopropyltoluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,4-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Butylbenzene##	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dibromo-3-chloropropane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2,4-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Hexachlorobutadiene##	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2,3-Trichlorobenzene##	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0

SVOCs

Aniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Chlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachloroethane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Isophorone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Nitrophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dimethylphthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

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Analytical Report Number: 23-41879
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2729531	2729532	2729533	2729534	2729535
Sample Reference				WS06	WS07	WS10	WS11	BH02
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				26/06/2023	26/06/2023	26/06/2023	26/06/2023	26/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibenzofuran	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Diethyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Nitroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Azobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	µg/l	0.01	ISO 17025	1.3	0.41	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	0.35	< 0.01	< 0.01	< 0.01	< 0.01
Carbazole	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Anthraquinone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	µg/l	0.01	ISO 17025	2	0.56	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	1.9	0.51	< 0.01	< 0.01	< 0.01
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	µg/l	0.01	ISO 17025	1.1	0.25	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	1.2	0.27	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	1.3	0.34	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	0.56	0.1	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	1.1	0.23	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	0.59	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	0.73	< 0.01	< 0.01	< 0.01	< 0.01

3&4-Methylphenol	µg/l	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number: 23-41879
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2729536
Sample Reference				DS101
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				26/06/2023
Time Taken				None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status	
General Inorganics				
pH (L099)	pH Units	N/A	ISO 17025	7.2
Electrical Conductivity at 20 °C (L031B)	µS/cm	10	ISO 17025	1300
Total Cyanide	µg/l	10	ISO 17025	< 10
Complex Cyanide	µg/l	10	ISO 17025	< 10
Free Cyanide	µg/l	10	ISO 17025	< 10
Sulphide	µg/l	5	NONE	< 5.0
Chloride	mg/l	0.15	ISO 17025	83
Ammoniacal Nitrogen as NH4	µg/l	15	ISO 17025	250
Total Organic Carbon (TOC)	mg/l	0.1	ISO 17025	4.71
Total Phenols				
Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10
Speciated PAHs				
Naphthalene	µg/l	0.01	ISO 17025	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01
Total PAH				
Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16

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Analytical Report Number: 23-41879
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2729536
Sample Reference				DS101
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				26/06/2023
Time Taken				None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status	
Heavy Metals / Metalloids				
Boron (dissolved)	µg/l	10	ISO 17025	250
Calcium (dissolved)	mg/l	0.012	ISO 17025	150
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0
Iron (dissolved)	mg/l	0.004	ISO 17025	0.26
Magnesium (dissolved)	mg/l	0.005	ISO 17025	31
Phosphorus (dissolved)	µg/l	20	ISO 17025	304
Potassium (dissolved)	mg/l	0.025	ISO 17025	28
Selenium (dissolved)	µg/l	4	ISO 17025	-
Sodium (dissolved)	mg/l	0.01	ISO 17025	46
Antimony (dissolved)	µg/l	0.4	ISO 17025	1
Arsenic (dissolved)	µg/l	0.15	ISO 17025	37.5
Barium (dissolved)	µg/l	0.06	ISO 17025	250
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2
Cobalt (dissolved)	µg/l	0.2	ISO 17025	11
Copper (dissolved)	µg/l	0.5	ISO 17025	1.8
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2
Manganese (dissolved)	µg/l	0.05	ISO 17025	1900
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	17
Nickel (dissolved)	µg/l	0.5	ISO 17025	7.6
Selenium (dissolved)	µg/l	0.6	ISO 17025	0.8
Tin (dissolved)	µg/l	0.2	ISO 17025	0.35
Vanadium (dissolved)	µg/l	0.2	ISO 17025	0.3
Zinc (dissolved)	µg/l	0.5	ISO 17025	4
Monoaromatics & Oxygenates				
Benzene	µg/l	3	ISO 17025	< 3.0
Toluene	µg/l	3	ISO 17025	< 3.0
Ethylbenzene	µg/l	3	ISO 17025	< 3.0
p & m-xylene	µg/l	3	ISO 17025	< 3.0
o-xylene	µg/l	3	ISO 17025	< 3.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0

Analytical Report Number: 23-41879
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2729536
Sample Reference				DS101
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				26/06/2023
Time Taken				None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status	
Petroleum Hydrocarbons				
Mineral Oil (C10 - C40) EH_1D_AL_MS	µg/l	10	NONE	< 10.0
Diesel Range Organics (C10 - C25) EH_1D_TOTAL_MS	µg/l	10	NONE	< 10
TPH1 (C10 - C40) EH_1D_TOTAL_MS	µg/l	10	ISO 17025	< 10
TPH2 (C6 - C10) HS_1D_TOTAL	µg/l	10	ISO 17025	< 10
TPH-CWG - Aliphatic >C5 - C6 HS_1D_AL	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aliphatic >C6 - C8 HS_1D_AL	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aliphatic >C8 - C10 HS_1D_AL	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aliphatic >C10 - C12 EH_1D_AL_MS	µg/l	10	NONE	< 10
TPH-CWG - Aliphatic >C12 - C16 EH_1D_AL_MS	µg/l	10	NONE	< 10
TPH-CWG - Aliphatic >C16 - C21 EH_1D_AL_MS	µg/l	10	NONE	< 10
TPH-CWG - Aliphatic >C21 - C35 EH_1D_AL_MS	µg/l	10	NONE	< 10
TPH-CWG - Aliphatic (C5 - C35) HS+EH_1D_AL_MS	µg/l	10	NONE	< 10
TPH-CWG - Aromatic >C5 - C7 HS_1D_AR	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aromatic >C7 - C8 HS_1D_AR	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aromatic >C8 - C10 HS_1D_AR	µg/l	1	ISO 17025	< 1.0
TPH-CWG - Aromatic >C10 - C12 EH_1D_AR_MS	µg/l	10	NONE	< 10
TPH-CWG - Aromatic >C12 - C16 EH_1D_AR_MS	µg/l	10	NONE	< 10
TPH-CWG - Aromatic >C16 - C21 EH_1D_AR_MS	µg/l	10	NONE	< 10
TPH-CWG - Aromatic >C21 - C35 EH_1D_AR_MS	µg/l	10	NONE	< 10
TPH-CWG - Aromatic (C5 - C35) HS+EH_1D_AR_MS	µg/l	10	NONE	< 10
VOCs				
Chloromethane	µg/l	3	ISO 17025	< 3.0
Chloroethane##	µg/l	3	ISO 17025	< 3.0
Bromomethane##	µg/l	3	ISO 17025	< 3.0
Vinyl Chloride	µg/l	3	NONE	< 3.0
Trichlorofluoromethane	µg/l	3	NONE	< 3.0
1,1-Dichloroethene	µg/l	3	ISO 17025	< 3.0
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	3	ISO 17025	< 3.0
Trans 1,2-dichloroethylene	µg/l	3	ISO 17025	< 3.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0
1,1-Dichloroethane	µg/l	3	ISO 17025	< 3.0
2,2-Dichloropropane	µg/l	3	ISO 17025	< 3.0
Chloroform	µg/l	3	ISO 17025	< 3.0
1,1,1-Trichloroethane	µg/l	3	ISO 17025	< 3.0
1,2-Dichloroethane	µg/l	3	ISO 17025	< 3.0
1,1-Dichloropropene	µg/l	3	ISO 17025	< 3.0
Cis-1,2-dichloroethene	µg/l	3	ISO 17025	< 3.0
Benzene	µg/l	3	ISO 17025	< 3.0
Carbontetrachloride	µg/l	3	ISO 17025	< 3.0
1,2-Dichloropropane	µg/l	3	ISO 17025	< 3.0
Trichloroethene	µg/l	3	ISO 17025	< 3.0
Dibromomethane	µg/l	3	ISO 17025	< 3.0
Bromodichloromethane	µg/l	3	ISO 17025	< 3.0
Cis-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0
Trans-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0
Toluene	µg/l	3	ISO 17025	< 3.0
1,1,2-Trichloroethane	µg/l	3	ISO 17025	< 3.0
1,3-Dichloropropane	µg/l	3	ISO 17025	< 3.0
Dibromochloromethane	µg/l	3	ISO 17025	< 3.0
Tetrachloroethene	µg/l	3	ISO 17025	< 3.0

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Analytical Report Number: 23-41879
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2729536
Sample Reference				DS101
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				26/06/2023
Time Taken				None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status	
1,2-Dibromoethane	µg/l	3	ISO 17025	< 3.0
Chlorobenzene	µg/l	3	ISO 17025	< 3.0
1,1,1,2-Tetrachloroethane	µg/l	3	ISO 17025	< 3.0
Ethylbenzene	µg/l	3	ISO 17025	< 3.0
p & m-Xylene	µg/l	3	ISO 17025	< 3.0
Styrene	µg/l	3	ISO 17025	< 3.0
Bromoform	µg/l	3	ISO 17025	< 3.0
o-Xylene	µg/l	3	ISO 17025	< 3.0
Isopropylbenzene	µg/l	3	ISO 17025	< 3.0
1,1,2,2-Tetrachloroethane	µg/l	3	ISO 17025	< 3.0
Bromobenzene	µg/l	3	ISO 17025	< 3.0
n-Propylbenzene	µg/l	3	ISO 17025	< 3.0
2-Chlorotoluene	µg/l	3	ISO 17025	< 3.0
4-Chlorotoluene	µg/l	3	ISO 17025	< 3.0
1,3,5-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0
tert-Butylbenzene	µg/l	3	ISO 17025	< 3.0
1,2,4-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0
sec-Butylbenzene	µg/l	3	ISO 17025	< 3.0
1,3-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0
p-Isopropyltoluene	µg/l	3	ISO 17025	< 3.0
1,4-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0
1,2-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0
Butylbenzene##	µg/l	3	ISO 17025	< 3.0
1,2-Dibromo-3-chloropropane	µg/l	3	ISO 17025	< 3.0
1,2,4-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0
Hexachlorobutadiene##	µg/l	3	ISO 17025	< 3.0
1,2,3-Trichlorobenzene##	µg/l	3	ISO 17025	< 3.0

SVOCs

Aniline	µg/l	0.05	NONE	< 0.05
Phenol	µg/l	0.05	NONE	< 0.05
2-Chlorophenol	µg/l	0.05	NONE	< 0.05
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05
2-Methylphenol	µg/l	0.05	NONE	< 0.05
Hexachloroethane	µg/l	0.05	NONE	< 0.05
Nitrobenzene	µg/l	0.05	NONE	< 0.05
4-Methylphenol	µg/l	0.05	NONE	< 0.05
Isophorone	µg/l	0.05	NONE	< 0.05
2-Nitrophenol	µg/l	0.05	NONE	< 0.05
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05
Naphthalene	µg/l	0.01	ISO 17025	< 0.01
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05
4-Chloroaniline	µg/l	0.05	NONE	< 0.05
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05
Dimethylphthalate	µg/l	0.05	NONE	< 0.05

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Analytical Report Number: 23-41879
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2729536
Sample Reference				DS101
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				26/06/2023
Time Taken				None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status	
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05
Dibenzofuran	µg/l	0.05	NONE	< 0.05
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05
Diethyl phthalate	µg/l	0.05	NONE	< 0.05
4-Nitroaniline	µg/l	0.05	NONE	< 0.05
Fluorene	µg/l	0.01	ISO 17025	< 0.01
Azobenzene	µg/l	0.05	NONE	< 0.05
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01
Carbazole	µg/l	0.05	NONE	< 0.05
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05
Anthraquinone	µg/l	0.05	NONE	< 0.05
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01

3&4-Methylphenol	µg/l	0.1	NONE	< 0.10

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number : 23-41879
Project / Site name: Phoenix Wharf, Port Talbot

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
Complex cyanide in water	Determination of complex cyanide by calculation. Accredited matrices SW, PW, GW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry.Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Mineral Oil (Waters) C10 - C40	Determination of dichloromethane extractable hydrocarbons in water by GC-MS.	In-house method	L070-PL	W	NONE
Monohydric phenols in water	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphide in water	Determination of sulphide in water by ion selective electrode.	In-house method	L029-PL	W	NONE
Sulphate in water	Determination of sulphate in water after filtration by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Semi-volatile organic compounds in water	Determination of semi-volatile organic compounds in leachate by extraction in dichloromethane followed by GC-MS.	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
TPH2 (Waters)	Determination of hydrocarbons C6-C10 by headspace GC-MS. Accredited Matrices SW, PW. GW.	In-house method based on USEPA8260	L088-PL	W	ISO 17025
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total organic carbon in water	Determination of dissolved organic carbon in water by TOC/DOC NDIR analyser. Accredited matrices: SW PW GW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	ISO 17025

Analytical Report Number : 23-41879
Project / Site name: Phoenix Wharf, Port Talbot

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Ammonium as NH4 in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the colorimetric salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
DRO (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS.	In-house method	L070-PL	W	NONE
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
TPH1 (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS.	In-house method	L070-PL	W	ISO 17025
Chloride in water	Determination of Chloride (diissolved) colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025

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

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

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

$$ - Result was reported from high dilution. The result should be interpreted with caution
- Quality control parameter has a high recovery (outside of limit); however the associated result is below the reporting limit, other checks applied prior to reporting the data have been accepted. The result should be considered as being deviating and may be compromised.

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Analytical Report Number : 23-41879

Project / Site name: Phoenix Wharf, Port Talbot

This deviation report indicates the sample and test deviations that apply to the samples submitted for analysis.Please note that the associated result(s) may be unreliable and should be interpreted with care.

Key: a - No sampling date b - Incorrect container c - Holding time d - Headspace e - Temperature

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
BH02	None Supplied	W	2729535	b	BTEX and MTBE in water (Monoaromatics)	L073B-PL	b
BH02	None Supplied	W	2729535	b	TPH2 (Waters)	L088-PL	b
BH02	None Supplied	W	2729535	b	Volatile organic compounds in water	L073B-PL	b

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Analytical Report Number : 23-42229

Project / Site name:	Phoenix Wharf, Port Talbot	Samples received on:	30/06/2023
Your job number:	2111006.005	Samples instructed on/ Analysis started on:	30/06/2023
Your order number:		Analysis completed by:	07/07/2023
Report Issue Number:	1	Report issued on:	13/07/2023
Samples Analysed:	10 water samples		

Signed:

Joanna Wawrzeczko
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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

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Analytical Report Number: 23-42229
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2731761	2731762	2731763	2731764	2731765
Sample Reference				DS103	DS104	DS105	DS106	DS107
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
General Inorganics								
pH (L099)	pH Units	N/A	ISO 17025	7.8	7.8	7.9	7.6	7.3
Electrical Conductivity at 20 °C (L031B)	µS/cm	10	ISO 17025	1400	1100	860	910	1000
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Complex Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Sulphate as SO4	µg/l	45	ISO 17025	295000	112000	242000	47500	48500
Sulphide	µg/l	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chloride	mg/l	0.15	ISO 17025	150	90	34	67	99
Ammoniacal Nitrogen as NH4	µg/l	15	ISO 17025	7800	1600	84	370	270
Total Organic Carbon (TOC)	mg/l	0.1	ISO 17025	10.2	4.46	5.12	3.2	4.98
Total Phenols								
Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Speciated PAHs								
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Total PAH								
Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16

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Analytical Report Number: 23-42229
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2731761	2731762	2731763	2731764	2731765
Sample Reference				DS103	DS104	DS105	DS106	DS107
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Heavy Metals / Metalloids								
Boron (dissolved)	µg/l	10	ISO 17025	290	400	240	190	120
Calcium (dissolved)	mg/l	0.012	ISO 17025	190	170	120	180	190
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Iron (dissolved)	mg/l	0.004	ISO 17025	0.054	0.006	0.021	< 0.004	0.006
Magnesium (dissolved)	mg/l	0.005	ISO 17025	21	50	37	41	14
Phosphorus (dissolved)	µg/l	20	ISO 17025	450	339	314	313	278
Potassium (dissolved)	mg/l	0.025	ISO 17025	21	30	15	7.7	6.1
Sodium (dissolved)	mg/l	0.01	ISO 17025	180	120	24	49	92
Antimony (dissolved)	µg/l	0.4	ISO 17025	1	0.5	0.9	< 0.4	0.9
Arsenic (dissolved)	µg/l	0.15	ISO 17025	723	3.52	13	0.94	1.93
Barium (dissolved)	µg/l	0.06	ISO 17025	31	73	62	13	100
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	0.04	< 0.02	< 0.02	0.06
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.3	< 0.2	< 0.2	< 0.2	0.3
Cobalt (dissolved)	µg/l	0.2	ISO 17025	0.9	5.8	0.7	0.8	5.2
Copper (dissolved)	µg/l	0.5	ISO 17025	1.8	12	2.6	0.6	7.1
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Manganese (dissolved)	µg/l	0.05	ISO 17025	1600	390	910	1100	1700
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	9.1	4.8	21	1.8	5.4
Nickel (dissolved)	µg/l	0.5	ISO 17025	2.3	6.4	4.4	0.7	6.4
Selenium (dissolved)	µg/l	0.6	ISO 17025	1.7	1.2	0.9	2	0.7
Tin (dissolved)	µg/l	0.2	ISO 17025	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Vanadium (dissolved)	µg/l	0.2	ISO 17025	8	0.2	3.5	< 0.2	< 0.2
Zinc (dissolved)	µg/l	0.5	ISO 17025	2.2	5	1.7	1.5	6.3
Monoaromatics & Oxygenates^								
Benzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Toluene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Ethylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
p & m-xylene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
o-xylene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0

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Analytical Report Number: 23-42229
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2731761	2731762	2731763	2731764	2731765
Sample Reference				DS103	DS104	DS105	DS106	DS107
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Petroleum Hydrocarbons								
Mineral Oil (C10 - C40) EH_1D_AL_MS	µg/l	10	NONE	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
Diesel Range Organics (C10 - C25) EH_1D_TOTAL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH1 (C10 - C40) EH_1D_TOTAL_MS	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
TPH2 (C6 - C10)# HS_1D_TOTAL	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C5 - C6# HS_1D_AL	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8# HS_1D_AL	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10# HS_1D_AL	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35) HS+EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C5 - C7# HS_1D_AR	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8# HS_1D_AR	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10# HS_1D_AR	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35) HS+EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10

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Analytical Report Number: 23-42229
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2731761	2731762	2731763	2731764	2731765
Sample Reference				DS103	DS104	DS105	DS106	DS107
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
VOCs^								
Chloromethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Chloroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Bromomethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Vinyl Chloride	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Trichlorofluoromethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1-Dichloroethene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Trans 1,2-dichloroethylene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1-Dichloroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
2,2-Dichloropropane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Chloroform	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1,1-Trichloroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dichloroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1-Dichloropropene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Cis-1,2-dichloroethene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Benzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Carbontetrachloride	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dichloropropane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Trichloroethene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Dibromomethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Bromodichloromethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Cis-1,3-dichloropropene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Trans-1,3-dichloropropene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Toluene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1,2-Trichloroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,3-Dichloropropane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Dibromochloromethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Tetrachloroethene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dibromoethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Chlorobenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1,1,2-Tetrachloroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Ethylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
p & m-Xylene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Styrene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Bromoform	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
o-Xylene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Isopropylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1,2,2-Tetrachloroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Bromobenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
n-Propylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
2-Chlorotoluene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
4-Chlorotoluene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,3,5-Trimethylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
tert-Butylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2,4-Trimethylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
sec-Butylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,3-Dichlorobenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
p-Isopropyltoluene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,4-Dichlorobenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dichlorobenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Butylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0

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Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2731761	2731762	2731763	2731764	2731765
Sample Reference				DS103	DS104	DS105	DS106	DS107
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
1,2-Dibromo-3-chloropropane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2,4-Trichlorobenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Hexachlorobutadiene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2,3-Trichlorobenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0

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Analytical Report Number: 23-42229
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2731761	2731762	2731763	2731764	2731765
Sample Reference				DS103	DS104	DS105	DS106	DS107
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
SVOCs								
Aniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Chlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachloroethane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Isophorone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Nitrophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dimethylphthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibenzofuran	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Diethyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Nitroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Azobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Carbazole	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Anthraquinone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

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Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2731761	2731762	2731763	2731764	2731765
Sample Reference				DS103	DS104	DS105	DS106	DS107
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
3&4-Methylphenol	µg/l	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PFAS Suite 3								
PFBS C4 Sulphonate	µg/l	0.05	NONE	< 0.05	< 0.05	-	< 0.05	< 0.05
PHPS C5 Sulphonate	µg/l	0.05	NONE	< 0.05	< 0.05	-	< 0.05	< 0.05
PFHxS C6 Sulphonate	µg/l	0.05	NONE	< 0.05	< 0.05	-	< 0.05	< 0.05
PFHpS C7 Sulphonate	µg/l	0.05	NONE	< 0.05	< 0.05	-	< 0.05	< 0.05
PFOS C8 Sulphonate	µg/l	0.05	NONE	< 0.05	< 0.05	-	< 0.05	< 0.05
PFNS C9 Sulphonate	µg/l	0.05	NONE	< 0.05	< 0.05	-	< 0.05	< 0.05
PFDS C10 Sulphonate	µg/l	0.05	NONE	< 0.05	< 0.05	-	< 0.05	< 0.05
PFUdS C11 Sulphonate	µg/l	0.05	NONE	< 0.05	< 0.05	-	< 0.05	< 0.05
PFDoS C12 Sulphonate	µg/l	0.05	NONE	< 0.05	< 0.05	-	< 0.05	< 0.05
PFBA C4 Carboxylic acid	µg/l	0.05	NONE	< 0.05	< 0.05	-	< 0.05	< 0.05
PFPeA C5 Carboxylic acid	µg/l	0.05	NONE	< 0.05	< 0.05	-	< 0.05	< 0.05
PFHxA C6 Carboxylic acid	µg/l	0.05	NONE	< 0.05	< 0.05	-	< 0.05	< 0.05
PFHpA C7 Carboxylic acid	µg/l	0.05	NONE	< 0.05	< 0.05	-	< 0.05	< 0.05
PFOA C8 Carboxylic acid	µg/l	0.05	NONE	< 0.05	< 0.05	-	< 0.05	< 0.05
PFNA C9 Carboxylic acid	µg/l	0.05	NONE	< 0.05	< 0.05	-	< 0.05	< 0.05
PFDA C10 Carboxylic acid	µg/l	0.05	NONE	< 0.05	< 0.05	-	< 0.05	< 0.05
PFUdA C11 Carboxylic acid	µg/l	0.05	NONE	< 0.05	< 0.05	-	< 0.05	< 0.05
PFDoA C12 Carboxylic acid	µg/l	0.05	NONE	< 0.05	< 0.05	-	< 0.05	< 0.05

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number: 23-42229
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2731766	2731767	2731768	2731769	2731770
Sample Reference				DS108	DS109	DS110	DS112	DS113
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
General Inorganics								
pH (L099)	pH Units	N/A	ISO 17025	6.9	7.2	7.7	7.5	7.3
Electrical Conductivity at 20 °C (L031B)	µS/cm	10	ISO 17025	1400	990	1200	1700	1500
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Complex Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Sulphate as SO4	µg/l	45	ISO 17025	328000	63600	222000	470000	4730
Sulphide	µg/l	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chloride	mg/l	0.15	ISO 17025	30	47	47	200	210
Ammoniacal Nitrogen as NH4	µg/l	15	ISO 17025	62	65	1300	11000	2200
Total Organic Carbon (TOC)	mg/l	0.1	ISO 17025	4.72	5.34	2.7	8.61	6.42
Total Phenols								
Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10	< 10	< 10	49	< 10
Speciated PAHs								
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	17.2	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.42	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.63	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.79	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	1.18	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.27	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.75	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.51	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Total PAH								
Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16	< 0.16	21.7	< 0.16

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Analytical Report Number: 23-42229
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2731766	2731767	2731768	2731769	2731770
Sample Reference				DS108	DS109	DS110	DS112	DS113
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Heavy Metals / Metalloids								
Boron (dissolved)	µg/l	10	ISO 17025	170	82	180	500	260
Calcium (dissolved)	mg/l	0.012	ISO 17025	340	180	250	140	170
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Iron (dissolved)	mg/l	0.004	ISO 17025	0.025	< 0.004	0.064	0.027	0.01
Magnesium (dissolved)	mg/l	0.005	ISO 17025	23	24	48	66	34
Phosphorus (dissolved)	µg/l	20	ISO 17025	408	282	245	296	280
Potassium (dissolved)	mg/l	0.025	ISO 17025	8.7	3.8	13	33	11
Sodium (dissolved)	mg/l	0.01	ISO 17025	20	37	39	180	160
Antimony (dissolved)	µg/l	0.4	ISO 17025	0.8	< 0.4	< 0.4	1.5	0.6
Arsenic (dissolved)	µg/l	0.15	ISO 17025	1.85	0.74	4.07	12.9	2.8
Barium (dissolved)	µg/l	0.06	ISO 17025	26	15	8.8	92	61
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.35	0.02	< 0.02	< 0.02	0.02
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.2	< 0.2	< 0.2	< 0.2	< 0.2
Cobalt (dissolved)	µg/l	0.2	ISO 17025	10	1.6	< 0.2	0.6	8.8
Copper (dissolved)	µg/l	0.5	ISO 17025	4	1.6	1.1	1.9	1.7
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Manganese (dissolved)	µg/l	0.05	ISO 17025	980	4600	220	700	3200
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	2.5	2.6	4.1	21	7.6
Nickel (dissolved)	µg/l	0.5	ISO 17025	11	1.9	< 0.5	4.2	4.9
Selenium (dissolved)	µg/l	0.6	ISO 17025	< 0.6	< 0.6	0.8	0.9	1.5
Tin (dissolved)	µg/l	0.2	ISO 17025	0.22	< 0.20	< 0.20	< 0.20	< 0.20
Vanadium (dissolved)	µg/l	0.2	ISO 17025	2.8	< 0.2	< 0.2	2.5	0.4
Zinc (dissolved)	µg/l	0.5	ISO 17025	16	2.2	< 0.5	4.6	0.9
Monoaromatics & Oxygenates^								
Benzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Toluene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Ethylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
p & m-xylene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
o-xylene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0

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Analytical Report Number: 23-42229
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2731766	2731767	2731768	2731769	2731770
Sample Reference				DS108	DS109	DS110	DS112	DS113
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Petroleum Hydrocarbons								
Mineral Oil (C10 - C40) EH_1D_AL_MS	µg/l	10	NONE	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
Diesel Range Organics (C10 - C25) EH_1D_TOTAL_MS	µg/l	10	NONE	< 10	< 10	< 10	300	< 10
TPH1 (C10 - C40) EH_1D_TOTAL_MS	µg/l	10	ISO 17025	< 10	< 10	< 10	340	< 10
TPH2 (C6 - C10)# HS_1D_TOTAL	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C5 - C6# HS_1D_AL	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8# HS_1D_AL	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10# HS_1D_AL	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35) HS+EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C5 - C7# HS_1D_AR	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8# HS_1D_AR	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10# HS_1D_AR	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	43	< 10
TPH-CWG - Aromatic >C12 - C16 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	140	< 10
TPH-CWG - Aromatic >C16 - C21 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	120	< 10
TPH-CWG - Aromatic >C21 - C35 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	40	< 10
TPH-CWG - Aromatic (C5 - C35) HS+EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	340	< 10

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Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2731766	2731767	2731768	2731769	2731770
Sample Reference				DS108	DS109	DS110	DS112	DS113
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
VOCs ^								
Chloromethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Chloroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Bromomethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Vinyl Chloride	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Trichlorofluoromethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1-Dichloroethene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Trans 1,2-dichloroethylene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1-Dichloroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
2,2-Dichloropropane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Chloroform	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1,1-Trichloroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dichloroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1-Dichloropropene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Cis-1,2-dichloroethene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Benzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Carbontetrachloride	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dichloropropane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Trichloroethene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Dibromomethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Bromodichloromethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Cis-1,3-dichloropropene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Trans-1,3-dichloropropene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Toluene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1,2-Trichloroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,3-Dichloropropane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Dibromochloromethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Tetrachloroethene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dibromoethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Chlorobenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1,1,2-Tetrachloroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Ethylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
p & m-Xylene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Styrene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Bromoform	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
o-Xylene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Isopropylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,1,2,2-Tetrachloroethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Bromobenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
n-Propylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
2-Chlorotoluene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
4-Chlorotoluene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,3,5-Trimethylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
tert-Butylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2,4-Trimethylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
sec-Butylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,3-Dichlorobenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
p-Isopropyltoluene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,4-Dichlorobenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dichlorobenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Butylbenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0

Analytical Report Number: 23-42229
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2731766	2731767	2731768	2731769	2731770
Sample Reference				DS108	DS109	DS110	DS112	DS113
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
1,2-Dibromo-3-chloropropane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2,4-Trichlorobenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
Hexachlorobutadiene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
1,2,3-Trichlorobenzene	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0

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Sample Reference				DS108	DS109	DS110	DS112	DS113
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
SVOCs								
Aniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Chlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachloroethane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Isophorone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Nitrophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	84	< 0.05
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	17	< 0.01
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	1.2	< 0.05
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dimethylphthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.42	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.63	< 0.01
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibenzofuran	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	0.5	< 0.05
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Diethyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Nitroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.79	< 0.01
Azobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	1.2	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.27	< 0.01
Carbazole	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	4.2	< 0.05
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Anthraquinone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.75	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.51	< 0.01
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

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Lab Sample Number				2731766	2731767	2731768	2731769	2731770
Sample Reference				DS108	DS109	DS110	DS112	DS113
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				28/06/2023	28/06/2023	28/06/2023	28/06/2023	28/06/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
3&4-Methylphenol	µg/l	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
PFAS Suite 3								
PFBS C4 Sulphonate	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	-
PHPS C5 Sulphonate	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	-
PFHxS C6 Sulphonate	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	-
PFHpS C7 Sulphonate	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	-
PFOS C8 Sulphonate	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	-
PFNS C9 Sulphonate	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	-
PFDS C10 Sulphonate	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	-
PFUdS C11 Sulphonate	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	-
PFDoS C12 Sulphonate	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	-
PFBA C4 Carboxylic acid	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	-
PFPeA C5 Carboxylic acid	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	-
PFHxA C6 Carboxylic acid	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	-
PFHpA C7 Carboxylic acid	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	-
PFOA C8 Carboxylic acid	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	-
PFNA C9 Carboxylic acid	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	-
PFDA C10 Carboxylic acid	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	-
PFUdA C11 Carboxylic acid	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	-
PFDoA C12 Carboxylic acid	µg/l	0.05	NONE	< 0.05	-	-	< 0.05	-

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number : 23-42229
Project / Site name: Phoenix Wharf, Port Talbot

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
Complex cyanide in water	Determination of complex cyanide by calculation. Accredited matrices SW, PW, GW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry.Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Mineral Oil (Waters) C10 - C40	Determination of dichloromethane extractable hydrocarbons in water by GC-MS.	In-house method	L070-PL	W	NONE
Monohydric phenols in water	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphide in water	Determination of sulphide in water by ion selective electrode.	In-house method	L029-PL	W	NONE
Sulphate in water	Determination of sulphate in water after filtration by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Semi-volatile organic compounds in water	Determination of semi-volatile organic compounds in leachate by extraction in dichloromethane followed by GC-MS.	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
TPH2 (Waters)	Determination of hydrocarbons C6-C10 by headspace GC-MS. Accredited Matrices SW, PW. GW.	In-house method based on USEPA8260	L088-PL	W	ISO 17025
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total organic carbon in water	Determination of dissolved organic carbon in water by TOC/DOC NDIR analyser. Accredited matrices: SW PW GW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	ISO 17025

Analytical Report Number : 23-42229
Project / Site name: Phoenix Wharf, Port Talbot

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Ammonium as NH4 in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the colorimetric salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
DRO (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS.	In-house method	L070-PL	W	NONE
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
EF - PFAS suite 3 in water by LC-MS/MS	PFAS suite 3 by LC-MS/MS	In-house method	UK	W	NONE
TPH1 (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS.	In-house method	L070-PL	W	ISO 17025

Analytical Report Number : 23-42229
Project / Site name: Phoenix Wharf, Port Talbot

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Chloride in water	Determination of Chloride (diissolved) colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025

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

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

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

^ - Data reported unaccredited due to quality control parameter failure associated with this result; The result should be considered as being deviating and may be compromised.
# - Data reported unaccredited due to quality control parameter failure associated with this result; other checks applied prior to reporting the data have been accepted. The result should be considered as being deviating and may be compromised.

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Analytical Report Number : 23-45177

Project / Site name:	Phoenix Wharf, Port Talbot	Samples received on:	17/07/2023
Your job number:	2111006.005	Samples instructed on/ Analysis started on:	17/07/2023
Your order number:		Analysis completed by:	28/07/2023
Report Issue Number:	1	Report issued on:	28/07/2023
Samples Analysed:	14 water samples		

Signed: JSzwagrak

Joanna Szwagrzak
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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

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Analytical Report Number: 23-45177
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2749137	2749138	2749139	2749140	2749141
Sample Reference				DS101	DS103	DS104	DS106	DS107
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				11/07/2023	11/07/2023	11/07/2023	11/07/2023	11/07/2023
Time Taken				0915	0940	1015	1035	1100
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
General Inorganics								
pH (L099)	pH Units	N/A	ISO 17025	7.3	7.7	7.7	7.5	7.4
Electrical Conductivity at 20 °C (L031B)	µS/cm	10	ISO 17025	1100	1600	1400	960	5200
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Complex Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Sulphate as SO4	µg/l	45	ISO 17025	290000	227000	115000	57800	24500
Sulphide	µg/l	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chloride	mg/l	0.15	ISO 17025	110	270	99	62	1500$$
Ammoniacal Nitrogen as NH4	µg/l	15	ISO 17025	940	14000	2300	420	3900
Total Organic Carbon (TOC)	mg/l	0.1	ISO 17025	5.28	11.8	4.63	4.3	11.9
Total Phenols								
Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Speciated PAHs								
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.8	0.73	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.23	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.44	0.19	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	1.71	2.69	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.2	0.72	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.75	2.66	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.66	2.27	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.32	1.27	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.65	1.48	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.5	1.69	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.17	0.63	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.33	1.3	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.17	0.72	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.23	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.23	0.87	< 0.01
Total PAH								
Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16	6.93	17.7	< 0.16

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Analytical Report Number: 23-45177
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2749137	2749138	2749139	2749140	2749141
Sample Reference				DS101	DS103	DS104	DS106	DS107
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				11/07/2023	11/07/2023	11/07/2023	11/07/2023	11/07/2023
Time Taken				0915	0940	1015	1035	1100
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Heavy Metals / Metalloids								
Boron (dissolved)	µg/l	10	ISO 17025	300	340	480	190	920
Calcium (dissolved)	mg/l	0.012	ISO 17025	220	220	160	150	130
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Iron (dissolved)	mg/l	0.004	ISO 17025	0.4	0.12	0.008	0.022	0.029
Magnesium (dissolved)	mg/l	0.005	ISO 17025	48	24	53	38	98
Phosphorus (dissolved)	µg/l	20	ISO 17025	91.9	557	39	258	281
Potassium (dissolved)	mg/l	0.025	ISO 17025	39	23	35	8.7	42
Selenium (dissolved)	µg/l	4	ISO 17025	-	-	-	-	< 4.0
Sodium (dissolved)	mg/l	0.01	ISO 17025	79	220	110	41	1100
Antimony (dissolved)	µg/l	0.4	ISO 17025	1.1	0.8	1.8	1	1
Arsenic (dissolved)	µg/l	0.15	ISO 17025	59	818	7.56	6.74	19.3
Barium (dissolved)	µg/l	0.06	ISO 17025	120	23	120	72	62
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.2	< 0.2	< 0.2	0.3
Cobalt (dissolved)	µg/l	0.2	ISO 17025	1.6	0.9	5.6	2.3	2.4
Copper (dissolved)	µg/l	0.5	ISO 17025	1.6	0.8	1.8	1.7	1.2
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	0.5	< 0.2	< 0.2
Manganese (dissolved)	µg/l	0.05	ISO 17025	1500	1700	410	960	1500
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	14	6.5	8.6	8	11
Nickel (dissolved)	µg/l	0.5	ISO 17025	2.8	2.2	8.8	3.4	2.4
Selenium (dissolved)	µg/l	0.6	ISO 17025	2.1	2.3	1.8	< 0.6	-
Tin (dissolved)	µg/l	0.2	ISO 17025	< 0.20	< 0.20	< 0.20	< 0.20	0.51
Vanadium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	3.1	0.9	0.7	0.8
Zinc (dissolved)	µg/l	0.5	ISO 17025	2.5	2.4	2.1	5.9	3.8
Monoaromatics & Oxygenates								
Benzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Toluene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Ethylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
p & m-xylene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
o-xylene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^

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Analytical Report Number: 23-45177
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2749137	2749138	2749139	2749140	2749141
Sample Reference				DS101	DS103	DS104	DS106	DS107
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				11/07/2023	11/07/2023	11/07/2023	11/07/2023	11/07/2023
Time Taken				0915	0940	1015	1035	1100
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Petroleum Hydrocarbons								
Mineral Oil (C10 - C40) EH_1D_AL_MS	µg/l	10	NONE	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
Diesel Range Organics (C10 - C25) EH_1D_TOTAL_MS	µg/l	10	NONE	< 10	< 10	79	86	< 10
TPH1 (C10 - C40) EH_1D_TOTAL_MS	µg/l	10	ISO 17025	< 10	< 10	79	86	< 10
TPH2 (C6 - C10) HS_1D_TOTAL	µg/l	10	ISO 17025	< 10##	< 10##	< 10##	< 10##	< 10##
TPH-CWG - Aliphatic >C5 - C6 HS_1D_AL	µg/l	1	ISO 17025	< 1.0##	< 1.0##	< 1.0##	< 1.0##	< 1.0##
TPH-CWG - Aliphatic >C6 - C8 HS_1D_AL	µg/l	1	ISO 17025	< 1.0^	< 1.0^	< 1.0^	< 1.0^	< 1.0^
TPH-CWG - Aliphatic >C8 - C10 HS_1D_AL	µg/l	1	ISO 17025	< 1.0^	< 1.0^	< 1.0^	< 1.0^	< 1.0^
TPH-CWG - Aliphatic >C10 - C12 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35) HS+EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C5 - C7 HS_1D_AR	µg/l	1	ISO 17025	< 1.0##	< 1.0##	< 1.0##	< 1.0##	< 1.0##
TPH-CWG - Aromatic >C7 - C8 HS_1D_AR	µg/l	1	ISO 17025	< 1.0##	< 1.0##	< 1.0##	< 1.0##	< 1.0##
TPH-CWG - Aromatic >C8 - C10 HS_1D_AR	µg/l	1	ISO 17025	< 1.0##	< 1.0##	< 1.0##	< 1.0##	< 1.0##
TPH-CWG - Aromatic >C10 - C12 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	28	25	< 10
TPH-CWG - Aromatic >C16 - C21 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	35	40	< 10
TPH-CWG - Aromatic >C21 - C35 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	15	20	< 10
TPH-CWG - Aromatic (C5 - C35) HS+EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	78	85	< 10
VOCs								
Chloromethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Chloroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Bromomethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Vinyl Chloride	µg/l	3	NONE	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Trichlorofluoromethane	µg/l	3	NONE	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,1-Dichloroethene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Trans 1,2-dichloroethylene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,1-Dichloroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
2,2-Dichloropropane	µg/l	3	NONE	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Chloroform	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,1,1-Trichloroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,2-Dichloroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,1-Dichloropropene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Cis-1,2-dichloroethene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Benzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Carbontetrachloride	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,2-Dichloropropane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Trichloroethene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Dibromomethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Bromodichloromethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Cis-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Trans-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^

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Analytical Report Number: 23-45177
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2749137	2749138	2749139	2749140	2749141
Sample Reference				DS101	DS103	DS104	DS106	DS107
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				11/07/2023	11/07/2023	11/07/2023	11/07/2023	11/07/2023
Time Taken				0915	0940	1015	1035	1100
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Toluene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,1,2-Trichloroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,3-Dichloropropane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Dibromochloromethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Tetrachloroethene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,2-Dibromoethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Chlorobenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,1,1,2-Tetrachloroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Ethylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
p & m-Xylene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Styrene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Bromoform	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
o-Xylene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Isopropylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,1,2,2-Tetrachloroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Bromobenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
n-Propylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
2-Chlorotoluene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
4-Chlorotoluene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,3,5-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
tert-Butylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,2,4-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
sec-Butylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,3-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
p-Isopropyltoluene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,4-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,2-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Butylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,2-Dibromo-3-chloropropane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,2,4-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
Hexachlorobutadiene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^
1,2,3-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0^

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Analytical Report Number: 23-45177
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2749137	2749138	2749139	2749140	2749141
Sample Reference				DS101	DS103	DS104	DS106	DS107
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				11/07/2023	11/07/2023	11/07/2023	11/07/2023	11/07/2023
Time Taken				0915	0940	1015	1035	1100
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
SVOCs								
Aniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Chlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachloroethane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Isophorone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Nitrophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.8	0.73	< 0.01
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	1	0.58	< 0.05
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dimethylphthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.23	< 0.01
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibenzofuran	µg/l	0.05	NONE	< 0.05	< 0.05	0.13	0.32	< 0.05
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Diethyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

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Analytical Report Number: 23-45177
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2749137	2749138	2749139	2749140	2749141
Sample Reference				DS101	DS103	DS104	DS106	DS107
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				11/07/2023	11/07/2023	11/07/2023	11/07/2023	11/07/2023
Time Taken				0915	0940	1015	1035	1100
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
4-Nitroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.44	0.19	< 0.01
Azobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	1.7	2.7	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.2	0.72	< 0.01
Carbazole	µg/l	0.05	NONE	< 0.05	< 0.05	0.2	0.4	< 0.05
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Anthraquinone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	0.2	< 0.05
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.75	2.7	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.66	2.3	< 0.01
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.32	1.3	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.65	1.5	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.5	1.7	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.17	0.63	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.33	1.3	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.17	0.72	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.23	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	0.23	0.87	< 0.01
3&4-Methylphenol	µg/l	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number: 23-45177
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2749142	2749143	2749144	2749145	2749146
Sample Reference				DS108	DS109	DS110	DS112	DS113
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				11/07/2023	11/07/2023	11/07/2023	11/07/2023	11/07/2023
Time Taken				1125	1200	1245	1325	1425
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
General Inorganics								
pH (L099)	pH Units	N/A	ISO 17025	6.8	7.1	7.6	7.3	7.2
Electrical Conductivity at 20 °C (L031B)	µS/cm	10	ISO 17025	1500	1000	1200	1600	1800
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Complex Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Sulphate as SO4	µg/l	45	ISO 17025	492000	59400	245000	424000	12900
Sulphide	µg/l	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chloride	mg/l	0.15	ISO 17025	28	49	46	190	300
Ammoniacal Nitrogen as NH4	µg/l	15	ISO 17025	120	65	1300	11000	4000
Total Organic Carbon (TOC)	mg/l	0.1	ISO 17025	3.63	5.76	3.27	9.39	7.88
Total Phenols								
Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10	< 10	< 10	47	< 10
Speciated PAHs								
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	18.1	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.44	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.73	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	1.04	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	1.51	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.51	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	1.21	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.83	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.29	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.28	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.29	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.07	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.2	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Total PAH								
Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16	< 0.16	25.5	< 0.16

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Analytical Report Number: 23-45177
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2749142	2749143	2749144	2749145	2749146
Sample Reference				DS108	DS109	DS110	DS112	DS113
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				11/07/2023	11/07/2023	11/07/2023	11/07/2023	11/07/2023
Time Taken				1125	1200	1245	1325	1425
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Heavy Metals / Metalloids								
Boron (dissolved)	µg/l	10	ISO 17025	250	91	240	610	470
Calcium (dissolved)	mg/l	0.012	ISO 17025	350	200	230	130	170
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0	U/S**	< 5.0
Iron (dissolved)	mg/l	0.004	ISO 17025	0.018	0.006	0.008	0.41	7.5
Magnesium (dissolved)	mg/l	0.005	ISO 17025	46	32	48	71	47
Phosphorus (dissolved)	µg/l	20	ISO 17025	145	90.6	103	300	126
Potassium (dissolved)	mg/l	0.025	ISO 17025	18	3.9	15	43	20
Selenium (dissolved)	µg/l	4	ISO 17025	-	-	-	-	-
Sodium (dissolved)	mg/l	0.01	ISO 17025	25	39	40	250	250
Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4	0.9	0.4	0.9	0.4
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.71	1.54	29.6	9.63	10.9
Barium (dissolved)	µg/l	0.06	ISO 17025	27	49	57	84	39
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.1	0.12	0.03	< 0.02	0.1
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Cobalt (dissolved)	µg/l	0.2	ISO 17025	9.4	5	0.7	0.6	3.5
Copper (dissolved)	µg/l	0.5	ISO 17025	3.4	9.8	7	2.6	6.2
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	< 0.2	0.2	< 0.2
Manganese (dissolved)	µg/l	0.05	ISO 17025	1500	5000	930	640	2900
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	1.9	8.8	21	18	5
Nickel (dissolved)	µg/l	0.5	ISO 17025	7.6	12	1.3	8.1	2.9
Selenium (dissolved)	µg/l	0.6	ISO 17025	< 0.6	< 0.6	< 0.6	1.2	2.4
Tin (dissolved)	µg/l	0.2	ISO 17025	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Vanadium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.6	0.2	3.1	0.5
Zinc (dissolved)	µg/l	0.5	ISO 17025	10	17	2.1	3.1	1.2
Monoaromatics & Oxygenates								
Benzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
Toluene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
Ethylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
p & m-xylene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
o-xylene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0

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Analytical Report Number: 23-45177
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2749142	2749143	2749144	2749145	2749146
Sample Reference				DS108	DS109	DS110	DS112	DS113
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				11/07/2023	11/07/2023	11/07/2023	11/07/2023	11/07/2023
Time Taken				1125	1200	1245	1325	1425
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Petroleum Hydrocarbons								
Mineral Oil (C10 - C40) EH_1D_AL_MS	µg/l	10	NONE	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
Diesel Range Organics (C10 - C25) EH_1D_TOTAL_MS	µg/l	10	NONE	< 10	< 10	< 10	700	< 10
TPH1 (C10 - C40) EH_1D_TOTAL_MS	µg/l	10	ISO 17025	< 10	< 10	< 10	700	< 10
TPH2 (C6 - C10) HS_1D_TOTAL	µg/l	10	ISO 17025	< 10##	< 10##	< 10##	< 10##	< 10
TPH-CWG - Aliphatic >C5 - C6 HS_1D_AL	µg/l	1	ISO 17025	< 1.0##	< 1.0##	< 1.0##	< 1.0##	< 1.0
TPH-CWG - Aliphatic >C6 - C8 HS_1D_AL	µg/l	1	ISO 17025	< 1.0^	< 1.0^	< 1.0^	< 1.0^	< 1.0
TPH-CWG - Aliphatic >C8 - C10 HS_1D_AL	µg/l	1	ISO 17025	< 1.0^	< 1.0^	< 1.0^	< 1.0^	< 1.0
TPH-CWG - Aliphatic >C10 - C12 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35) HS+EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C5 - C7 HS_1D_AR	µg/l	1	ISO 17025	< 1.0##	< 1.0##	< 1.0##	< 1.0##	< 1.0
TPH-CWG - Aromatic >C7 - C8 HS_1D_AR	µg/l	1	ISO 17025	< 1.0##	< 1.0##	< 1.0##	< 1.0##	< 1.0
TPH-CWG - Aromatic >C8 - C10 HS_1D_AR	µg/l	1	ISO 17025	< 1.0##	< 1.0##	< 1.0##	< 1.0##	< 1.0
TPH-CWG - Aromatic >C10 - C12 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	40	< 10
TPH-CWG - Aromatic >C12 - C16 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	360	< 10
TPH-CWG - Aromatic >C16 - C21 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	240	< 10
TPH-CWG - Aromatic >C21 - C35 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	60	< 10
TPH-CWG - Aromatic (C5 - C35) HS+EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	700	< 10
VOCs								
Chloromethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
Chloroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
Bromomethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
Vinyl Chloride	µg/l	3	NONE	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
Trichlorofluoromethane	µg/l	3	NONE	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
1,1-Dichloroethene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0##
Trans 1,2-dichloroethylene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
1,1-Dichloroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
2,2-Dichloropropane	µg/l	3	NONE	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0#
Chloroform	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
1,1,1-Trichloroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
1,2-Dichloroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
1,1-Dichloropropene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
Cis-1,2-dichloroethene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
Benzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
Carbontetrachloride	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
1,2-Dichloropropane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
Trichloroethene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
Dibromomethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
Bromodichloromethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
Cis-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
Trans-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0

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Analytical Report Number: 23-45177
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2749142	2749143	2749144	2749145	2749146
Sample Reference				DS108	DS109	DS110	DS112	DS113
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				11/07/2023	11/07/2023	11/07/2023	11/07/2023	11/07/2023
Time Taken				1125	1200	1245	1325	1425
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Toluene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
1,1,2-Trichloroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
1,3-Dichloropropane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
Dibromochloromethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
Tetrachloroethene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
1,2-Dibromoethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
Chlorobenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
1,1,1,2-Tetrachloroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
Ethylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
p & m-Xylene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
Styrene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
Bromoform	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
o-Xylene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
Isopropylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
1,1,2,2-Tetrachloroethane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
Bromobenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
n-Propylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
2-Chlorotoluene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
4-Chlorotoluene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
1,3,5-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
tert-Butylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
1,2,4-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
sec-Butylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
1,3-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
p-Isopropyltoluene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
1,4-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
1,2-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
Butylbenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
1,2-Dibromo-3-chloropropane	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
1,2,4-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0
Hexachlorobutadiene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0#
1,2,3-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0^	< 3.0^	< 3.0^	< 3.0^	< 3.0

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Analytical Report Number: 23-45177
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2749142	2749143	2749144	2749145	2749146
Sample Reference				DS108	DS109	DS110	DS112	DS113
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				11/07/2023	11/07/2023	11/07/2023	11/07/2023	11/07/2023
Time Taken				1125	1200	1245	1325	1425
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
SVOCs								
Aniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	0.92	< 0.05
Phenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Chlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachloroethane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Isophorone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Nitrophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	89	< 0.05
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	18	< 0.01
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	1.6	< 0.05
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dimethylphthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.44	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.73	< 0.01
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibenzofuran	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	0.83	< 0.05
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Diethyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

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Analytical Report Number: 23-45177
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2749142	2749143	2749144	2749145	2749146
Sample Reference				DS108	DS109	DS110	DS112	DS113
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				11/07/2023	11/07/2023	11/07/2023	11/07/2023	11/07/2023
Time Taken				1125	1200	1245	1325	1425
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
4-Nitroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	1	< 0.01
Azobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	1.5	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.51	< 0.01
Carbazole	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	6.3	< 0.05
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Anthraquinone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	1.2	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.83	< 0.01
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.29	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.28	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.29	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.07	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	0.2	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

3&4-Methylphenol	µg/l	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number: 23-45177
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2749147	2749148	2749149	2749150
Sample Reference				WS06	WS07	WS10	WS11
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				11/07/2023	11/07/2023	11/07/2023	11/07/2023
Time Taken				0740	0800	0830	0900
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				
General Inorganics							
pH (L099)	pH Units	N/A	ISO 17025	7.6	6.9	7.4	7.1
Electrical Conductivity at 20 °C (L031B)	µS/cm	10	ISO 17025	230	970	870	1100
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10
Complex Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10
Sulphate as SO4	µg/l	45	ISO 17025	33300	84300	61200	97900
Sulphide	µg/l	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0
Chloride	mg/l	0.15	ISO 17025	19	74	37	21
Ammoniacal Nitrogen as NH4	µg/l	15	ISO 17025	300	1200	2900	2200
Total Organic Carbon (TOC)	mg/l	0.1	ISO 17025	10.3	3.84	3.72	3.63
Total Phenols							
Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10
Speciated PAHs							
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	0.28	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	0.31	1.24	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	0.36	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	0.4	1.93	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	0.33	1.74	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	0.16	0.89	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	0.19	0.92	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	0.24	1.2	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	0.07	0.49	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	0.15	1.02	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	0.53	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	0.16	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	0.66	< 0.01	< 0.01
Total PAH							
Total EPA-16 PAHs	µg/l	0.16	ISO 17025	1.85	11.4	< 0.16	< 0.16

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Analytical Report Number: 23-45177
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2749147	2749148	2749149	2749150
Sample Reference				WS06	WS07	WS10	WS11
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				11/07/2023	11/07/2023	11/07/2023	11/07/2023
Time Taken				0740	0800	0830	0900
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				
Heavy Metals / Metalloids							
Boron (dissolved)	µg/l	10	ISO 17025	130	320	240	210
Calcium (dissolved)	mg/l	0.012	ISO 17025	52	120	190	240
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0
Iron (dissolved)	mg/l	0.004	ISO 17025	0.017	0.01	0.87	0.021
Magnesium (dissolved)	mg/l	0.005	ISO 17025	11	35	24	28
Phosphorus (dissolved)	µg/l	20	ISO 17025	159	297	114	78.5
Potassium (dissolved)	mg/l	0.025	ISO 17025	5.5	13	13	12
Selenium (dissolved)	µg/l	4	ISO 17025	-	-	-	-
Sodium (dissolved)	mg/l	0.01	ISO 17025	20	77	24	17
Antimony (dissolved)	µg/l	0.4	ISO 17025	5	1	2.5	1
Arsenic (dissolved)	µg/l	0.15	ISO 17025	2.17	9.44	9.46	4.53
Barium (dissolved)	µg/l	0.06	ISO 17025	46	130	300	38
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1	< 0.1	< 0.1
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.11	< 0.02	0.11	0.04
Chromium (dissolved)	µg/l	0.2	ISO 17025	1	< 0.2	< 0.2	< 0.2
Cobalt (dissolved)	µg/l	0.2	ISO 17025	< 0.2	2.8	0.3	0.5
Copper (dissolved)	µg/l	0.5	ISO 17025	64	2.1	9.2	1.6
Lead (dissolved)	µg/l	0.2	ISO 17025	0.5	< 0.2	0.6	< 0.2
Manganese (dissolved)	µg/l	0.05	ISO 17025	2.6	1200	3800	610
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	< 0.05
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	32	10	3.2	1.2
Nickel (dissolved)	µg/l	0.5	ISO 17025	2.6	3.7	5.8	1.7
Selenium (dissolved)	µg/l	0.6	ISO 17025	1.1	< 0.6	< 0.6	< 0.6
Tin (dissolved)	µg/l	0.2	ISO 17025	0.43	< 0.20	< 0.20	< 0.20
Vanadium (dissolved)	µg/l	0.2	ISO 17025	3.9	1.2	0.3	0.9
Zinc (dissolved)	µg/l	0.5	ISO 17025	32	5.5	8.1	2.4
Monoaromatics & Oxygenates							
Benzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Toluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Ethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
p & m-xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
o-xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0

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Analytical Report Number: 23-45177
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2749147	2749148	2749149	2749150
Sample Reference				WS06	WS07	WS10	WS11
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				11/07/2023	11/07/2023	11/07/2023	11/07/2023
Time Taken				0740	0800	0830	0900
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				
Petroleum Hydrocarbons							
Mineral Oil (C10 - C40) EH_1D_AL_MS	µg/l	10	NONE	< 10.0	< 10.0	< 10.0	< 10.0
Diesel Range Organics (C10 - C25) EH_1D_TOTAL_MS	µg/l	10	NONE	< 10	13	< 10	< 10
TPH1 (C10 - C40) EH_1D_TOTAL_MS	µg/l	10	ISO 17025	< 10	13	< 10	< 10
TPH2 (C6 - C10) HS_1D_TOTAL	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C5 - C6 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10 HS_1D_AL	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35 EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35) HS+EH_1D_AL_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C5 - C7 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10 HS_1D_AR	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35 EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (C5 - C35) HS+EH_1D_AR_MS	µg/l	10	NONE	< 10	< 10	< 10	< 10
VOCs							
Chloromethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Chloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Bromomethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Vinyl Chloride	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0
Trichlorofluoromethane	µg/l	3	NONE	< 3.0	< 3.0	< 3.0	< 3.0
1,1-Dichloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	3	ISO 17025	< 3.0##	< 3.0##	< 3.0##	< 3.0##
Trans 1,2-dichloroethylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,1-Dichloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
2,2-Dichloropropane	µg/l	3	NONE	< 3.0#	< 3.0#	< 3.0#	< 3.0#
Chloroform	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,1,1-Trichloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dichloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,1-Dichloropropene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Cis-1,2-dichloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Benzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Carbontetrachloride	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dichloropropane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Trichloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Dibromomethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Bromodichloromethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Cis-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Trans-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0

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Analytical Report Number: 23-45177
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2749147	2749148	2749149	2749150
Sample Reference				WS06	WS07	WS10	WS11
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				11/07/2023	11/07/2023	11/07/2023	11/07/2023
Time Taken				0740	0800	0830	0900
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				
Toluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,1,2-Trichloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,3-Dichloropropane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Dibromochloromethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Tetrachloroethene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dibromoethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Chlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,1,1,2-Tetrachloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Ethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
p & m-Xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Styrene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Bromoform	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
o-Xylene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Isopropylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,1,2,2-Tetrachloroethane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Bromobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
n-Propylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
2-Chlorotoluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
4-Chlorotoluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,3,5-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
tert-Butylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,2,4-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
sec-Butylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,3-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
p-Isopropyltoluene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,4-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Butylbenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,2-Dibromo-3-chloropropane	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
1,2,4-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0
Hexachlorobutadiene	µg/l	3	ISO 17025	< 3.0#	< 3.0#	< 3.0#	< 3.0#
1,2,3-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0	< 3.0	< 3.0	< 3.0

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Analytical Report Number: 23-45177
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2749147	2749148	2749149	2749150
Sample Reference				WS06	WS07	WS10	WS11
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				11/07/2023	11/07/2023	11/07/2023	11/07/2023
Time Taken				0740	0800	0830	0900
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				
SVOCs							
Aniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Phenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2-Chlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Hexachloroethane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Nitrobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
4-Methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Isophorone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2-Nitrophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	0.28	< 0.01	< 0.01
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Dimethylphthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Dibenzofuran	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Diethyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05

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Analytical Report Number: 23-45177
Project / Site name: Phoenix Wharf, Port Talbot

Lab Sample Number				2749147	2749148	2749149	2749150
Sample Reference				WS06	WS07	WS10	WS11
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				11/07/2023	11/07/2023	11/07/2023	11/07/2023
Time Taken				0740	0800	0830	0900
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				
4-Nitroaniline	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01
Azobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	µg/l	0.01	ISO 17025	0.31	1.2	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	0.36	< 0.01	< 0.01
Carbazole	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Anthraquinone	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	µg/l	0.01	ISO 17025	0.4	1.9	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	0.33	1.7	< 0.01	< 0.01
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	µg/l	0.01	ISO 17025	0.16	0.89	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	0.19	0.92	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	0.24	1.2	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	0.07	0.49	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	0.15	1	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	0.53	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	0.16	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	0.66	< 0.01	< 0.01
3&4-Methylphenol	µg/l	0.1	NONE	< 0.10	< 0.10	< 0.10	< 0.10

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number : 23-45177
Project / Site name: Phoenix Wharf, Port Talbot

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
Complex cyanide in water	Determination of complex cyanide by calculation. Accredited matrices SW, PW, GW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry.Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Mineral Oil (Waters) C10 - C40	Determination of dichloromethane extractable hydrocarbons in water by GC-MS.	In-house method	L070-PL	W	NONE
Monohydric phenols in water	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphide in water	Determination of sulphide in water by ion selective electrode.	In-house method	L029-PL	W	NONE
Sulphate in water	Determination of sulphate in water after filtration by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Semi-volatile organic compounds in water	Determination of semi-volatile organic compounds in leachate by extraction in dichloromethane followed by GC-MS.	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
TPH2 (Waters)	Determination of hydrocarbons C6-C10 by headspace GC-MS. Accredited Matrices SW, PW. GW.	In-house method based on USEPA8260	L088-PL	W	ISO 17025
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025

Analytical Report Number : 23-45177
Project / Site name: Phoenix Wharf, Port Talbot

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Total organic carbon in water	Determination of dissolved organic carbon in water by TOC/DOC NDIR analyser. Accredited matrices: SW PW GW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	ISO 17025
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Ammonium as NH4 in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the colorimetric salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
DRO (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS.	In-house method	L070-PL	W	NONE
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025

Analytical Report Number : 23-45177
Project / Site name: Phoenix Wharf, Port Talbot

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
TPH1 (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS.	In-house method	L070-PL	W	ISO 17025
Chloride in water	Determination of Chloride (diissolved) colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025

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

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

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

$$ - Result was reported from high dilution. The result should be interpreted with caution.
**U/S - Analysis could not be completed due to sample matrix.
- Data reported unaccredited due to quality control parameter failure associated with this result; other checks applied prior to reporting the data have been accepted. The result should be considered as being deviating and may be compromised.
- Quality control parameter has a high recovery (outside of limit); however the associated result is below the reporting limit, other checks applied prior to reporting the data have been accepted. The result should be considered as being deviating and may be compromised.
^ - Data reported unaccredited due to quality control parameter failure associated with this result; The result should be considered as being deviating and may be compromised.

Sample Deviation Report

Analytical Report Number : 23-45177
Project / Site name: Phoenix Wharf, Port Talbot

This deviation report indicates the sample and test deviations that apply to the samples submitted for analysis.Please note that the associated result(s) may be unreliable and should be interpreted with care.

Key: a - No sampling date b - Incorrect container c - Holding time d - Headspace e - Temperature

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
DS101	None Supplied	W	2749137	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DS101	None Supplied	W	2749137	c	Ammonium as NH4 in water	L082-PL	c
DS101	None Supplied	W	2749137	c	Electrical conductivity at 20oC of water	L031-PL	c
DS101	None Supplied	W	2749137	c	pH at 20oC in water (automated)	L099-PL	c
DS103	None Supplied	W	2749138	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DS103	None Supplied	W	2749138	c	Ammonium as NH4 in water	L082-PL	c
DS103	None Supplied	W	2749138	c	Electrical conductivity at 20oC of water	L031-PL	c
DS103	None Supplied	W	2749138	c	pH at 20oC in water (automated)	L099-PL	c
DS104	None Supplied	W	2749139	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DS104	None Supplied	W	2749139	c	Ammonium as NH4 in water	L082-PL	c
DS104	None Supplied	W	2749139	c	Electrical conductivity at 20oC of water	L031-PL	c
DS104	None Supplied	W	2749139	c	pH at 20oC in water (automated)	L099-PL	c
DS106	None Supplied	W	2749140	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DS106	None Supplied	W	2749140	c	Ammonium as NH4 in water	L082-PL	c
DS106	None Supplied	W	2749140	c	Electrical conductivity at 20oC of water	L031-PL	c
DS106	None Supplied	W	2749140	c	pH at 20oC in water (automated)	L099-PL	c
DS107	None Supplied	W	2749141	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DS107	None Supplied	W	2749141	c	Ammonium as NH4 in water	L082-PL	c
DS107	None Supplied	W	2749141	c	Electrical conductivity at 20oC of water	L031-PL	c
DS107	None Supplied	W	2749141	c	pH at 20oC in water (automated)	L099-PL	c
DS108	None Supplied	W	2749142	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DS108	None Supplied	W	2749142	c	Ammonium as NH4 in water	L082-PL	c
DS108	None Supplied	W	2749142	c	Electrical conductivity at 20oC of water	L031-PL	c
DS108	None Supplied	W	2749142	c	pH at 20oC in water (automated)	L099-PL	c
DS109	None Supplied	W	2749143	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DS109	None Supplied	W	2749143	c	Ammonium as NH4 in water	L082-PL	c
DS109	None Supplied	W	2749143	c	Electrical conductivity at 20oC of water	L031-PL	c
DS109	None Supplied	W	2749143	c	pH at 20oC in water (automated)	L099-PL	c
DS110	None Supplied	W	2749144	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DS110	None Supplied	W	2749144	c	Ammonium as NH4 in water	L082-PL	c
DS110	None Supplied	W	2749144	c	Electrical conductivity at 20oC of water	L031-PL	c
DS110	None Supplied	W	2749144	c	pH at 20oC in water (automated)	L099-PL	c
DS112	None Supplied	W	2749145	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DS112	None Supplied	W	2749145	c	Ammonium as NH4 in water	L082-PL	c
DS112	None Supplied	W	2749145	c	Electrical conductivity at 20oC of water	L031-PL	c
DS112	None Supplied	W	2749145	c	pH at 20oC in water (automated)	L099-PL	c
DS113	None Supplied	W	2749146	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DS113	None Supplied	W	2749146	c	Ammonium as NH4 in water	L082-PL	c
DS113	None Supplied	W	2749146	c	Electrical conductivity at 20oC of water	L031-PL	c
DS113	None Supplied	W	2749146	c	pH at 20oC in water (automated)	L099-PL	c
WS06	None Supplied	W	2749147	c	Ammoniacal Nitrogen as N in water	L082-PL	c
WS06	None Supplied	W	2749147	c	Ammonium as NH4 in water	L082-PL	c
WS06	None Supplied	W	2749147	c	Electrical conductivity at 20oC of water	L031-PL	c
WS06	None Supplied	W	2749147	c	pH at 20oC in water (automated)	L099-PL	c
WS07	None Supplied	W	2749148	c	Ammoniacal Nitrogen as N in water	L082-PL	c
WS07	None Supplied	W	2749148	c	Ammonium as NH4 in water	L082-PL	c
WS07	None Supplied	W	2749148	c	Electrical conductivity at 20oC of water	L031-PL	c
WS07	None Supplied	W	2749148	c	pH at 20oC in water (automated)	L099-PL	c
WS10	None Supplied	W	2749149	c	Ammoniacal Nitrogen as N in water	L082-PL	c
WS10	None Supplied	W	2749149	c	Ammonium as NH4 in water	L082-PL	c
WS10	None Supplied	W	2749149	c	Electrical conductivity at 20oC of water	L031-PL	c
WS10	None Supplied	W	2749149	c	pH at 20oC in water (automated)	L099-PL	c
WS11	None Supplied	W	2749150	c	Ammoniacal Nitrogen as N in water	L082-PL	c
WS11	None Supplied	W	2749150	c	Ammonium as NH4 in water	L082-PL	c
WS11	None Supplied	W	2749150	c	Electrical conductivity at 20oC of water	L031-PL	c
WS11	None Supplied	W	2749150	c	pH at 20oC in water (automated)	L099-PL	c

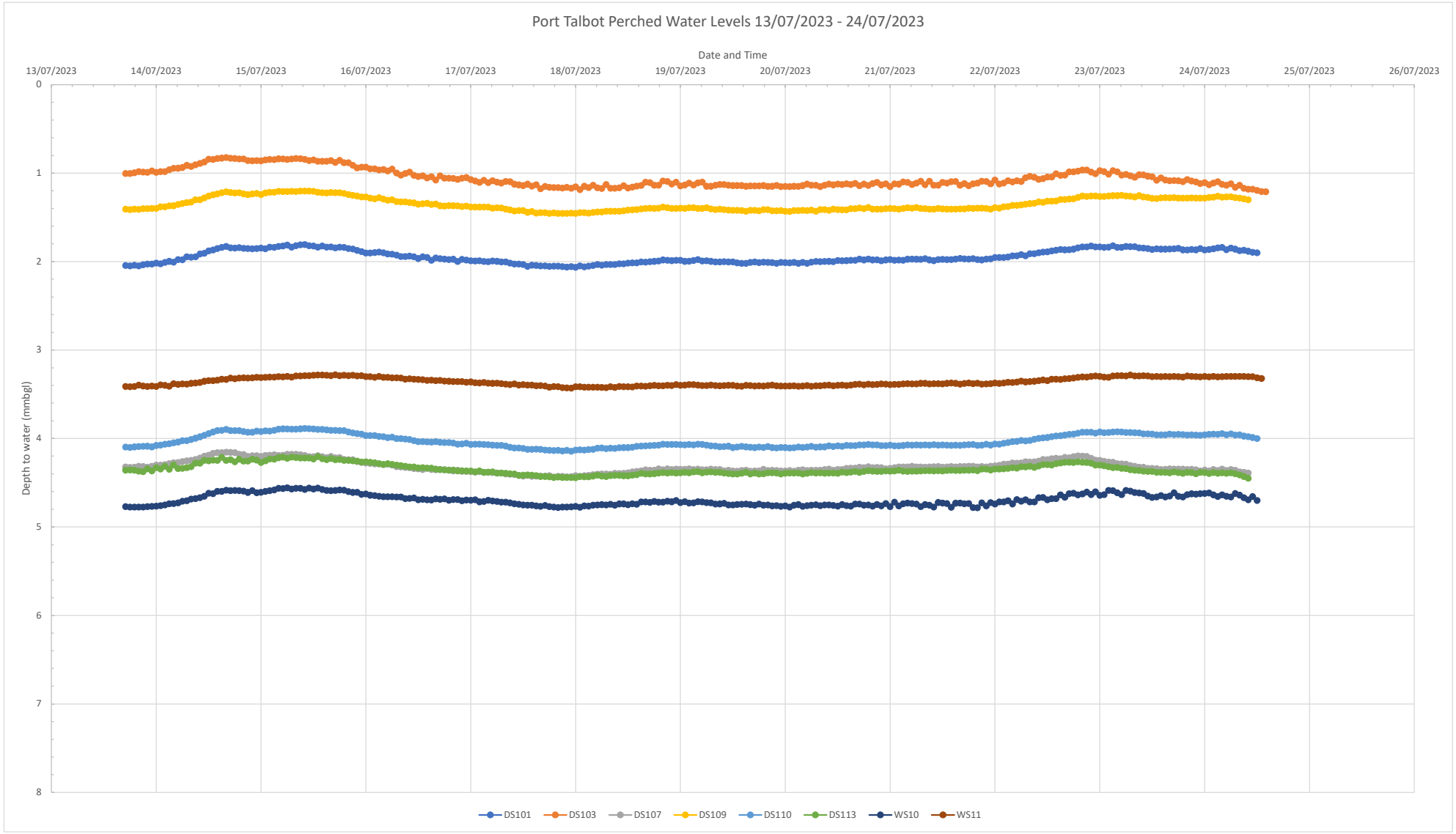
Appendix F

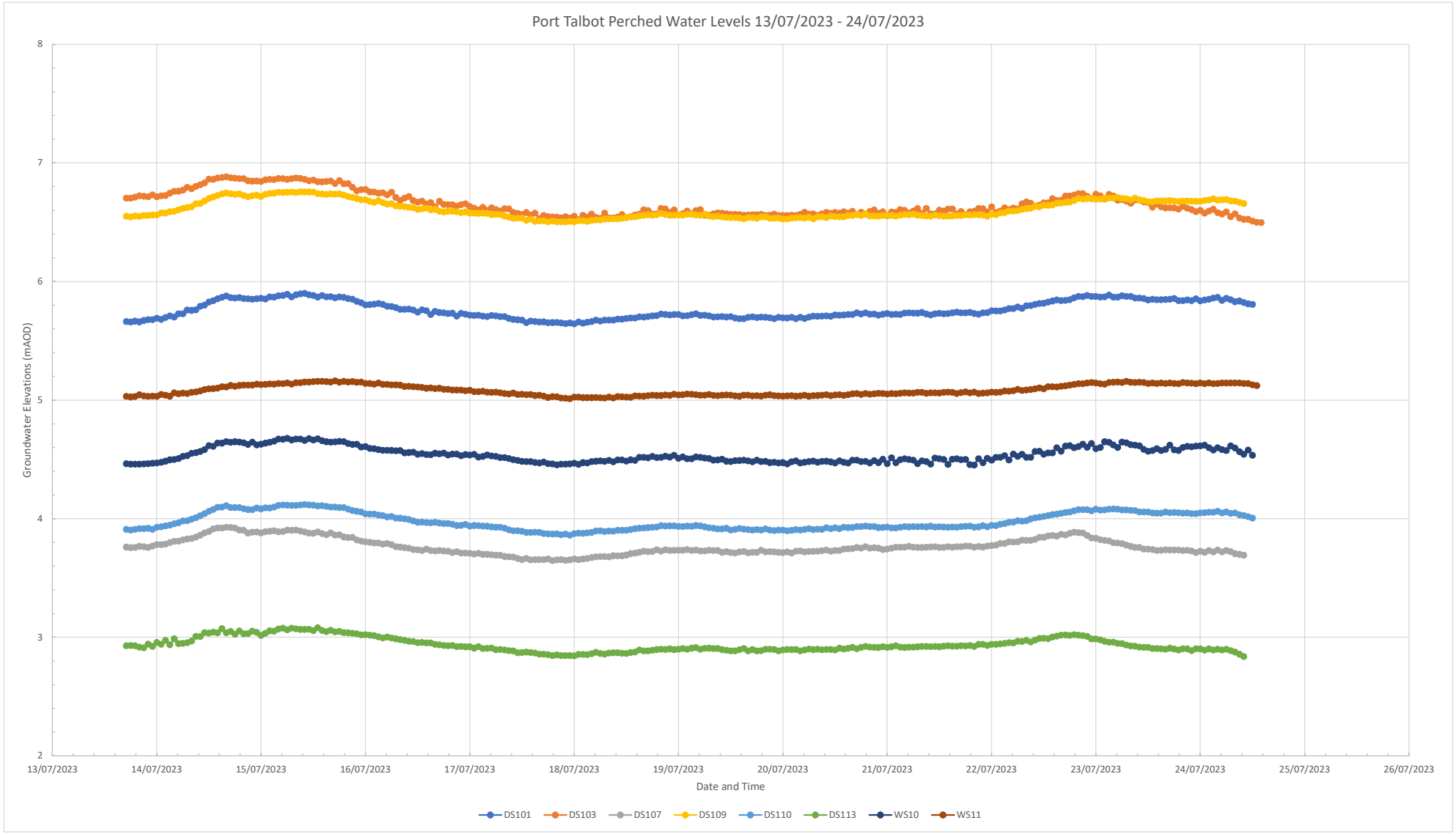
Groundwater Monitoring Results

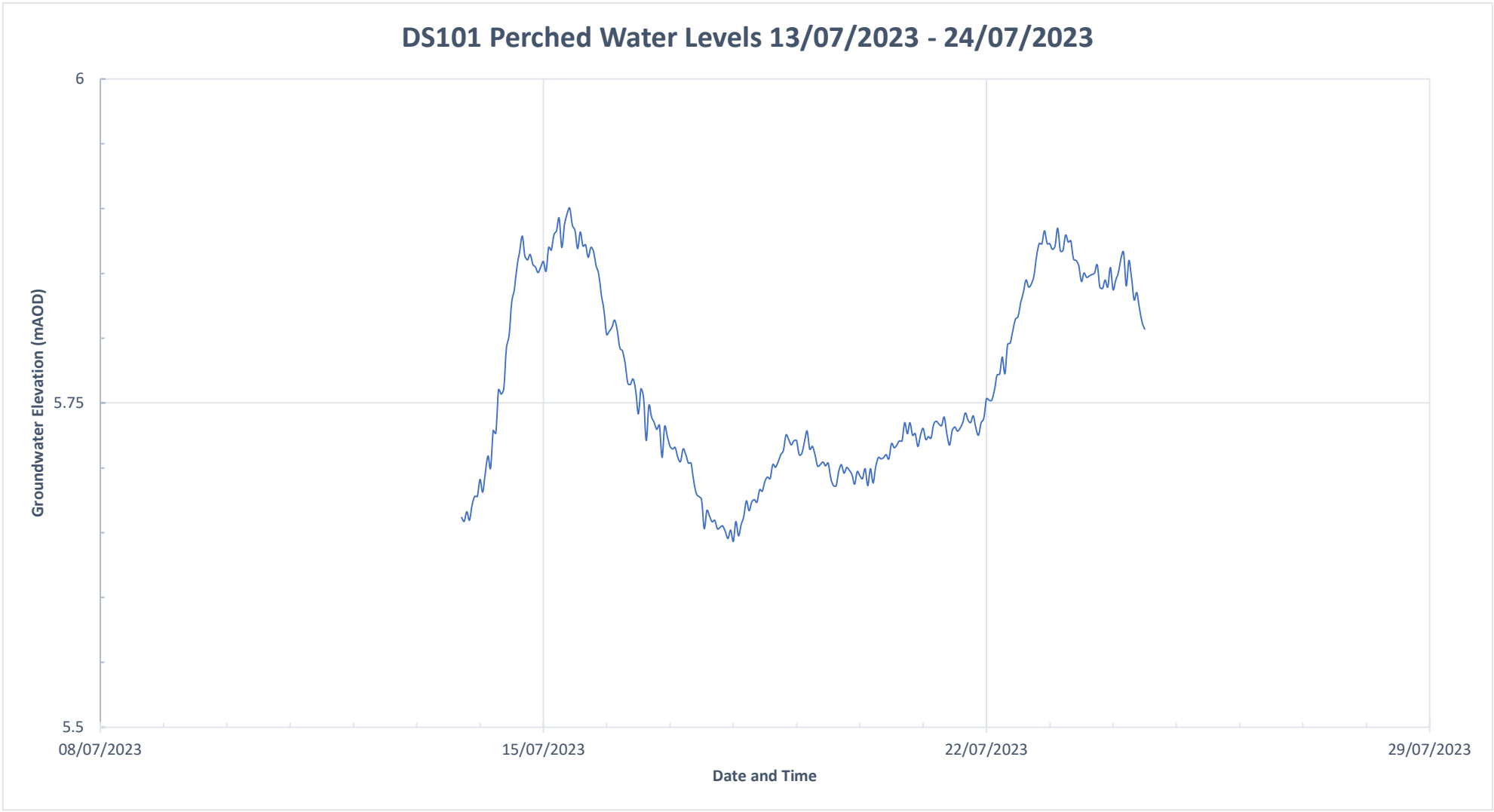
Groundwater Level Monitoring Results

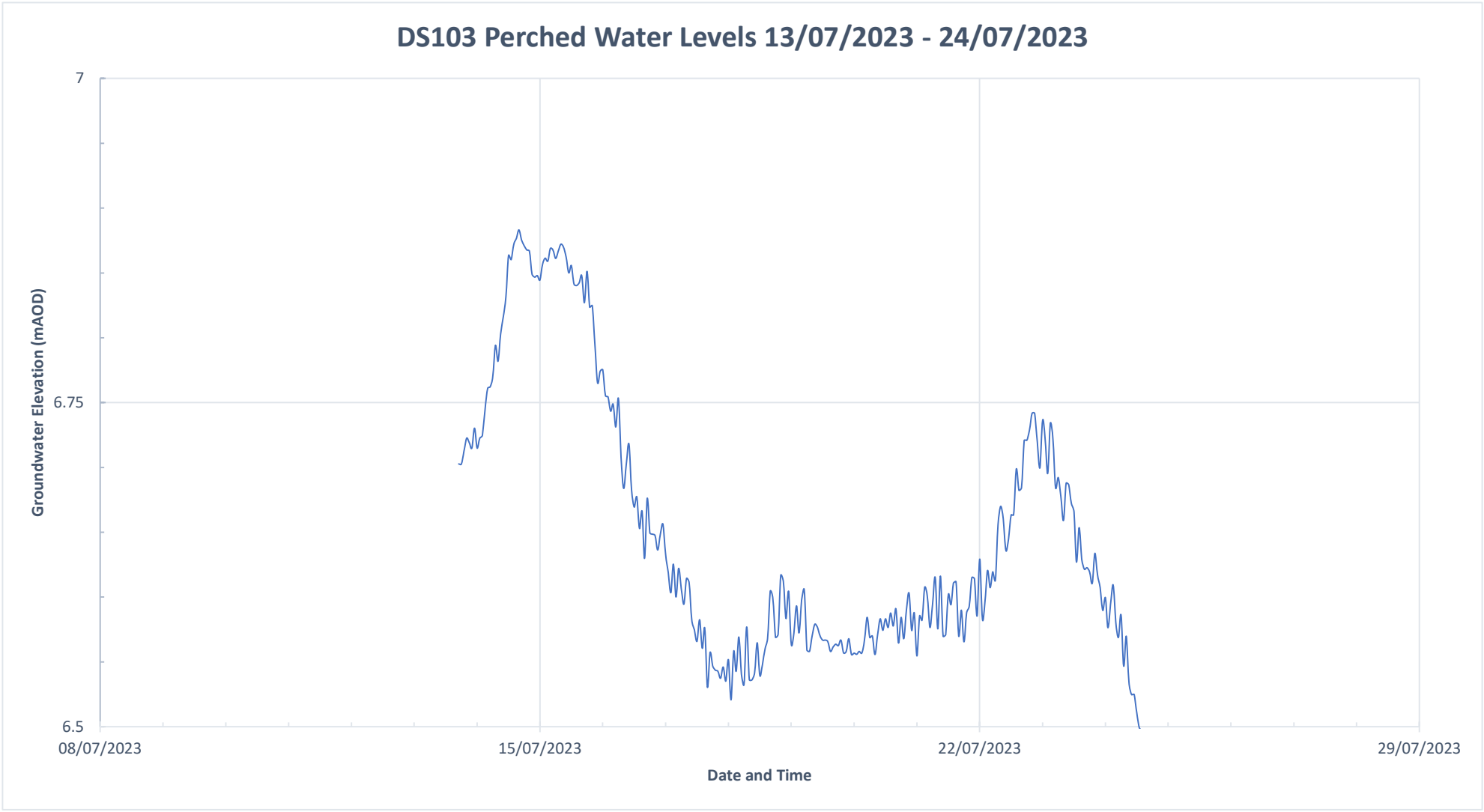
Location		Depth of Borehole (mbgl)	Standing Depths (mbgl)																Additional Observation
			Date(s)																
			22-Mar	29-Mar	05-Apr		12-Apr	19-Apr	26-Apr	03-May	10-May	17-May	24-May	31-May	13-Jun	26-Jun	10-Jul	24-Jul	
					07:55 (high tide)	12:50 (low tide)													
Previous Phase (003)	WS01	2.45	0.36	1.11	1.08	1.09	1.03	1.15	1.25	1.39	1.70	2.05	2.23	2.41	Dry	Dry	Dry	Dry	
	WS03	2.36	0.83	0.96	1.00	1.00	1.01	1.08	1.17	1.24	1.25	1.80	2.02	2.26	1.41	Dry	Dry	Dry	
	WS06	2.55	Flooded	Flooded	Flooded	Flooded	Flooded	Flooded	Flooded	Flooded	Flooded	0.26	0.29	0.43	0.50	0.81	0.91	0.85	
	WS07	3.19	Flooded	Flooded	Flooded	Flooded	Flooded	0.13	0.10	0.22	0.21	0.45	0.57	0.71	0.79	1.03	1.19	0.93	
	WS10	4.70	1.28	1.30	1.28	1.29	1.26	1.34	1.46	1.71	1.74	2.63	2.94	3.11	2.32	3.23	3.34	3.29	
	WS11	3.32	0.36	0.45	0.54	0.54	0.40	0.65	0.64	0.72	0.71	0.95	1.09	1.26	1.36	1.72	1.84	1.95	
	BH01	18.57	1.44	1.69	1.68	1.76	0.78	1.60	1.71	1.65	1.77	1.46	1.49	1.54	1.71	2.38	2.62	2.55	
	BH02	24.14	3.08	3.28	3.24	3.44	3.23	3.16	3.26	3.27	2.95	3.02	2.91	3.10	3.17	3.77	4.07	3.40	
	BH03A	19.87	2.48	2.68	2.67	2.90	2.65	2.75	2.74	2.59	2.60	2.50	2.43	2.57	2.71	3.26	3.59	2.94	
	BH04	19.25	4.59	4.80	4.71	4.77	4.76	4.70	4.76	5.20	5.36	5.36	4.33	4.47	4.67	5.21	5.49	4.87	
Current Phase (005)	BH103	21.16	-	-	-	-	-	-	3.31	3.39	2.96	2.96	3.00	3.17	3.29	3.96	4.22	3.38	
	BH104	59.72	-	-	-	-	-	-	-	3.79	3.55	3.48	3.47	3.63	3.72	4.36	4.51	3.83	
	BH105	22.40	-	-	3.30	3.39	3.29	3.28	3.58	3.24	2.93	2.93	2.95	3.13	3.08	3.86	4.14	3.28	
	BH106	19.70	-	1.93	1.83	1.89	1.92	1.85	1.86	1.77	1.69	1.69	1.57	1.68	1.82	2.50	2.75	2.30	
	BH107	21.23	-	-	-	-	-	-	-	-	-	-	3.13	3.31	3.6	4.04	4.42	3.64	
	BH108	21.30	-	-	-	-	-	-	-	-	-	1.92	1.88	2.07	2.2	2.84	3.07	2.93	
	BH110	19.00	-	-	-	-	-	-	-	-	2.32	2.50	2.47	2.62	2.72	3.30	3.55	2.95	
	BH111	18.00	-	-	-	-	-	-	-	-	-	3.15	1.75	1.88	1.9	2.67	2.89	2.30	
	BH112	7.35	-	-	-	-	-	-	-	-	-	0.54	0.66	0.73	0.86	1.11	1.26	0.99	
	BH113	57.71	-	-	-	-	-	-	-	-	-	2.54	2.63	2.21	2.82	3.33	3.56	2.56	
	BH115	19.74	-	-	-	-	-	-	-	1.93	2.05	2.08	1.75	1.86	2.03	2.69	2.9	2.25	
	BH116	31.85	-	-	-	-	-	-	-	-	4.95	4.17	3.99	3.81	3.88	4.4	4.55	4.85	
	BH117	54.34	-	-	-	-	-	-	-	-	-	3.3	3.31	3.46	3.55	4.13	4.31	3.74	
	BH119	57.7	-	-	-	-	-	-	-	-	-	2.8	2.69	2.83	3.00	2.57	3.8	3.18	
	BH120	20.10	-	-	-	-	-	-	-	-	2.93	2.8	2.75	2.52	2.97	3.62	2.81	3.22	
	DS101	2.17	-	-	-	-	-	-	-	-	-	-	-	1.26	1.34	1.64	1.89	1.9	
	DS102	0.92	-	-	-	-	-	-	-	-	-	-	-	Dry	Dry	Dry	Dry	Dry	
	DS103	4.36	-	-	-	-	-	-	-	-	-	-	-	0.75	0.95	1.41	1.59	1.21	
	DS104	4.19	-	-	-	-	-	-	-	-	-	-	-	1.28	1.42	1.83	2	1.88	
	DS105	2.74	-	-	-	-	-	-	-	-	-	-	-	2.07	2.19	2.56	Dry	Dry	
	DS106	3.61	-	-	-	-	-	-	-	-	-	-	-	1.81	1.91	2.31	2.5	2.54	
	DS107	4.39	-	-	-	-	-	-	-	-	-	-	-	0.87	0.94	1.04	1.21	1.01	
	DS108	3.51	-	-	-	-	-	-	-	-	-	-	-	1.36	1.57	2.28	2.2	2.31	
	DS109	1.32	-	-	-	-	-	-	-	-	-	-	-	0.7	0.78	1.00	1.05	0.93	
	DS110	4.00	-	-	-	-	-	-	-	-	-	-	-	1.9	1.5	1.74	2.83	1.86	
	DS111	1.64	-	-	-	-	-	-	-	-	-	-	-	1.49	1.53	Dry	Dry	Dry	
	DS112	4.49	-	-	-	-	-	-	-	-	-	-	-	2.23	2.32	3.2	2.61	2.69	
	DS113	4.45	-	-	-	-	-	-	-	-	-	-	-	0.74	0.83	1.16	1.34	1.13	

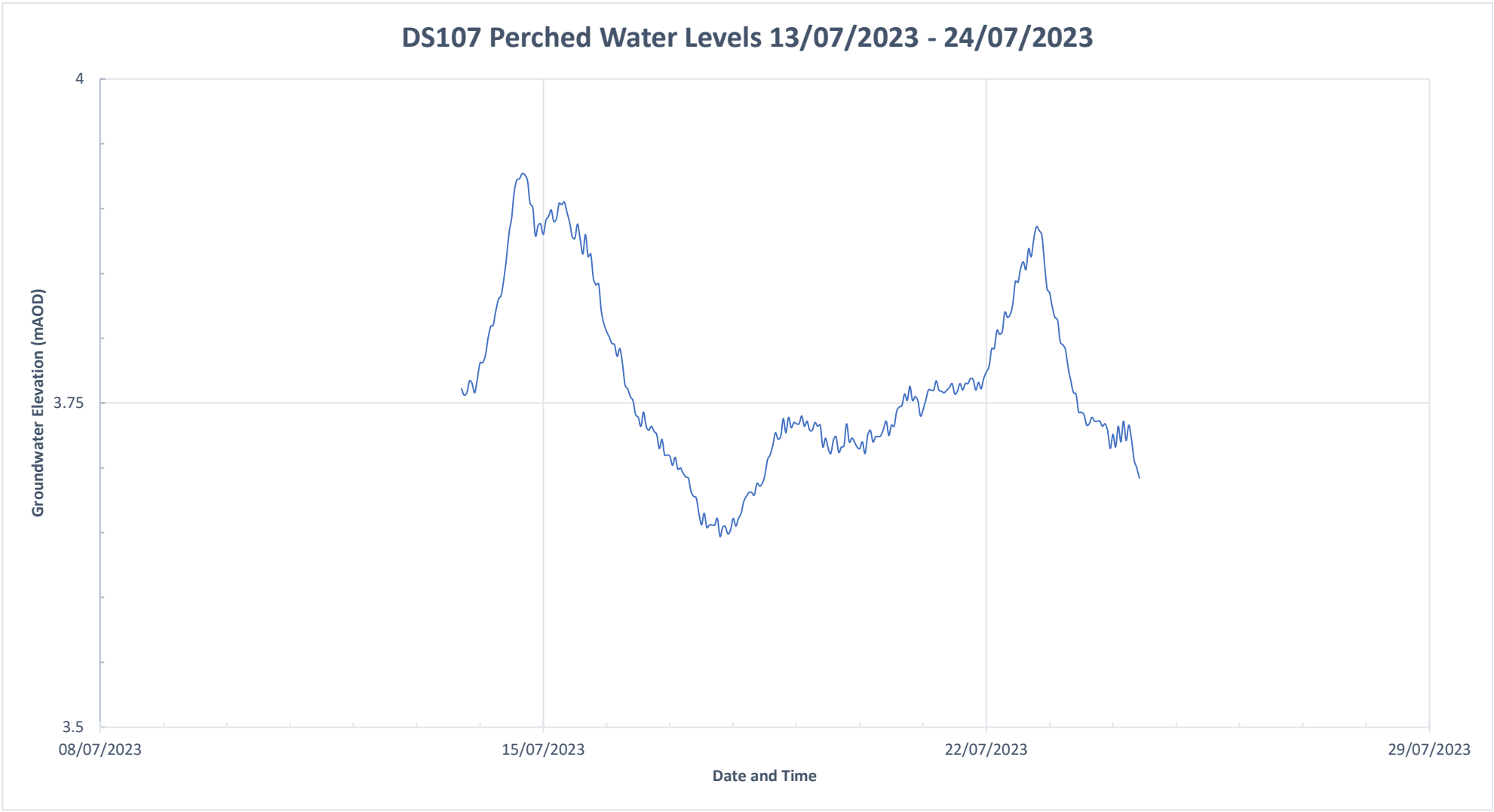
	Approx Ground Level (mAOD)	Base of Borehole (mAOD)	Groundwater Elevation (mAOD)																Additional Observation
			Date(s)																
			22-Mar	29-Mar	05-Apr		12-Apr	19-Apr	26-Apr	03-May	10-May	17-May	24-May	31-May	13-Jun	26-Jun	10-Jul	24-Jul	
					07:55 (high tide)	12:50 (low tide)													
WS01	9.16	6.71	8.80	8.05	8.08	8.07	8.13	8.01	7.91	7.77	7.46	7.11	6.93	6.75	Dry to 6.71				
WS03	8.98	6.62	8.15	8.02	7.98	7.98	7.97	7.90	7.81	7.74	7.73	7.18	6.96	6.72	7.57	Dry to 6.62			
WS06	7.26	4.71	Flooded	Flooded	Flooded	Flooded	Flooded	Flooded	Flooded	Flooded	Flooded	7.00	6.97	6.83	6.76	6.45	6.35	6.41	
WS07	7.05	3.86	Flooded	Flooded	Flooded	Flooded	Flooded	6.92	6.95	6.83	6.84	6.60	6.48	6.34	6.26	6.02	5.86	6.12	
WS10	9.24	4.54	7.96	7.94	7.96	7.95	7.98	7.90	7.78	7.53	7.50	6.61	6.30	6.13	6.92	6.01	5.90	5.95	
WS11	8.44	5.12	8.09	7.99	7.90	7.90	8.04	7.79	7.80	7.72	7.73	7.49	7.35	7.18	7.08	6.72	6.60	6.49	
BH01	7.22	-11.35	5.78	5.53	5.54	5.46	6.44	5.62	5.51	5.57	5.45	5.76	5.73	5.68	5.51	4.84	4.60	4.67	
BH02	8.21	-15.93	5.13	4.93	4.97	4.77	4.98	5.05	4.95	4.94	5.26	5.19	5.30	5.11	5.04	4.44	4.14	4.81	
BH03A	7.87	-12.00	5.39	5.19	5.20	4.97	5.22	5.12	5.13	5.28	5.27	5.37	5.44	5.30	5.16	4.61	4.28	4.93	
BH04	9.70	-9.55	5.11	4.90	4.99	4.93	4.94	5.00	4.94	4.50	4.34	4.34	5.37	5.23	5.03	4.49	4.21	4.83	
BH103	8.43	-12.73	-	-	-	-	-	-	5.12	5.04	5.47	5.47	5.43	5.26	5.14	4.47	4.21	5.05	
BH105	8.44	-13.97	-	-	5.14	5.05	5.15	5.16	4.86	5.20	5.51	5.51	5.49	5.31	5.36	4.58	4.30	5.16	
BH106	7.13	-12.57	-	5.20	5.30	5.24	5.21	5.28	5.27	5.36	5.44	5.44	5.56	5.45	5.31	4.63	4.38	4.83	
BH107	8.61	-12.62	-	-	-	-	-	-	-	-	-	-	5.48	5.30	5.01	4.57	4.19	4.97	
BH108	7.30	-14.00	-	-	-	-	-	-	-	-	-	5.38	5.42	5.23	5.10	4.46	4.23	4.37	
BH110	7.91	-11.09	-	-	-	-	-	-	-	-	5.59	5.41	5.44	5.29	5.19	4.61	4.36	4.96	
BH111	7.45	-10.55	-	-	-	-	-	-	-	-	-	4.30	5.70	5.57	5.55	4.78	4.56	5.15	
BH112	7.15	-0.20	-	-	-	-	-	-	-	-	-	6.61	6.49	6.42	6.29	6.04	5.89	6.16	
BH115	7.48	-12.26	-	-	-	-	-	-	-	5.55	5.43	5.40	5.73	5.62	5.45	4.79	4.58	5.23	
BH120	8.38	-11.72	-	-	-	-	-	-	-	-	5.45	5.58	5.63	5.86	5.41	4.76	5.57	5.16	
BH104	8.73	-50.99	-	-	-	-	-	-	-	4.94	5.18	5.25	5.26	5.10	5.01	4.37	4.22	4.90	
BH113	8.08	-49.63	-	-	-	-	-	-	-	-	-	5.54	5.45	5.87	5.26	4.75	4.52	5.52	
BH116	8.72	-23.13	-	-	-	-	-	-	-	-	3.77	4.55	4.73	4.91	4.84	4.32	4.17	3.87	
BH117	8.35	-45.99	-	-	-	-	-	-	-	-	-	5.05	5.04	4.89	4.80	4.22	4.04	4.61	
BH119	8.25	-49.45	-	-	-	-	-	-	-	-	-	5.45	5.56	5.42	5.25	5.68	4.45	5.07	
DS101	8.27	6.10	-	-	-	-	-	-	-	-	-	-		7.01	6.93	6.63	6.38	6.37	
DS102	8.25	7.33	-	-	-	-	-	-	-	-	-	-		Dry to 7.33					
DS103	7.71	3.35	-	-	-	-	-	-	-	-	-	-		6.96	6.76	6.30	6.12	6.50	
DS104	7.51	3.32	-	-	-	-	-	-	-	-	-	-		6.23	6.09	5.68	5.51	5.63	
DS105	8.28	5.54	-	-	-	-	-	-	-	-	-	-		6.21	6.09	5.72	Dry to 5.54		
DS106	8.07	4.46	-	-	-	-	-	-	-	-	-	-		6.26	6.16	5.76	5.57	5.53	
DS107	8.08	3.69	-	-	-	-	-	-	-	-	-	-		7.21	7.14	7.04	6.87	7.07	
DS108	8.81	5.30	-	-	-	-	-	-	-	-	-	-		7.45	7.24	6.53	6.61	6.50	
DS109	7.96	6.64	-	-	-	-	-	-	-	-	-	-		7.26	7.18	6.96	6.91	7.03	
DS110	8.01	4.01	-	-	-	-	-	-	-	-	-	-		6.11	6.51	6.27	5.18	6.15	
DS111	8.29	6.65	-	-	-	-	-	-	-	-	-	-		6.80	6.76	Dry to 6.65			
DS112	8.64	4.15	-	-	-	-	-	-	-	-	-	-		6.41	6.32	5.44	6.03	5.95	
DS113	7.29	2.84	-	-	-	-	-	-	-	-	-	-		6.55	6.46	6.13	5.95	6.16	

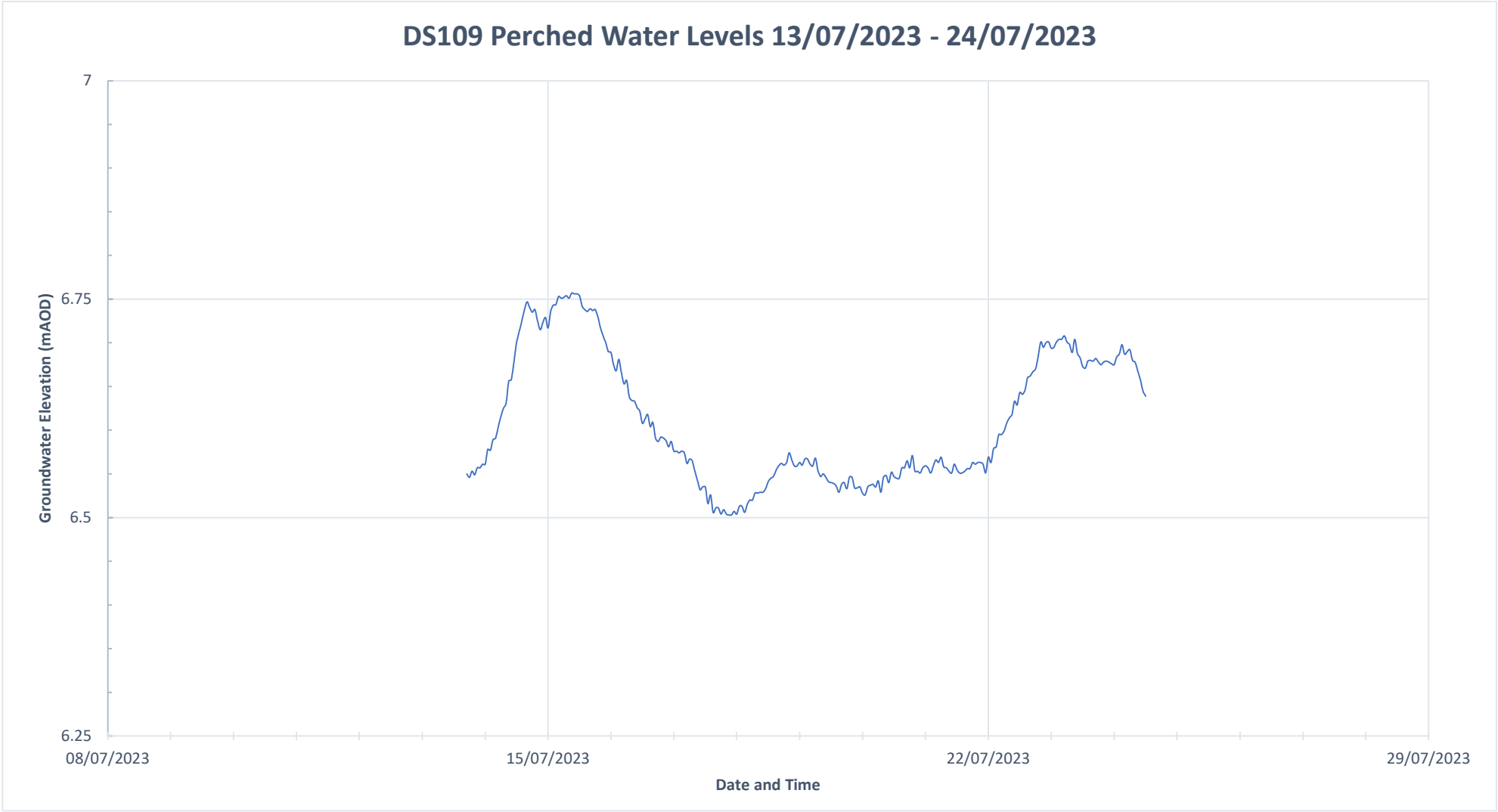

Port Talbot Perched Water Levels 13/07/2023 - 24/07/2023
Date and Time
13/07/2023
14/07/2023
15/07/2023
16/07/2023
17/07/2023
18/07/2023
19/07/2023
20/07/2023
21/07/2023
22/07/2023
23/07/2023
24/07/2023
25/07/2023
26/07/2023
Depth to water (mmbgl)
0
1
2
3
4
5
6
7
8
DS101
DS103
DS107
DS109
DS110
DS113
WS10
WS11

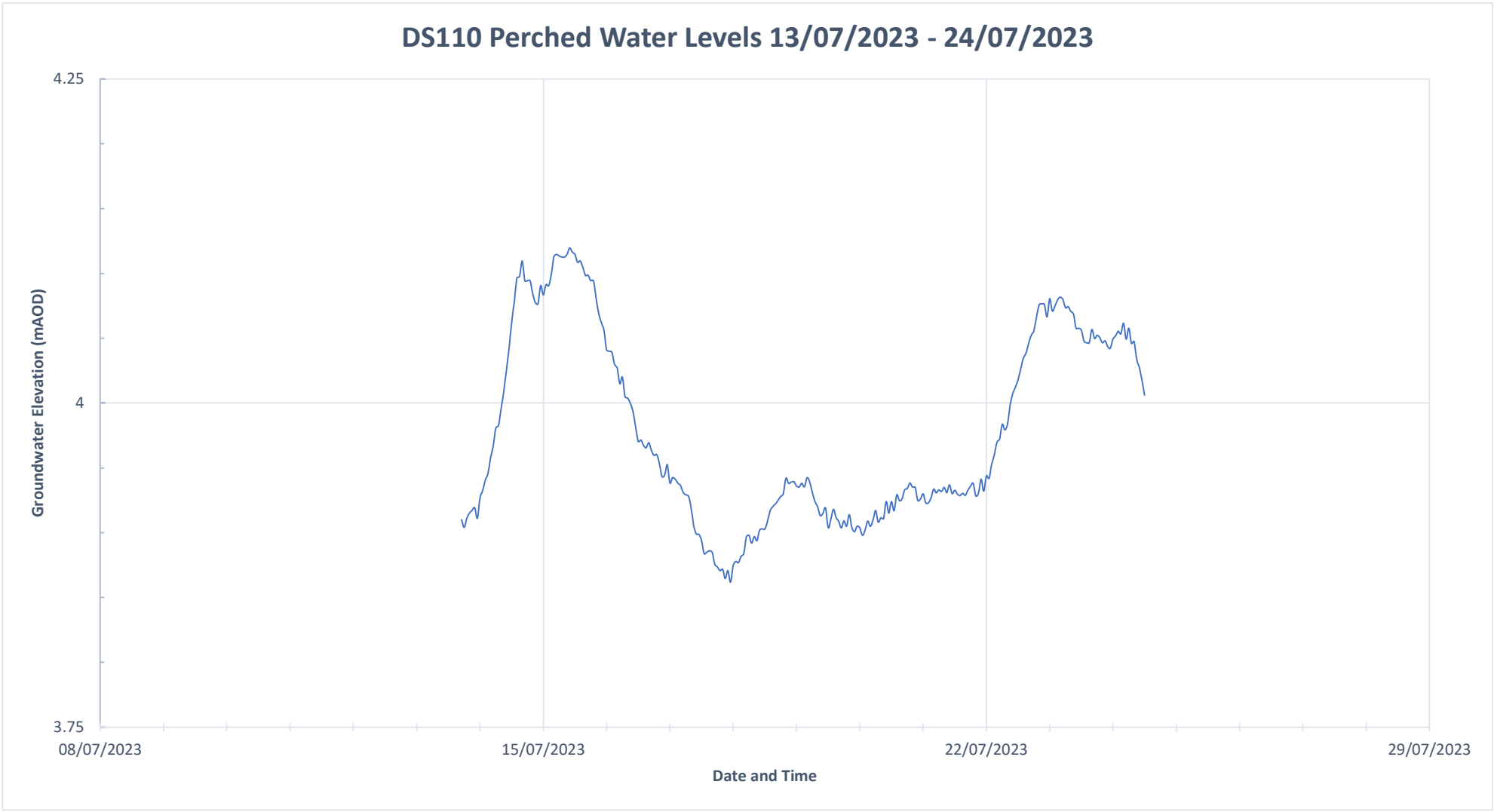

Port Talbot Perched Water Levels 13/07/2023 - 24/07/2023
Groundwater Elevations (mAOD)
8
7
6
5
4
3
2
13/07/2023
14/07/2023
15/07/2023
16/07/2023
17/07/2023
18/07/2023
19/07/2023
20/07/2023
21/07/2023
22/07/2023
23/07/2023
24/07/2023
25/07/2023
26/07/2023
Date and Time
DS101
DS103
DS107
DS109
DS110
DS113
WS10
WS11

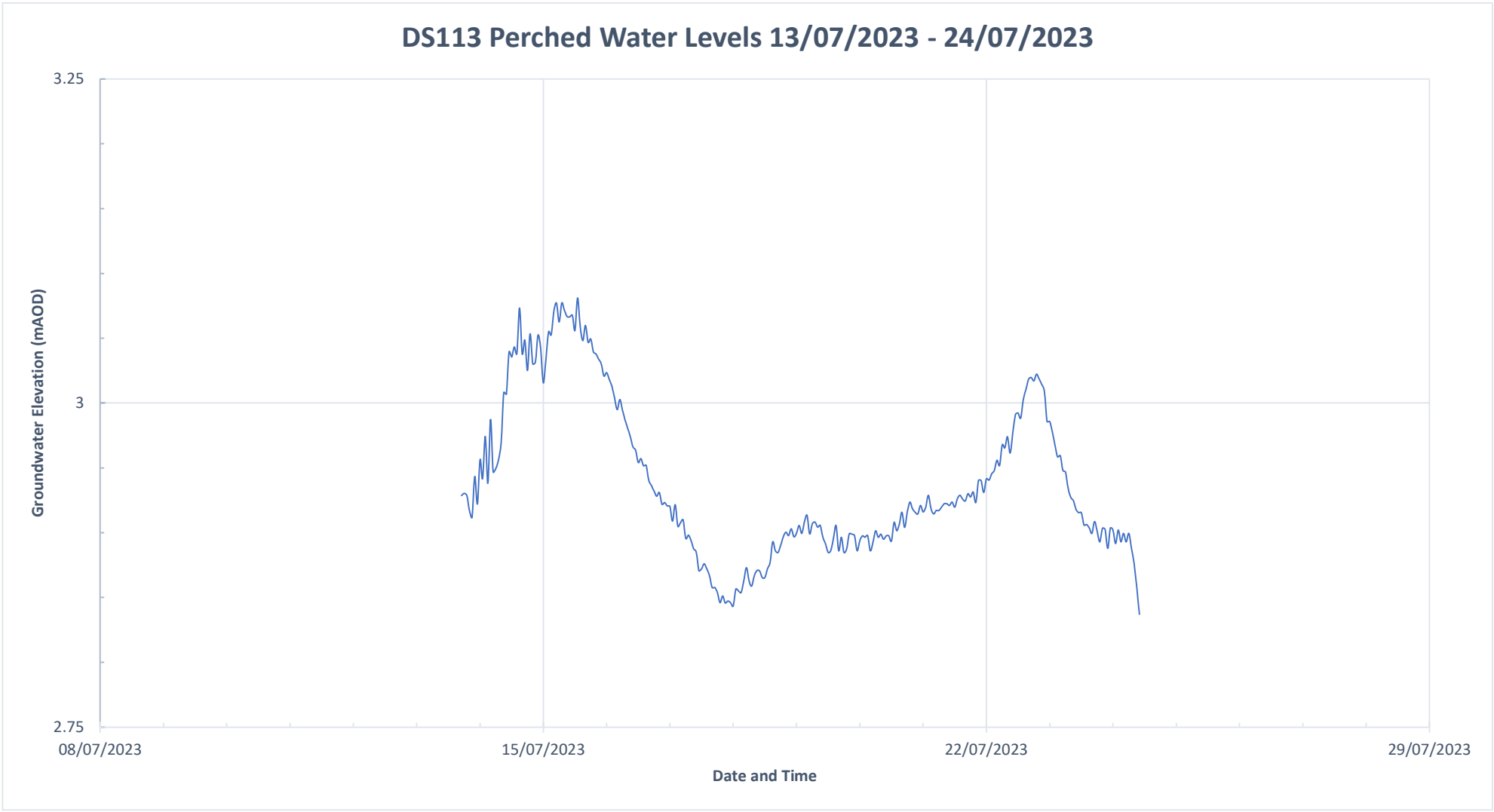

DS101 Perched Water Levels 13/07/2023 - 24/07/2023
6
5.75
5.5
Groundwater Elevation (mAOD)
08/07/2023
15/07/2023
22/07/2023
29/07/2023
Date and Time

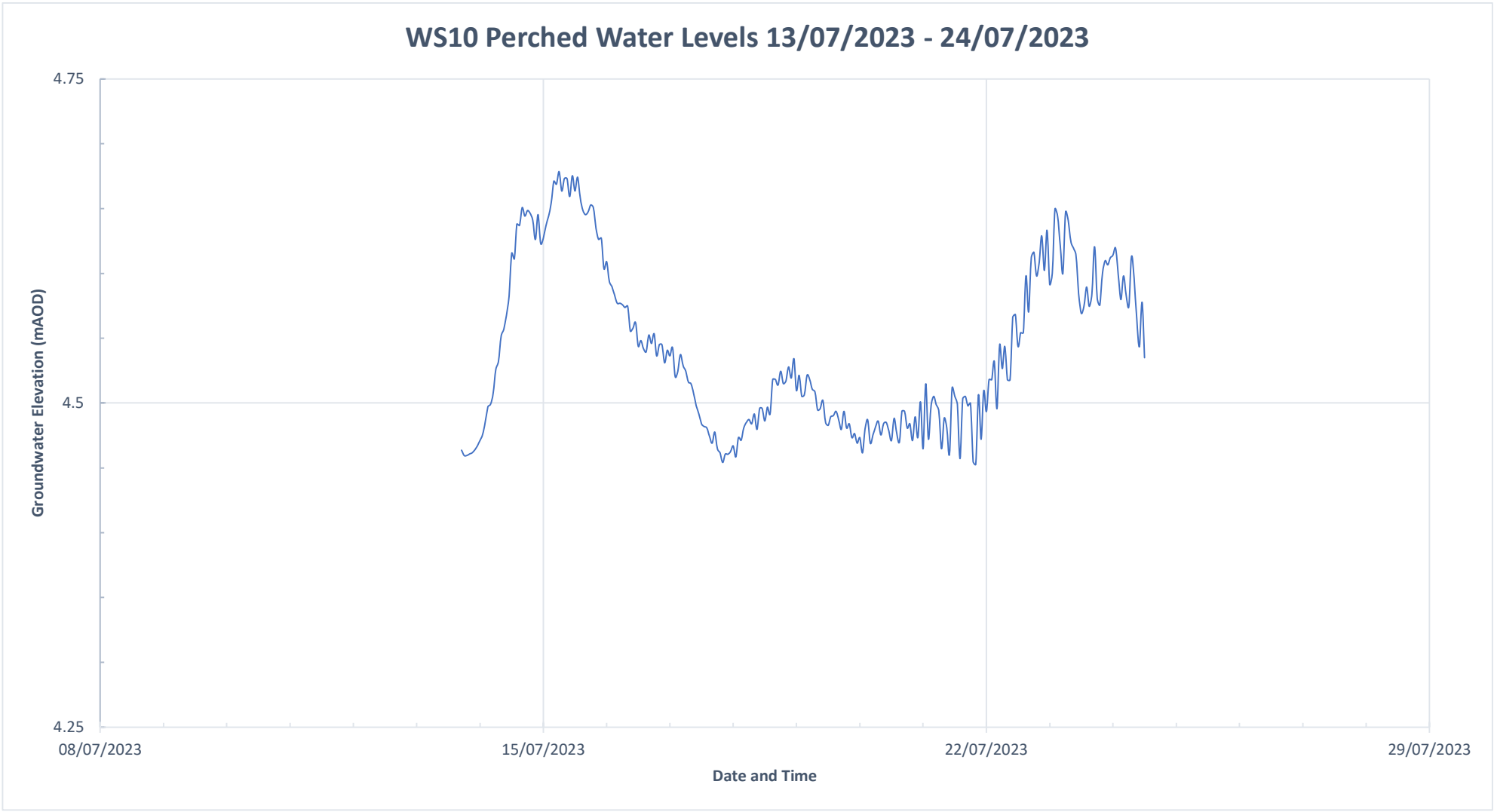

DS103 Perched Water Levels 13/07/2023 - 24/07/2023
Groundwater Elevation (mAOD)
7
6.75
6.5
08/07/2023
15/07/2023
22/07/2023
29/07/2023
Date and Time

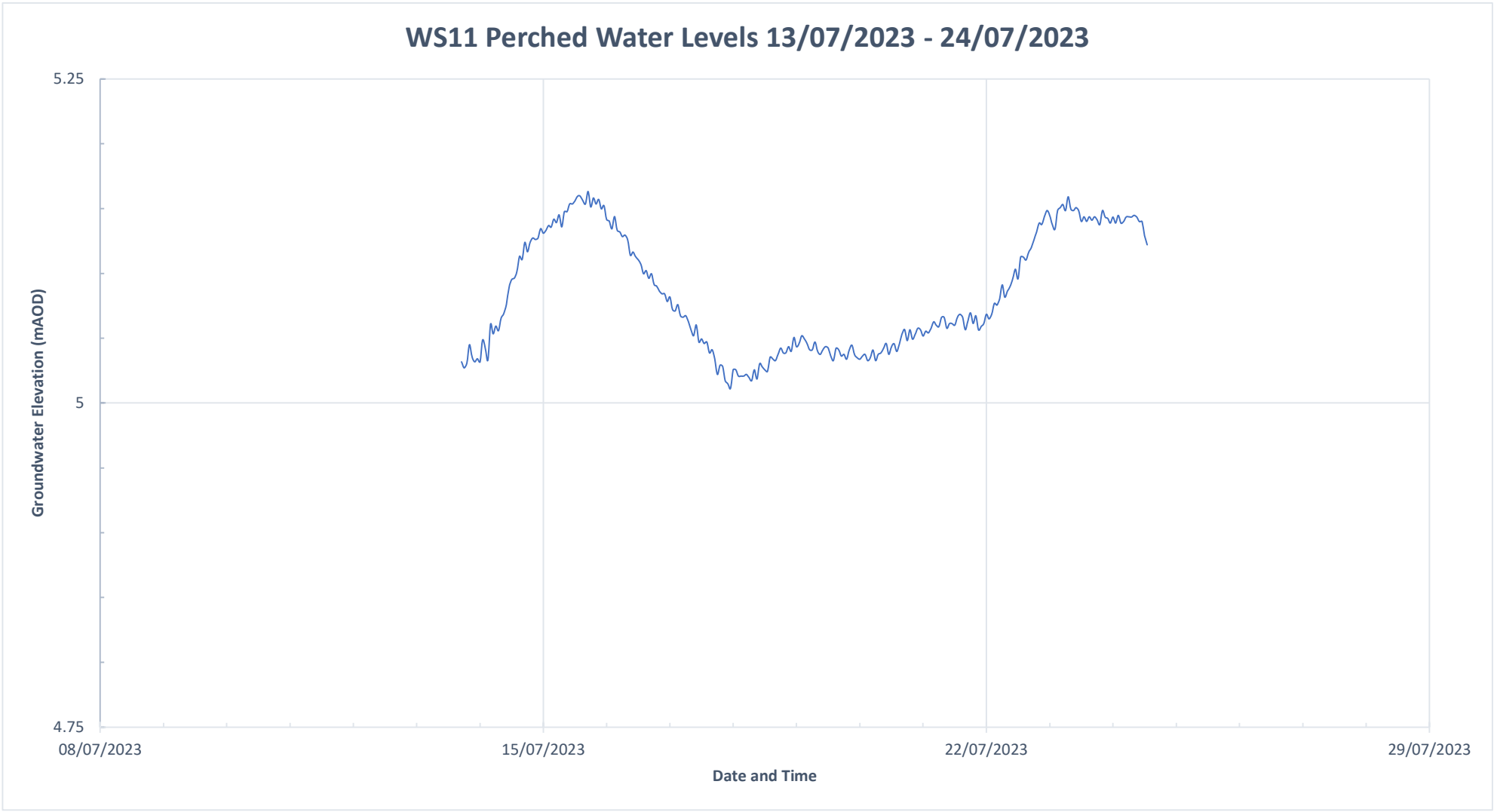

DS107 Perched Water Levels 13/07/2023 - 24/07/2023
Groundwater Elevation (mAOD)
4
3.75
3.5
08/07/2023
15/07/2023
22/07/2023
29/07/2023
Date and Time

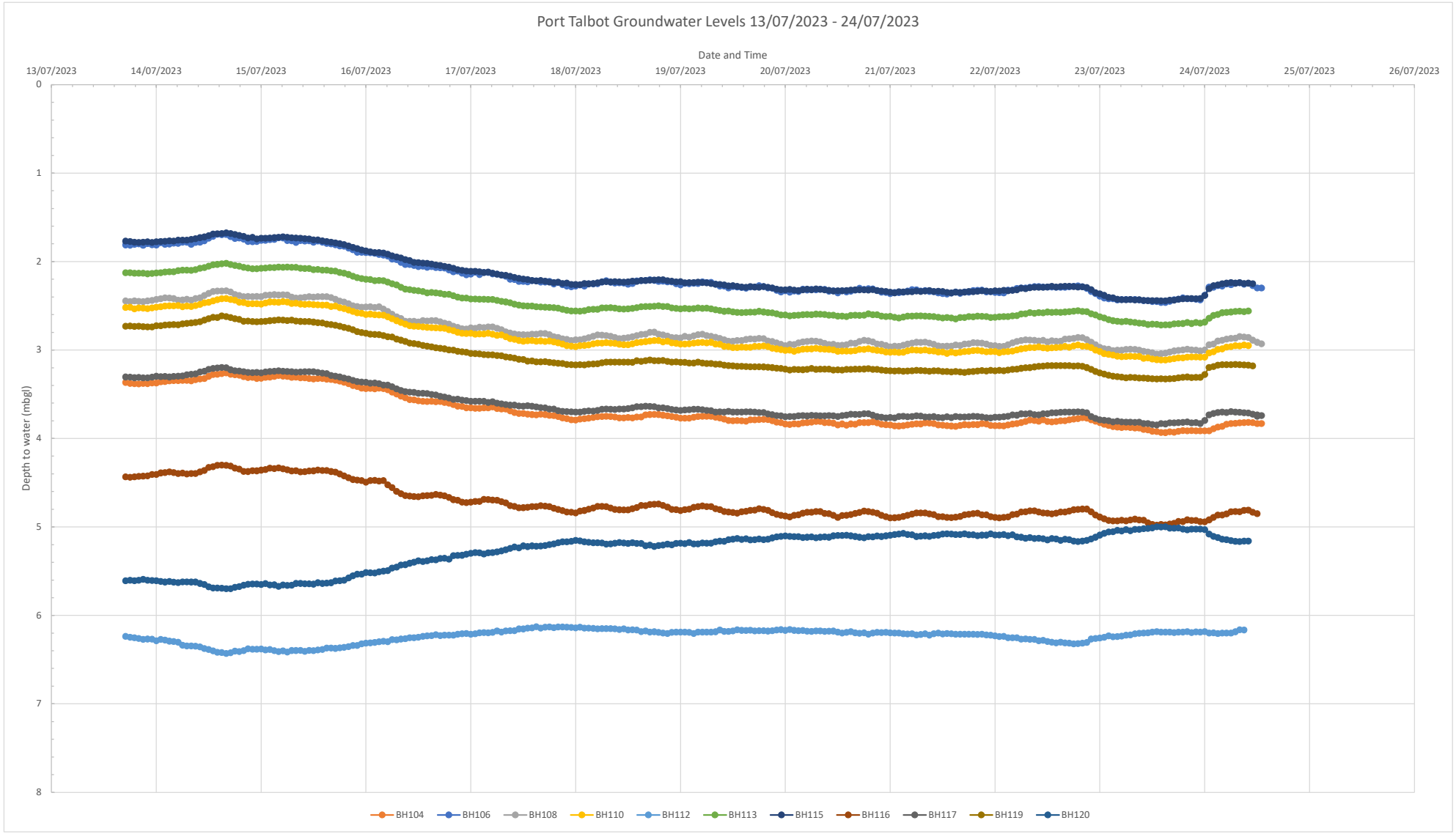

DS109 Perched Water Levels 13/07/2023 - 24/07/2023
7
6.75
6.5
6.25
Groundwater Elevation (mAOD)
08/07/2023
15/07/2023
22/07/2023
29/07/2023
Date and Time

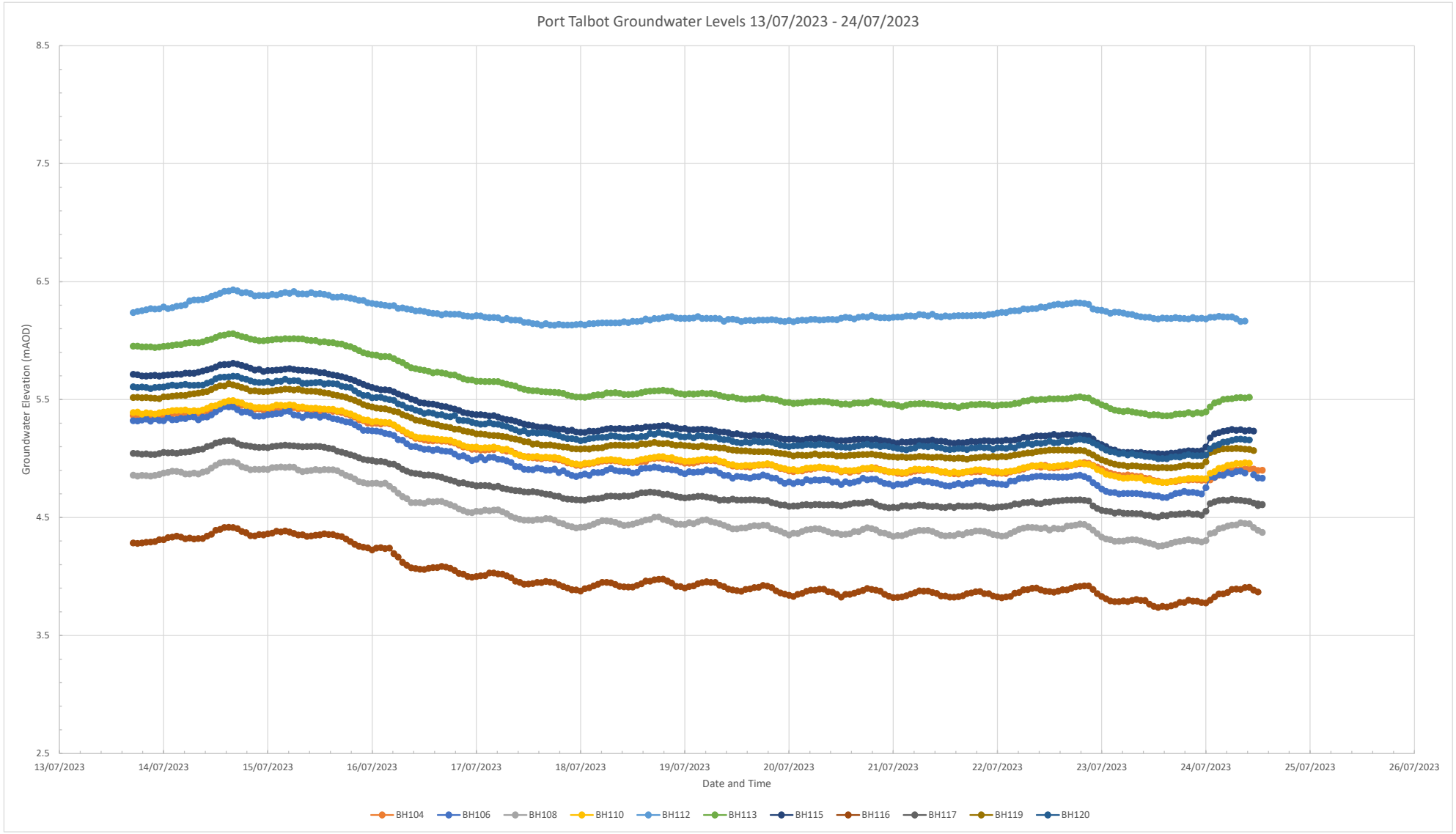

DS110 Perched Water Levels 13/07/2023 - 24/07/2023
4.25
4
3.75
Groundwater Elevation (mAOD)
08/07/2023
15/07/2023
22/07/2023
29/07/2023
Date and Time

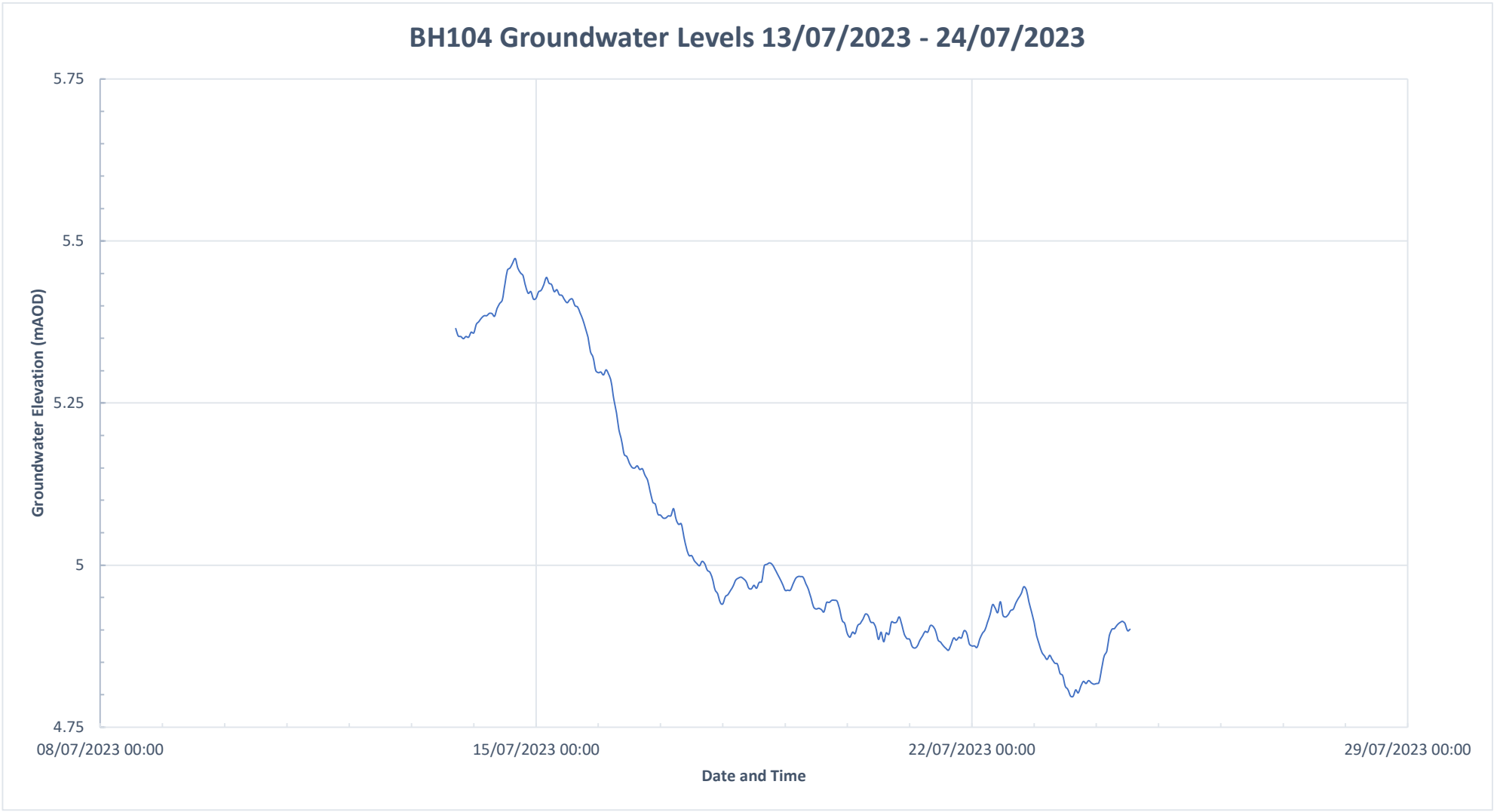

DS113 Perched Water Levels 13/07/2023 - 24/07/2023
3.25
3
2.75
Groundwater Elevation (mAOD)
08/07/2023
15/07/2023
22/07/2023
29/07/2023
Date and Time

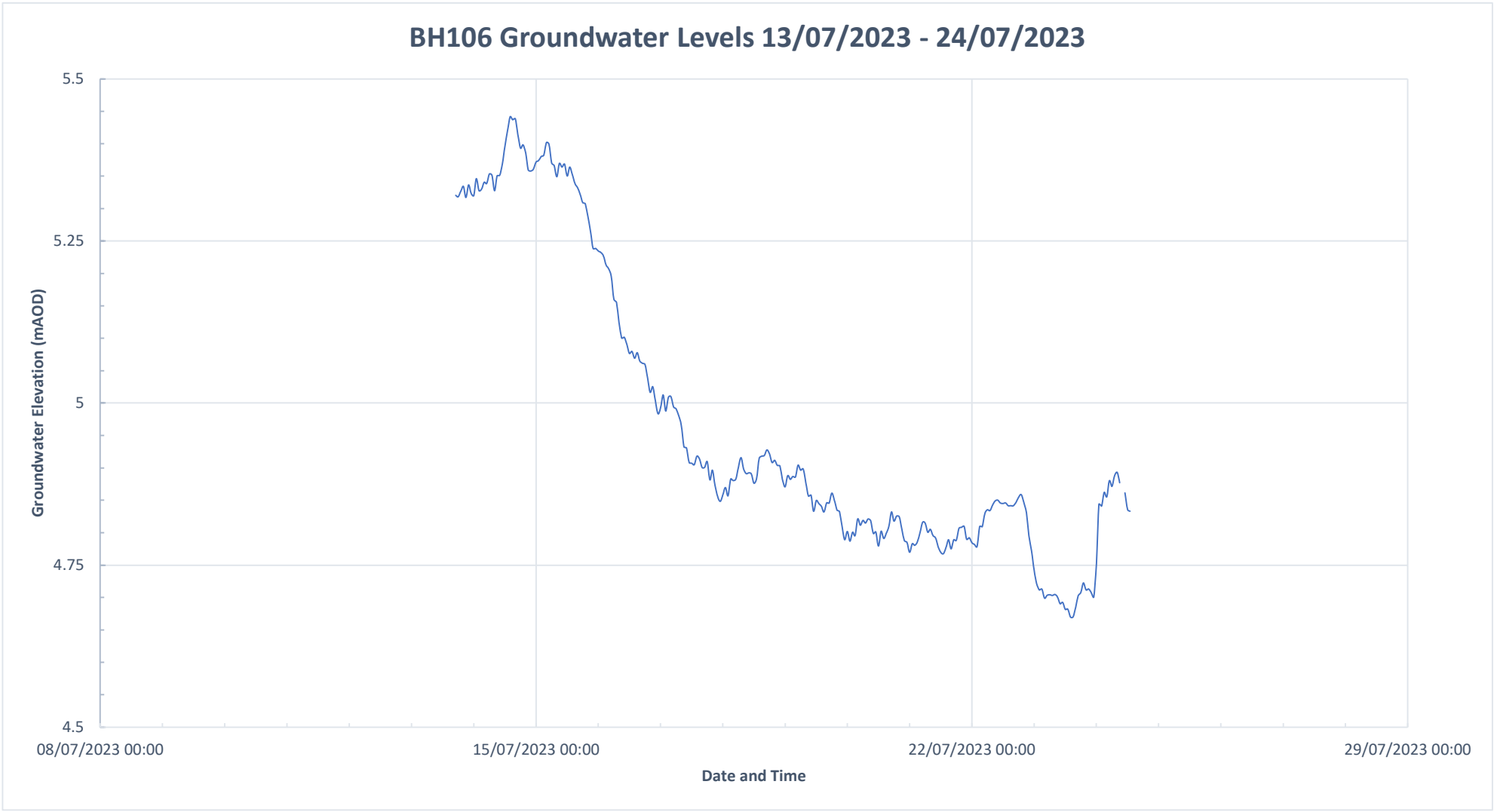

WS10 Perched Water Levels 13/07/2023 - 24/07/2023
4.75
4.5
4.25
Groundwater Elevation (mAOD)
08/07/2023
15/07/2023
22/07/2023
29/07/2023
Date and Time

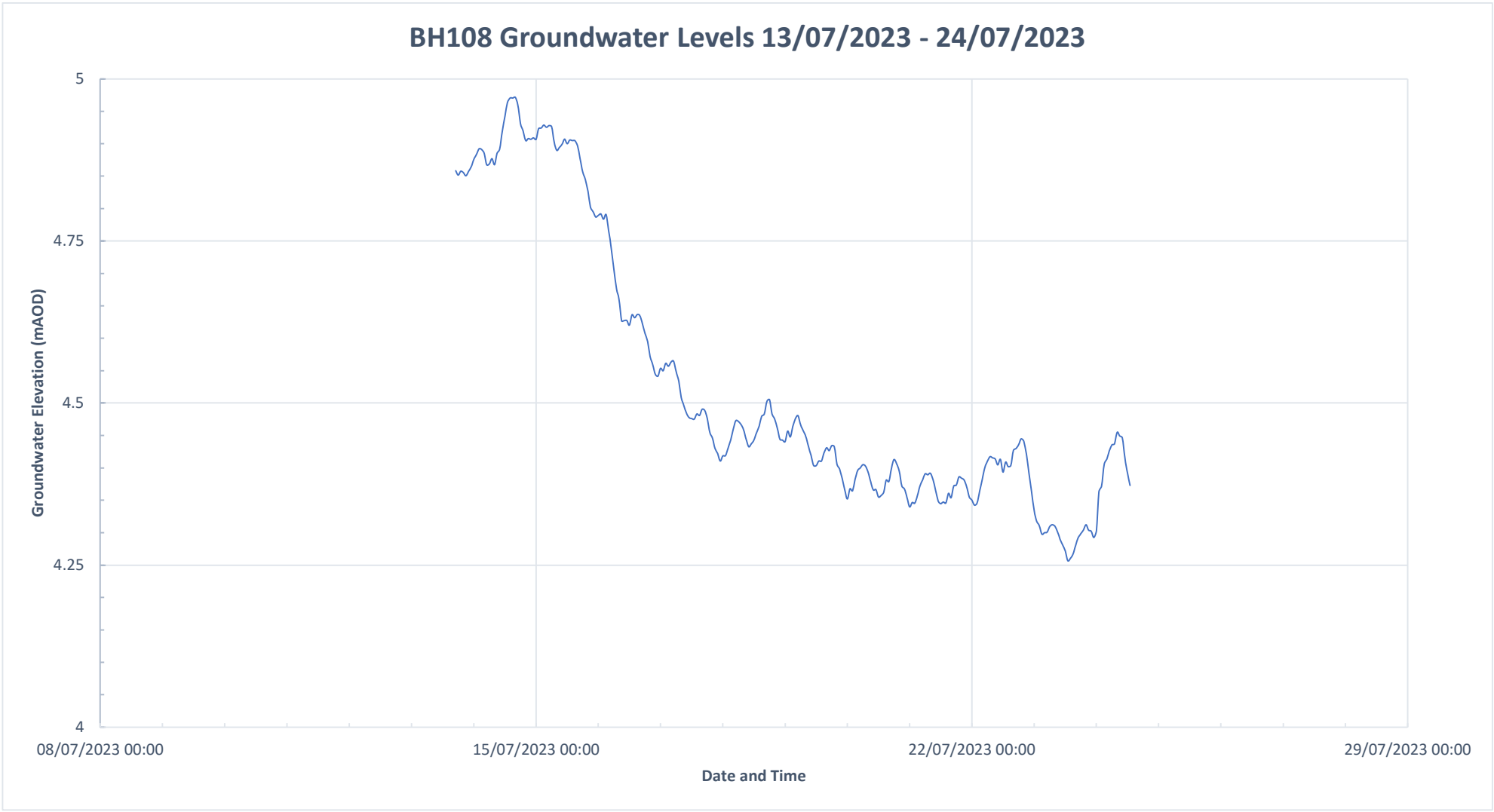

WS11 Perched Water Levels 13/07/2023 - 24/07/2023
5.25
5
4.75
Groundwater Elevation (mAOD)
08/07/2023
15/07/2023
22/07/2023
29/07/2023
Date and Time

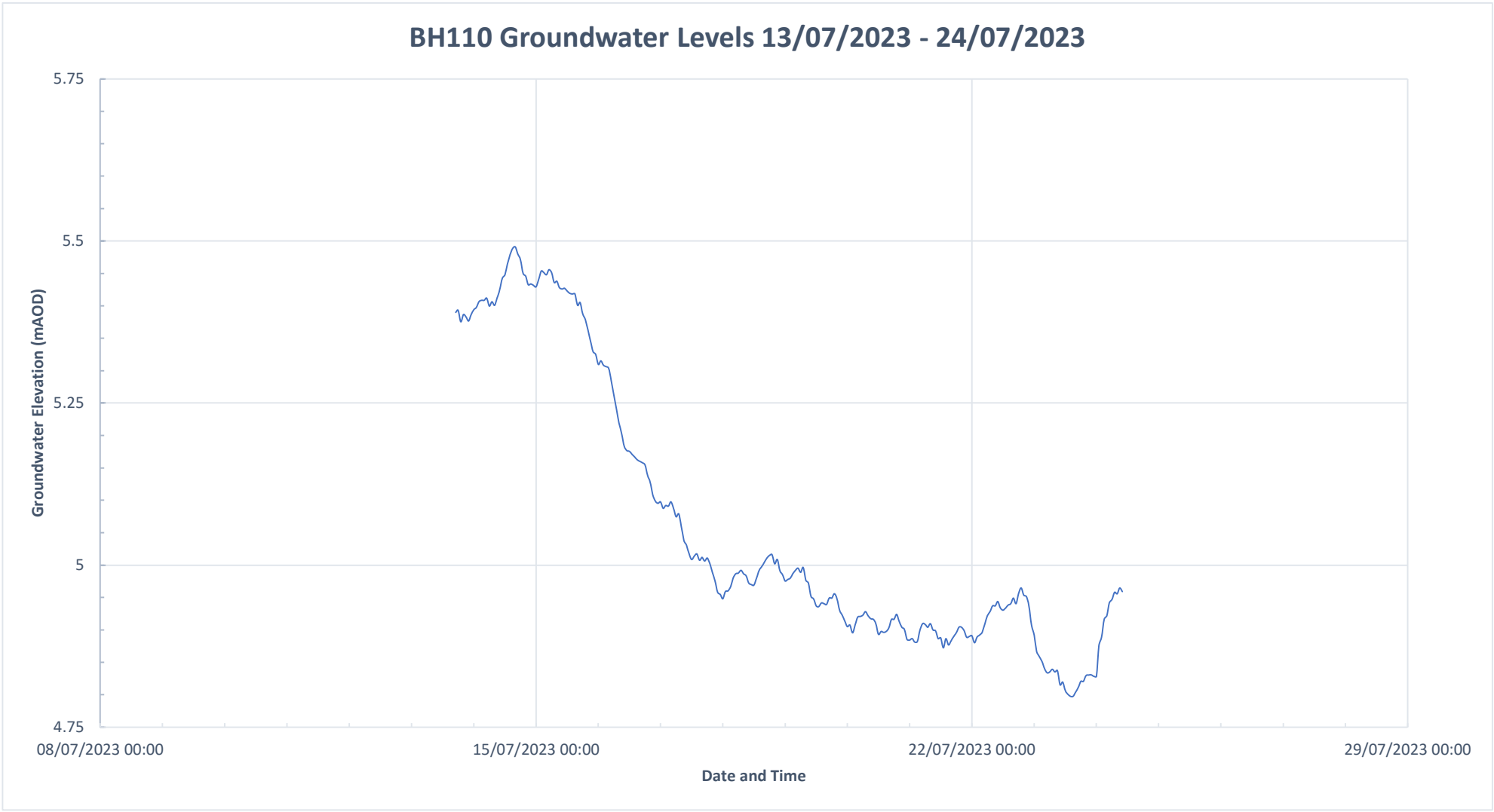

Port Talbot Groundwater Levels 13/07/2023 - 24/07/2023
Date and Time
13/07/2023
14/07/2023
15/07/2023
16/07/2023
17/07/2023
18/07/2023
19/07/2023
20/07/2023
21/07/2023
22/07/2023
23/07/2023
24/07/2023
25/07/2023
26/07/2023
Depth to water (mbgl)
0
1
2
3
4
5
6
7
8
BH104
BH106
BH108
BH110
BH112
BH113
BH115
BH116
BH117
BH119
BH120

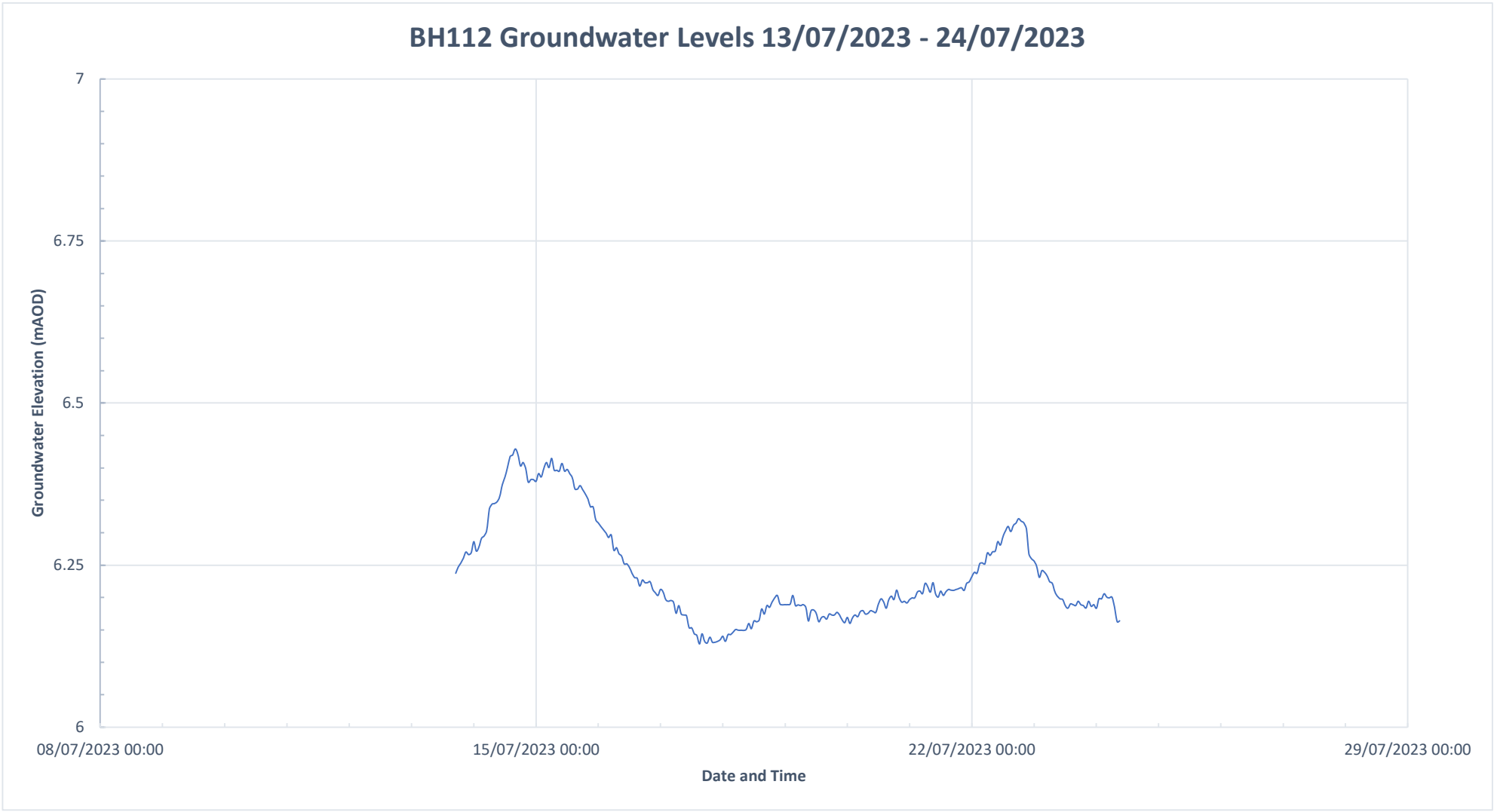

Port Talbot Groundwater Levels 13/07/2023 - 24/07/2023
Groundwater Elevation (mAOD)
8.5
7.5
6.5
5.5
4.5
3.5
2.5
13/07/2023
14/07/2023
15/07/2023
16/07/2023
17/07/2023
18/07/2023
19/07/2023
20/07/2023
21/07/2023
22/07/2023
23/07/2023
24/07/2023
25/07/2023
26/07/2023
Date and Time
BH104
BH106
BH108
BH110
BH112
BH113
BH115
BH116
BH117
BH119
BH120

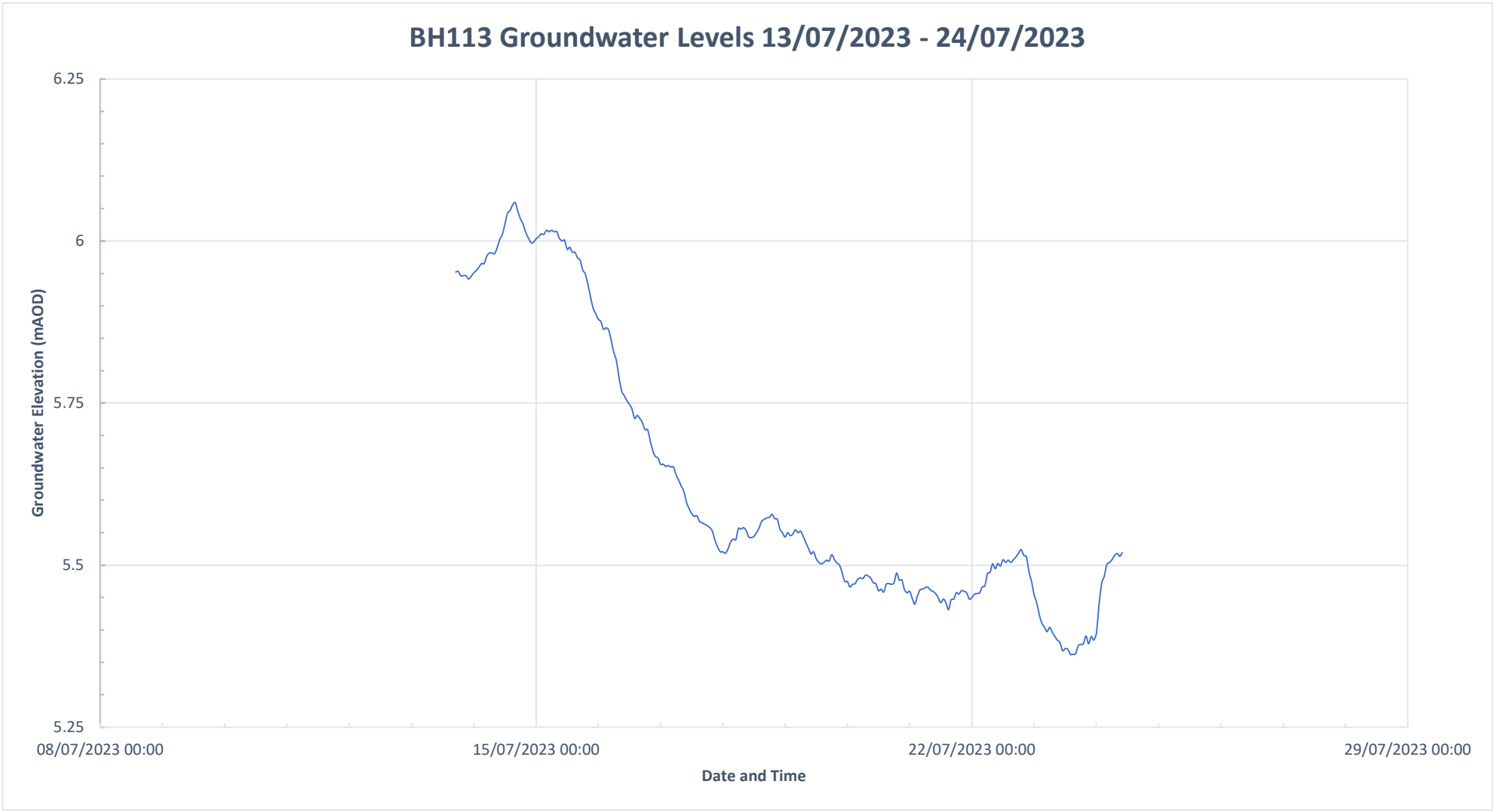

BH104 Groundwater Levels 13/07/2023 - 24/07/2023
5.75
5.5
5.25
5
4.75
Groundwater Elevation (mAOD)
08/07/2023 00:00
15/07/2023 00:00
22/07/2023 00:00
29/07/2023 00:00
Date and Time

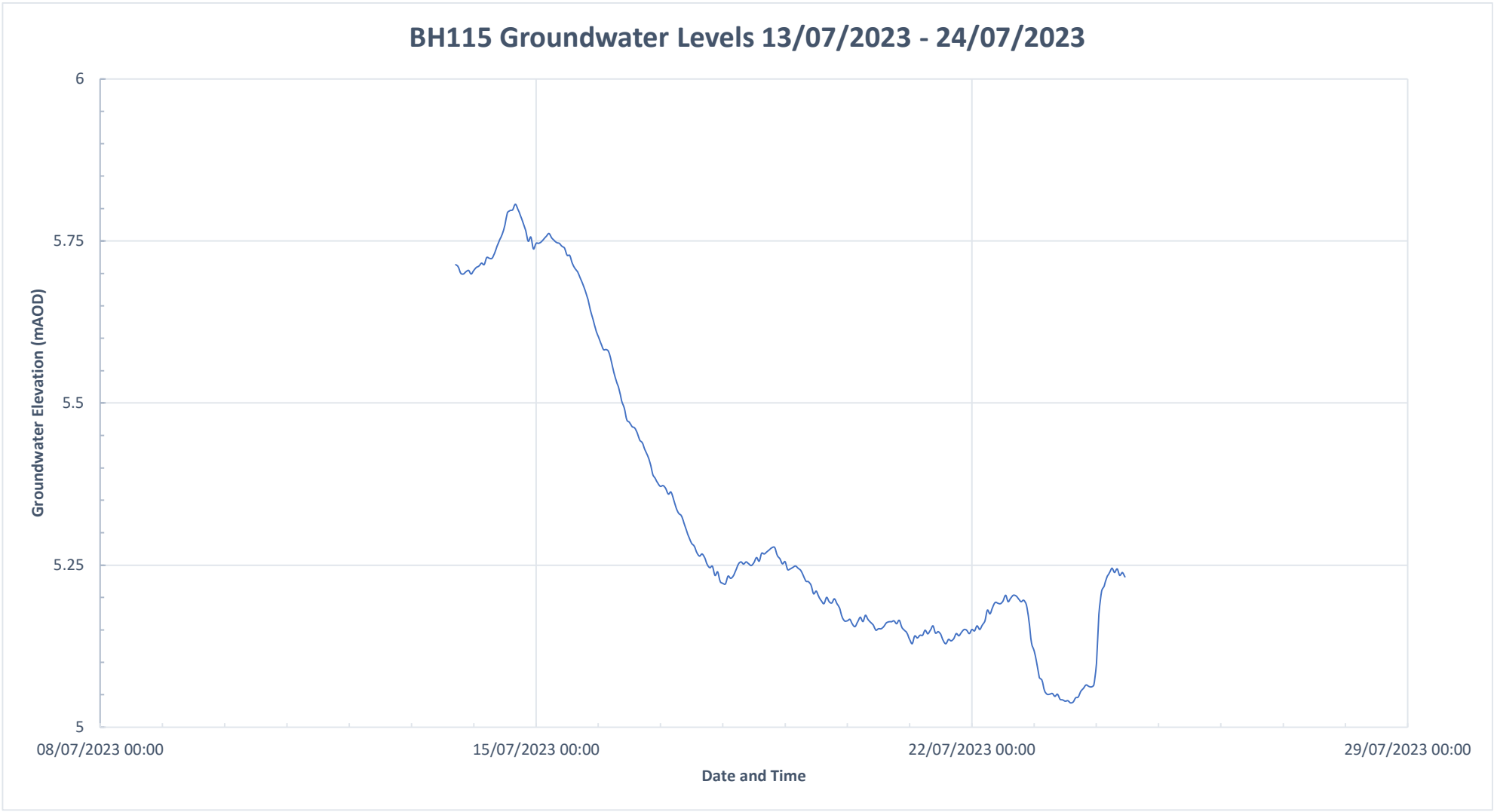

BH106 Groundwater Levels 13/07/2023 - 24/07/2023
5.5
5.25
5
4.75
4.5
Groundwater Elevation (mAOD)
08/07/2023 00:00
15/07/2023 00:00
22/07/2023 00:00
29/07/2023 00:00
Date and Time

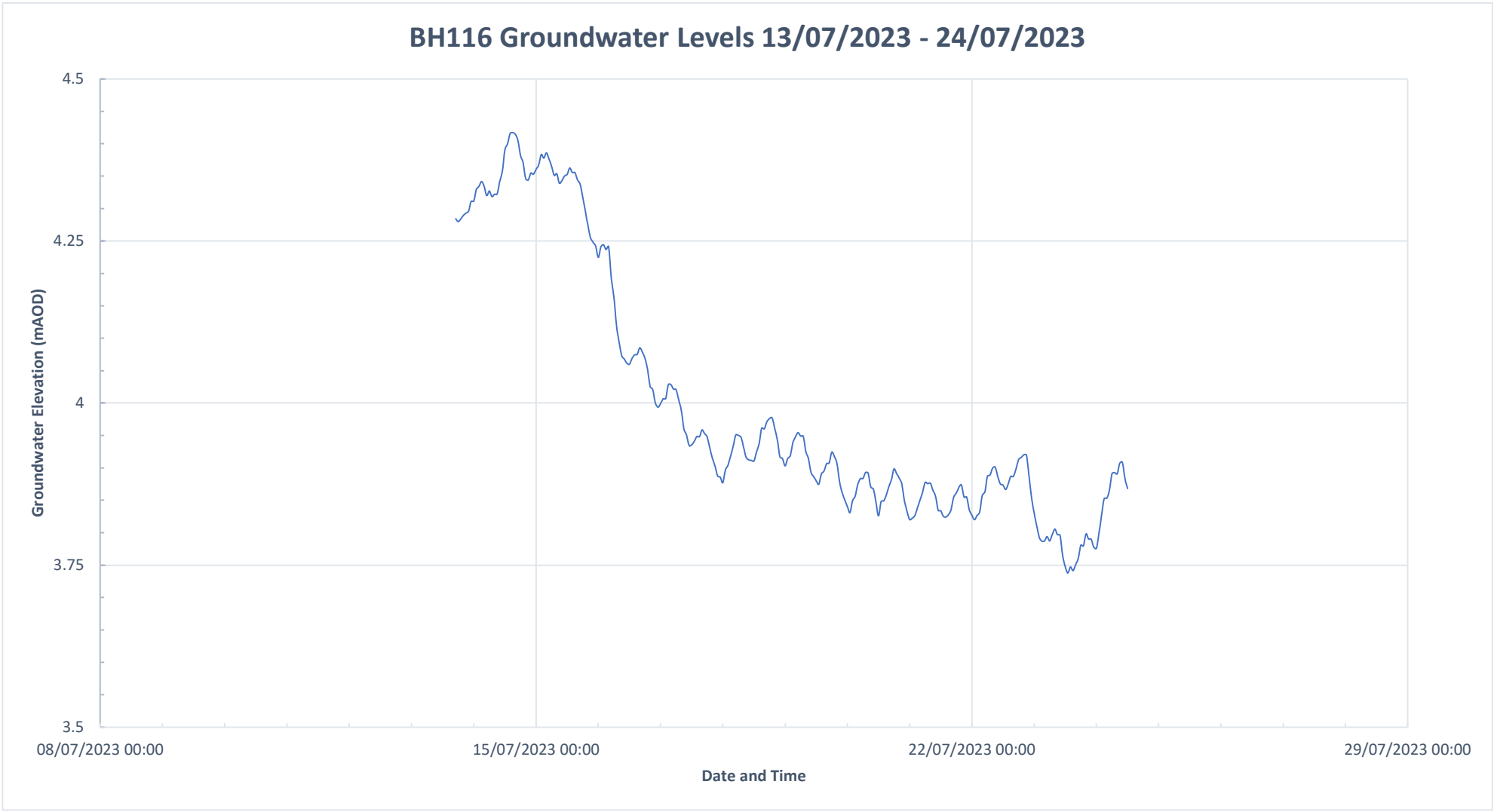

BH108 Groundwater Levels 13/07/2023 - 24/07/2023
5
4.75
4.5
4.25
4
Groundwater Elevation (mAOD)
08/07/2023 00:00
15/07/2023 00:00
22/07/2023 00:00
29/07/2023 00:00
Date and Time

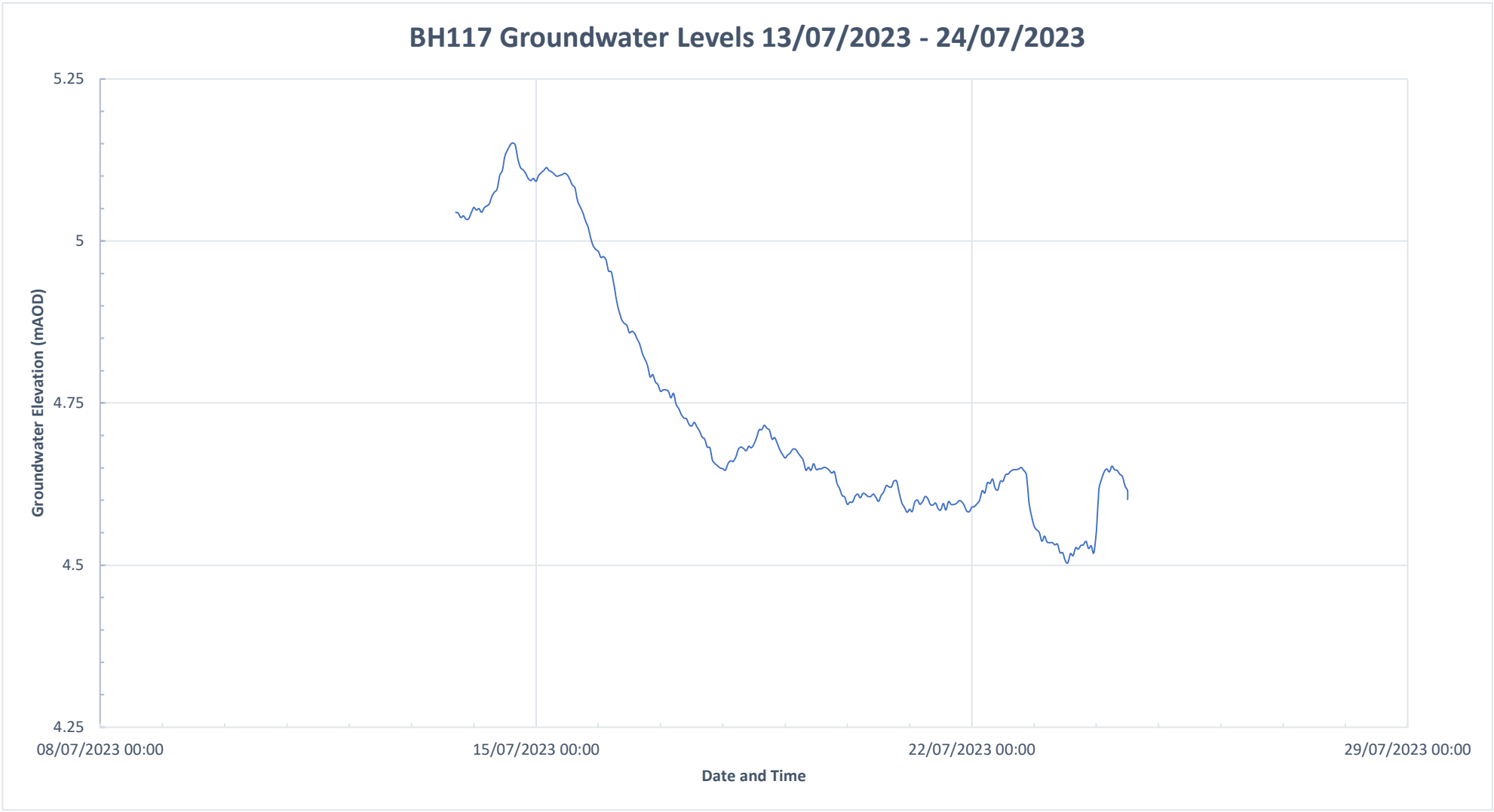

BH110 Groundwater Levels 13/07/2023 - 24/07/2023
5.75
5.5
5.25
5
4.75
Groundwater Elevation (mAOD)
08/07/2023 00:00
15/07/2023 00:00
22/07/2023 00:00
29/07/2023 00:00
Date and Time

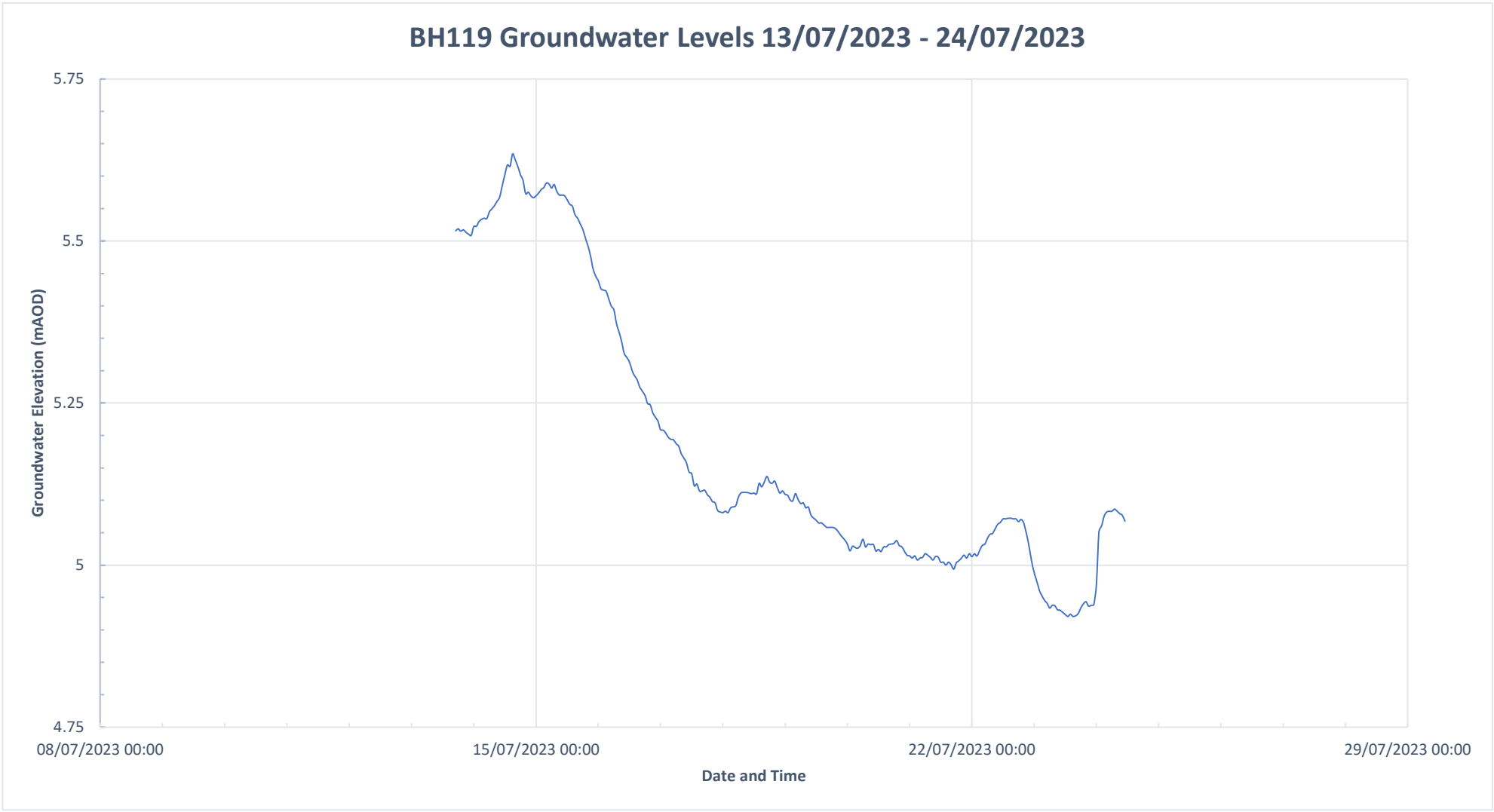

BH112 Groundwater Levels 13/07/2023 - 24/07/2023
7
6.75
6.5
6.25
6
Groundwater Elevation (mAOD)
08/07/2023 00:00
15/07/2023 00:00
22/07/2023 00:00
29/07/2023 00:00
Date and Time

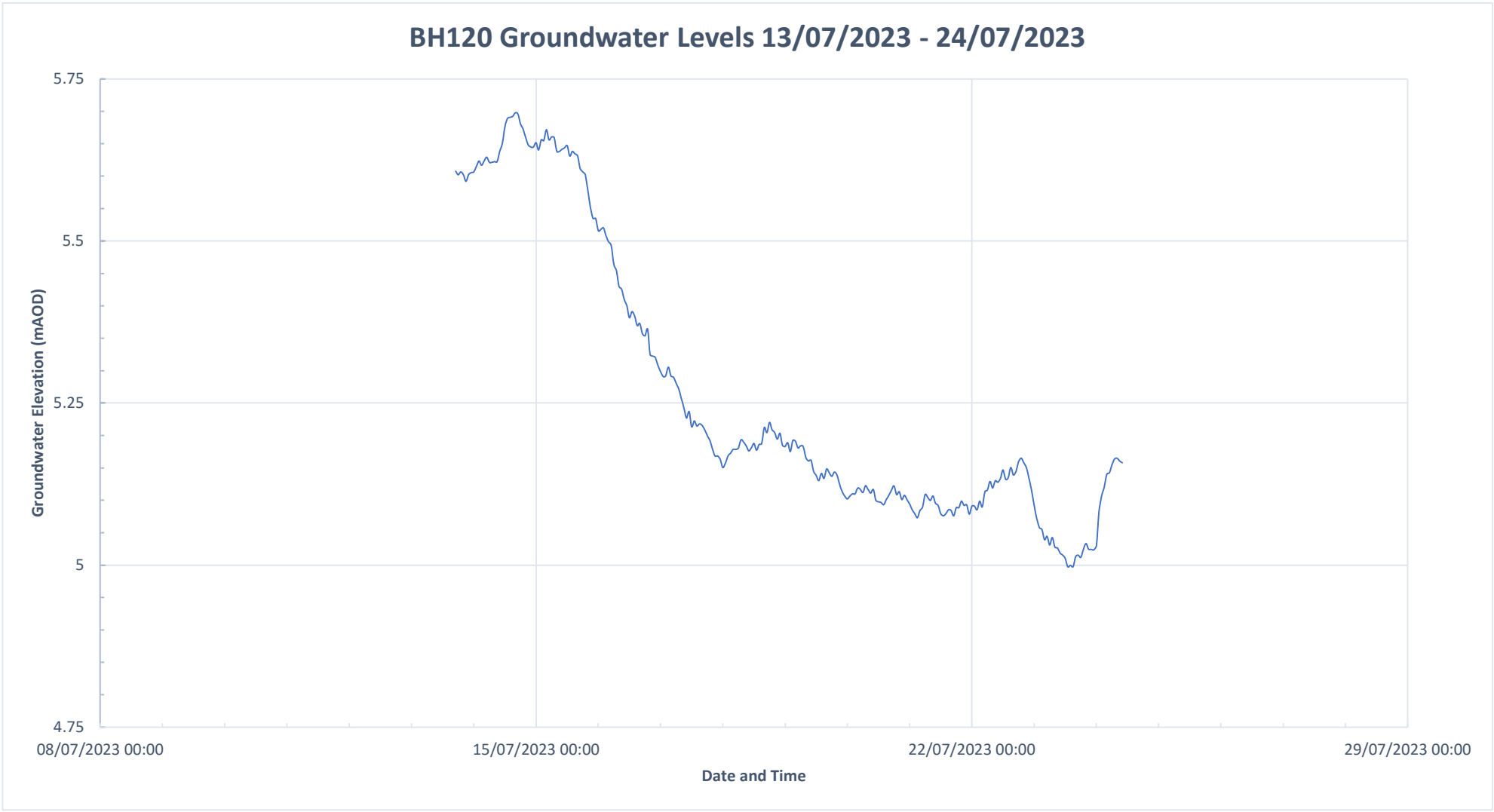

BH113 Groundwater Levels 13/07/2023 - 24/07/2023
6.25
6
5.75
5.5
5.25
Groundwater Elevation (mAOD)
08/07/2023 00:00
15/07/2023 00:00
22/07/2023 00:00
29/07/2023 00:00
Date and Time


BH115 Groundwater Levels 13/07/2023 - 24/07/2023
6
5.75
5.5
5.25
5
Groundwater Elevation (mAOD)
08/07/2023 00:00
15/07/2023 00:00
22/07/2023 00:00
29/07/2023 00:00
Date and Time


BH116 Groundwater Levels 13/07/2023 - 24/07/2023
4.5
4.25
4
3.75
3.5
Groundwater Elevation (mAOD)
08/07/2023 00:00
15/07/2023 00:00
22/07/2023 00:00
29/07/2023 00:00
Date and Time


BH117 Groundwater Levels 13/07/2023 - 24/07/2023
5.25
5
4.75
4.5
4.25
Groundwater Elevation (mAOD)
08/07/2023 00:00
15/07/2023 00:00
22/07/2023 00:00
29/07/2023 00:00
Date and Time


BH119 Groundwater Levels 13/07/2023 - 24/07/2023
5.75
5.5
5.25
5
4.75
Groundwater Elevation (mAOD)
08/07/2023 00:00
15/07/2023 00:00
22/07/2023 00:00
29/07/2023 00:00
Date and Time


BH120 Groundwater Levels 13/07/2023 - 24/07/2023
5.75
5.5
5.25
5
4.75
Groundwater Elevation (mAOD)
08/07/2023 00:00
15/07/2023 00:00
22/07/2023 00:00
29/07/2023 00:00
Date and Time

Appendix G

Ground Gas Monitoring Data

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 430	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1010 - 1035 (falling)	Sunny / Dry	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	30m Black	Temperature range:	14 - 24°c		
Test Date:	13/06/2023	Operator:	OD	Rainfall:	0.0mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: WS01	Atmospheric Conditions	0.0	0	0.0	0.0	21.0	0.0	0	0	N/A	Dry	2.45	
Time: 11:30	0	0.0	0	0.0	0.0	20.0	0.0	0	0	N/A			
	15	0.0	0	0.0	0.1	19.7	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1023	30	0.0	0	0.0	0.1	20.2	0.0	0	0	N/A			
	45	0.0	0	0.0	0.1	20.3	0.0	0	0	N/A			
	60	0.0	0	0.0	0.1	20.4	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1023	120			0.0	0.1	20.5	0.0	0	0				
	180			0.0	0.1	20.5	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: WS03	Atmospheric Conditions	0.0	0	0.0	0.0	21.0	0.0	0	0	N/A	1.41	2.36	
Time: 12:20	0	0.0	0	0.0	0.0	20.1	0.0	0	0	N/A			
	15	0.0	0	0.0	2.2	16.9	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1023	30	0.0	0	0.0	2.2	16.8	0.0	0	0	N/A			
	45	0.0	0	0.0	2.2	16.8	0.0	0	0	N/A			
	60	0.0	0	0.0	2.2	16.8	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1023	120			0.0	2.2	16.8	0.0	0	0				
	180			0.0	2.2	16.8	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: WS06	Atmospheric Conditions	0.0	0	0.0	0.0	21.4	0.0	0	0	N/A	0.50	2.55	
Time: 14:00	0	0.0	0	0.0	0.0	20.1	0.0	0	0	N/A			
	15	0.0	0	0.0	0.0	21.0	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1021	30	0.0	0	0.0	0.0	21.0	0.0	0	0	N/A			
	45	0.0	0	0.0	0.0	21.0	0.0	0	0	N/A			
	60	0.0	0	0.0	0.0	21.0	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1021	120			0.0	0.0	21.0	0.0	0	0				
	180			0.0	0.0	21.0	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 430	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1010 - 1035 (falling)	Sunny / Dry	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	30m Black	Temperature range:	14 - 24°c		
Test Date:	13/06/2023	Operator:	OD	Rainfall:	0.0mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: WS07	Atmospheric Conditions	0.0	0	0.0	0.0	20.9	0.0	0	0	N/A	0.79	3.19	
Time: 08:50	0	0.0	0	0.0	0.0	20.2	0.0	0	0	N/A			
	15	0.0	0	0.0	0.0	20.0	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1027	30	0.0	0	0.0	0.0	20.0	0.0	0	0	N/A			
	45	0.0	0	0.0	0.0	20.1	0.0	0	0	N/A			
	60	0.0	0	0.0	0.0	20.1	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1027	120			0.0	0.0	20.1	0.0	0	0				
	180			0.0	0.0	20.1	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: WS10	Atmospheric Conditions	0.0	0	0.0	0.0	21.5	0.0	0	0	N/A	3.23	4.70	
Time: 11:40	0	0.0	0	0.0	0.0	20.0	0.0	0	0	N/A			
	15	0.0	0	0.0	0.7	18.0	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1023	30	0.0	0	0.0	0.7	17.9	0.0	0	0	N/A			
	45	0.0	0	0.0	0.7	17.5	0.0	0	0	N/A			
	60	0.0	0	0.0	0.7	17.1	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1023	120			0.0	0.7	17.0	0.0	0	0				
	180			0.0	0.7	16.9	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: WS11	Atmospheric Conditions	0.0	0	0.0	0.0	21.4	0.0	0	0	N/A	1.36	3.32	
Time: 12:30	0	0.0	0	0.0	0.0	20.0	0.0	0	0	N/A			
	15	0.0	0	0.0	3.3	17.9	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1022	30	0.0	0	0.0	3.2	17.8	0.0	0	0	N/A			
	45	0.0	0	0.0	3.3	17.7	0.0	0	0	N/A			
	60	0.0	0	0.0	3.4	17.7	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1022	120			0.0	3.4	17.7	0.0	0	0				
	180			0.0	3.4	17.6	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 430	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1010 - 1035 (falling)	Sunny / Dry	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	30m Black	Temperature range:	14 - 24°c		
Test Date:	13/06/2023	Operator:	OD	Rainfall:	0.0mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS101	Atmospheric Conditions	0.0	0	0.0	0.0	21.0	0.0	0	0	N/A	1.34	2.17	
Time: 10:10	0	0.0	0	0.0	0.0	20.2	0.0	0	0	N/A			
	15	0.0	0	0.0	0.1	20.5	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1024	30	0.0	0	0.0	0.1	20.5	0.0	0	0	N/A			
	45	0.0	0	0.0	0.1	20.5	0.0	0	0	N/A			
	60	0.0	0	0.0	0.1	20.5	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1024	120			0.0	0.1	20.5	0.0	0	0				
	180			0.0	0.1	20.5	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS102	Atmospheric Conditions	0.0	0	0.0	0.0	21.0	0.0	0	0	N/A	Dry	0.92	
Time: 09:50	0	0.0	0	0.0	0.0	20.5	0.0	0	0	N/A			
	15	0.0	0	0.0	0.2	20.6	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1028	30	0.0	0	0.0	0.2	20.6	0.0	0	0	N/A			
	45	0.0	0	0.0	0.2	20.6	0.0	0	0	N/A			
	60	0.0	0	0.0	0.2	20.6	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1028	120			0.0	0.2	20.6	0.0	0	0				
	180			0.0	0.2	20.6	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS103	Atmospheric Conditions	0.0	0	0.0	0.0	21.5	0.0	0	0	N/A	0.95	4.36	
Time: 10:00	0	0.0	0	0.0	0.0	21.0	0.0	0	0	N/A			
	15	0.0	0	0.0	0.2	20.7	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1025	30	0.0	0	0.0	0.2	20.7	0.0	0	0	N/A			
	45	0.0	0	0.0	0.2	20.7	0.0	0	0	N/A			
	60	0.0	0	0.0	0.1	20.7	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1025	120			0.0	0.1	20.7	0.0	0	0				
	180			0.0	0.1	20.7	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 430	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1010 - 1035 (falling)	Sunny / Dry	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	30m Black	Temperature range:	14 - 24°c		
Test Date:	13/06/2023	Operator:	OD	Rainfall:	0.0mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS104	Atmospheric Conditions	0.0	0	0.0	0.0	21.0	0.0	0	0	N/A	1.42	4.19	
Time: 14:30	0	0.0	0	0.0	0.0	20.5	0.0	0	0	N/A			
	15	0.0	0	0.0	1.1	20.1	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1024	30	0.0	0	0.0	1.1	19.9	0.0	0	0	N/A			
	45	0.0	0	0.0	1.1	19.9	0.0	0	0	N/A			
	60	0.0	0	0.0	1.1	19.7	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1024	120			0.0	1.1	19.7	0.0	0	0				
	180			0.0	1.1	19.7	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS105	Atmospheric Conditions	0.0	0	0.0	0.0	20.8	0.0	0	0	N/A	2.19	2.74	
Time: 14:10	0	0.0	0	0.0	0.0	19.5	0.0	0	0	N/A			
	15	0.0	0	0.0	0.6	13.6	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1023	30	0.0	0	0.0	0.6	13.5	0.0	0	0	N/A			
	45	0.0	0	0.0	0.6	13.1	0.0	0	0	N/A			
	60	0.0	0	0.0	0.6	13.0	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1023	120			0.0	0.6	12.8	0.0	0	0				
	180			0.0	0.6	12.7	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS106	Atmospheric Conditions	0.0	0	0.0	0.0	21.0	0.0	0	0	N/A	1.91	3.61	
Time: 15:00	0	0.0	0	0.0	0.0	20.5	0.0	0	0	N/A			
	15	0.0	0	0.0	2.6	16.5	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1023	30	0.0	0	0.0	2.7	16.4	0.0	0	0	N/A			
	45	0.0	0	0.0	2.7	16.4	0.0	0	0	N/A			
	60	0.0	0	0.0	2.7	16.3	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1023	120			0.0	2.7	16.3	0.0	0	0				
	180			0.0	2.7	16.3	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 430	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1010 - 1035 (falling)	Sunny / Dry	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	30m Black	Temperature range:	14 - 24°c		
Test Date:	13/06/2023	Operator:	OD	Rainfall:	0.0mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS107	Atmospheric Conditions	0.0	0	0.0	0.0	21.2	0.0	0	0	N/A	0.94	4.39	
Time: 13:25	0	0.0	0	0.0	0.0	20.0	0.0	0	0	N/A			
	15	0.0	0	0.0	3.4	17.5	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1023	30	0.0	0	0.0	3.4	17.3	0.0	0	0	N/A			
	45	0.0	0	0.0	3.4	17.2	0.0	0	0	N/A			
	60	0.0	0	0.0	3.4	17.2	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1023	120			0.0	3.4	17.2	0.0	0	0				
	180			0.0	3.4	17.2	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS108	Atmospheric Conditions	0.0	0	0.0	0.0	21.5	0.0	0	0	N/A	1.57	3.51	
Time: 12:00	0	0.0	0	0.0	0.0	20.5	0.0	0	0	N/A			
	15	0.0	0	0.0	1.1	20.1	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1023	30	0.0	0	0.0	1.1	20.1	0.0	0	0	N/A			
	45	0.0	0	0.0	1.1	20.1	0.0	0	0	N/A			
	60	0.0	0	0.0	1.1	20.1	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1023	120			0.0	1.1	20.1	0.0	0	0				
	180			0.0	1.1	20.1	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS109	Atmospheric Conditions	0.0	0	0.0	0.0	21.2	0.0	0	0	N/A	0.78	1.32	
Time: 12:50	0	0.0	0	0.0	0.5	19.5	0.0	0	0	N/A			
	15	0.0	0	0.0	4.3	3.9	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1022	30	0.0	0	0.0	4.4	3.8	0.0	0	0	N/A			
	45	0.0	0	0.0	4.4	3.7	0.0	0	0	N/A			
	60	0.0	0	0.0	4.4	3.8	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1022	120			0.0	4.4	3.8	0.0	0	0				
	180			0.0	4.4	3.8	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 430	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1010 - 1035 (falling)	Sunny / Dry	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	30m Black	Temperature range:	14 - 24°c		
Test Date:	13/06/2023	Operator:	OD	Rainfall:	0.0mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS110	Atmospheric Conditions	0.0	0	0.0	0.0	21.0	0.0	0	0	N/A	1.50	4.00	
Time: 11:20	0	0.0	0	0.0	0.0	19.8	0.0	0	0	N/A			
	15	0.0	0	0.0	1.6	1.8	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1023	30	0.0	0	0.0	1.6	1.7	0.0	0	0	N/A			
	45	0.0	0	0.0	1.6	1.7	0.0	0	0	N/A			
	60	0.0	0	0.0	1.6	1.7	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1023	120			0.0	1.6	1.7	0.0	0	0				
	180			0.0	1.6	1.7	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS111	Atmospheric Conditions	0.0	0	0.0	0.0	20.9	0.0	0	0	N/A	1.53	1.64	
Time: 10:30	0	0.0	0	0.4	0.0	20.1	0.0	0	0	N/A			
	15	0.0	0	0.0	0.6	13.7	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1023	30	0.0	0	0.0	0.5	13.9	0.0	0	0	N/A			
	45	0.0	0	0.0	0.5	13.9	0.0	0	0	N/A			
	60	0.0	0	0.0	0.5	13.9	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1023	120			0.0	0.4	13.9	0.0	0	0				
	180			0.0	0.4	13.9	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS112	Atmospheric Conditions	0.0	0	0.0	0.0	21.0	0.0	0	0	N/A	2.32	4.49	
Time: 10:00	0	0.0	0	0.0	0.0	20.2	0.0	0	5	N/A			
	15	0.0	0	0.0	3.2	8.5	0.0	0	25	N/A			
Atmospheric pressure (mb) before: 1023	30	0.0	0	0.0	3.2	8.3	0.0	0	25	N/A			
	45	0.0	0	0.0	3.2	8.3	0.0	0	25	N/A			
	60	0.0	0	0.0	3.2	8.3	0.0	0	25	N/A			
Atmospheric pressure (mb) after: 1023	120			0.0	3.2	8.3	0.0	0	20				
	180			0.0	3.2	8.3	0.0	0	20				
Well Condition: Good													
Well Diameter: 50mm													

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 430	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1010 - 1035 (falling)	Sunny / Dry	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	30m Black	Temperature range:	14 - 24°c		
Test Date:	13/06/2023	Operator:	OD	Rainfall:	0.0mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS113	Atmospheric Conditions	0.0	0	0.0	0.0	21.0	0.0	0	0	N/A	0.83	4.45	
Time: 13:50	0	0.0	0	0.0	0.0	20.5	0.0	0	0	N/A			
	15	0.0	0	0.0	2.0	13.3	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1020	30	0.0	0	0.0	2.0	13.3	0.0	0	0	N/A			
	45	0.0	0	0.0	2.0	13.2	0.0	0	0	N/A			
	60	0.0	0	0.0	2.0	13.2	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1020	120			0.0	2.0	13.2	0.0	0	0				
	180			0.0	2.0	13.2	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref:	Atmospheric Conditions												
Time:	0												
	15												
Atmospheric pressure (mb) before:	30												
	45												
	60												
Atmospheric pressure (mb) after:	120												
	180												
Well Condition:													
Well Diameter:													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref:	Atmospheric Conditions	0.0	0	0.0	0.0		0.0	0	0	N/A			
Time:	0	0.0	0	0.0	0.0		0.0	0	0	N/A			
	15									N/A			
Atmospheric pressure (mb) before:	30									N/A			
	45									N/A			
	60									N/A			
Atmospheric pressure (mb) after:	120												
	180												
Well Condition: Good													
Well Diameter: 50mm													

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 430	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1010 - 1035 (falling)	Sunny / Dry	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	30m Black	Temperature range:	14 - 24°c		
Test Date:	13/06/2023	Operator:	OD	Rainfall:	0.0mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: BH01	Atmospheric Conditions	0.0	0	0.0	0.0	21.2	0.0	0	0	N/A	1.71	18.57	
Time: 14:40	0	0.0	0	0.0	0.7	20.1	0.0	0	0	N/A			
	15	0.0	0	0.0	0.0	21.0	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1022	30	0.0	0	0.0	0.0	21.0	0.0	0	0	N/A			
	45	0.0	0	0.0	0.0	21.0	0.0	0	0	N/A			
	60	0.0	0	0.0	0.0	21.0	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1022	120			0.0	0.0	21.0	0.0	0	0				
	180			0.0	0.0	21.0	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: BH02	Atmospheric Conditions	0.0	0	0.0	0.0	20.9	0.0	0	0	N/A	3.17	24.14	
Time: 10:10	0	0.0	0	0.0	0.0	18.0	0.0	0	0	N/A			
	15	0.0	0	30.7	0.3	12.1	>>>.>	12	0	N/A			
Atmospheric pressure (mb) before: 1025	30	0.0	0	68.7	5.2	5.1	>>>.>	0	0	N/A			
	45	0.0	0	72.6	5.8	5.8	>>>.>	0	0	N/A			
	60	0.0	0	74.0	6.2	4.0	>>>.>	0	0	N/A			
Atmospheric pressure (mb) after: 1025	120			74.0	6.2	3.7	>>>.>	0	0				
	180			74.0	6.2	3.7	>>>.>	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: BH03A	Atmospheric Conditions	0.0	0	0.0	0.0	20.6	0.0	0	0	N/A	2.71	19.87	
Time: 12:40	0	0.0	0.0	0.0	0.0	20.0	0.0	0	0	N/A			
	15	0.0	0.0	21.4	1.2	14.8	>>>.>	0	0	N/A			
Atmospheric pressure (mb) before: 1022	30	0.0	0.0	21.8	1.2	14.8	>>>.>	0	0	N/A			
	45	0.0	0.0	22.9	1.2	14.8	>>>.>	0	0	N/A			
	60	0.0	0.0	23.2	1.2	14.8	>>>.>	0	0	N/A			
Atmospheric pressure (mb) after: 1022	120			23.2	1.2	14.8	>>>.>	0	0				
	180			22.8	1.2	14.9	>>>.>	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 430	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1010 - 1035 (falling)	Sunny / Dry	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	30m Black	Temperature range:	14 - 24°c		
Test Date:	13/06/2023	Operator:	OD	Rainfall:	0.0mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: BH04	Atmospheric Conditions	0.0	0	0.0	0.0	21.5	0.0	0	0	N/A	4.67	19.25	
Time: 11:50	0	0.0	0	0.0	0.0	20.5	0.0	0	0	N/A			
	15	0.0	0	0.0	0.3	20.7	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1023	30	0.0	0	0.0	0.2	20.8	0.0	0	0	N/A			
	45	0.0	0	0.0	0.2	20.8	0.0	0	0	N/A			
	60	0.0	0	0.0	0.2	20.8	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1023	120			0.0	0.2	20.8	0.0	0	0				
	180			0.0	0.2	20.8	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: BH103	Atmospheric Conditions	0.0	0	0.0	0.0	20.8	0.0	0	0	N/A	3.29	21.16	
Time: 11:00	0	0.0	0.0	0.0	0.1	20.6	0.0	0	0	N/A			
	15	0.0	0.0	0.0	0.1	20.6	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1023	30	0.0	0.0	0.0	0.1	20.6	0.0	0	0	N/A			
	45	0.0	0.0	0.0	0.1	20.6	0.0	0	0	N/A			
	60	0.0	0.0	0.0	0.1	20.6	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1023	120	0.0	0.0	0.0	0.1	20.6	0.0	0	0				
	180	0.0	0.0	0.0	0.1	20.6	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: BH104	Atmospheric Conditions	0.0	0	0.0	0.0	21.2	0.0	0	0	N/A	3.72	59.72	
Time: 12:10	0	0.0	0	0.0	0.0	20.9	0.0	0	0	N/A			
	15	0.0	0	0.0	0.1	20.9	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1023	30	0.0	0	0.0	0.1	20.9	0.0	0	0	N/A			
	45	0.0	0	0.0	0.1	20.9	0.0	0	0	N/A			
	60	0.0	0	0.0	0.1	20.9	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1023	120			0.0	0.1	20.9	0.0	0	0				
	180			0.0	0.1	20.9	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 430	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1010 - 1035 (falling)	Sunny / Dry	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	30m Black	Temperature range:	14 - 24°c		
Test Date:	13/06/2023	Operator:	OD	Rainfall:	0.0mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: BH105	Atmospheric Conditions	0.0	0	0.0	0.0	20.5	0.0	0	0	N/A	3.08	22.4	
Time: 10:40	0	0.0	0	0.0	0.0	19.0	0.0	0	0	N/A			
	15	0.0	0	54.6	8.7	5.0	>>>.>		650	N/A			
Atmospheric pressure (mb) before: 1023	30	0.0	0	54.6	8.7	5.0	>>>.>		670	N/A			
	45	0.0	0	54.6	8.5	5.1	>>>.>		680	N/A			
	60	0.0	0	54.7	8.5	5.2	>>>.>		710	N/A			
Atmospheric pressure (mb) after: 1023	120			54.7	8.5	5.3	>>>.>		720				
	180			54.4	8.5	5.3	>>>.>		730				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: BH106	Atmospheric Conditions	0.0	0	0.0	0.0	21.0	0.0	0	0	N/A	1.82	19.7	
Time: 09:15	0	1.3	10	0.0	0.0	20.4	0.0	0	0	N/A			
	15	0.1	1	0.0	0.0	20.4	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1031	30	0.1	1	0.0	0.0	20.4	0.0	0	0	N/A			
	45	0.0	0	0.0	0.0	20.4	0.0	0	0	N/A			
	60	0.0	0	0.0	0.0	20.4	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1031	120			0.0	0.0	20.4	0.0	0	0				
	180			0.0	0.0	20.4	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: BH107 (not tested)	Atmospheric Conditions												
Time:	0												
	15												
Atmospheric pressure (mb) before:	30												
	45												
	60												
Atmospheric pressure (mb) after:	120												
	180												
Well Condition: Good													
Well Diameter: 50mm													

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 430	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1010 - 1035 (falling)	Sunny / Dry	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	30m Black	Temperature range:	14 - 24°c		
Test Date:	13/06/2023	Operator:	OD	Rainfall:	0.0mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: BH108	Atmospheric Conditions	0.0	0	0.0	0.0	20.5	0.0	0	0	N/A	2.20	21.30	
Time: 09:25	0	0.0	0.0	0.0	0.1	20.5	0.0	0	0	N/A			
	15	0.0	0.0	0.0	0.1	20.5	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1030	30	0.0	0.0	0.0	0.1	20.5	0.0	0	0	N/A			
	45	0.0	0.0	0.0	0.1	20.5	0.0	0	0	N/A			
	60	0.0	0.0	0.0	0.1	20.5	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1030	120	0.0	0.0	0.0	0.1	20.5	0.0	0	0				
	180	0.0	0.0	0.0	0.1	20.5	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: BH110	Atmospheric Conditions	0.0	0	0.0	0.0	21.3	0.0	0	0	N/A	2.72	19.00	
Time: 13:35	0	0.0	0	0.0	0.0	20.9	0.0	0	0	N/A			
	15	0.0	0	0.0	0.2	21.0	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1022	30	0.0	0	0.0	0.1	21.0	0.0	0	0	N/A			
	45	0.0	0	0.0	0.1	21.0	0.0	0	0	N/A			
	60	0.0	0	0.0	0.1	21.0	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1022	120			0.0	0.1	21.0	0.0	0	0				
	180			0.0	0.1	21.0	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: BH111	Atmospheric Conditions	0.0	0	0.0	0.0	20.9	0.0	0	0	N/A	1.90	18.00	
Time: 15:10	0	0.0	0	0.0	0.0	19.8	0.0	0	0	N/A			
	15	0.0	0	9.1	0.9	15.7	>>>.>	0	0	N/A			
Atmospheric pressure (mb) before: 1021	30	0.0	0	8.5	0.9	16.0	>>>.>	0	0	N/A			
	45	0.0	0	8.4	0.8	16.1	>>>.>	0	0	N/A			
	60	0.0	0	8.4	0.8	16.2	>>>.>	0	0	N/A			
Atmospheric pressure (mb) after: 1021	120			8.4	0.8	16.2	>>>.>	0	0				
	180			8.4	0.8	16.3	>>>.>	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 430	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1010 - 1035 (falling)	Sunny / Dry	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	30m Black	Temperature range:	14 - 24°c		
Test Date:	13/06/2023	Operator:	OD	Rainfall:	0.0mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: BH112	Atmospheric Conditions	0.0	0	0.0	0.0	20.9	0.0	0	0	N/A	0.86	7.35	
Time: 15:20	0	0.0	0	0.2	0.0	20.1	0.0	0	0	N/A			
	15	0.0	0	0.0	2.0	15.7	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1023	30	0.0	0	0.0	2.0	16.1	0.0	0	0	N/A			
	45	0.0	0	0.0	1.0	16.5	0.0	0	0	N/A			
	60	0.0	0	0.0	1.6	16.5	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1023	120			0.0	1.7	16.5	0.0	0	0				
	180			0.0	1.7	16.5	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: BH113	Atmospheric Conditions	0.0	0	0.0	0.0	20.8	0.0	0	0	N/A	2.82	57.71	
Time: 13:15	0	0.0	0	0.0	0.0	20.4	0.0	0	0	N/A			
	15	0.0	0	0.0	0.0	20.4	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1022	30	0.0	0	0.0	0.0	20.5	0.0	0	0	N/A			
	45	0.0	0	0.0	0.0	20.5	0.0	0	0	N/A			
	60	0.0	0	0.0	0.0	20.5	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1022	120			0.0	0.0	20.5	0.0	0	0				
	180			0.0	0.0	20.5	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: BH115	Atmospheric Conditions	0.0	0	0.0	0.0	21.2	0.0	0	0	N/A	2.03	19.74	
Time: 14:20	0	0.0	0	0.0	0.0	20.7	0.0	0	0	N/A			
	15	0.0	0	0.0	0.1	20.8	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1022	30	0.0	0	0.0	0.0	20.8	0.0	0	0	N/A			
	45	0.0	0	0.0	0.0	20.9	0.0	0	0	N/A			
	60	0.0	0	0.0	0.0	20.9	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1022	120			0.0	0.0	20.9	0.0	0	0				
	180			0.0	0.0	20.9	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 430	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1010 - 1035 (falling)	Sunny / Dry	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	30m Black	Temperature range:	14 - 24°c		
Test Date:	13/06/2023	Operator:	OD	Rainfall:	0.0mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: BH116	Atmospheric Conditions	0.0	0	0.0	0.0	21.0	0.0	0	0	N/A	3.88	31.85	
Time: 11:10	0	0.0	0	0.0	0.0	20.9	0.0	0	0	N/A			
	15	0.0	0	0.0	0.1	20.9	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1022	30	0.0	0	0.0	0.0	20.9	0.0	0	0	N/A			
	45	0.0	0	0.0	0.0	20.9	0.0	0	0	N/A			
	60	0.0	0	0.0	0.0	20.9	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1022	120			0.0	0.0	20.9	0.0	0	0				
	180			0.0	0.0	20.9	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: BH117	Atmospheric Conditions	0.0	0	0.0	0.0	20.5	0.0	0	0	N/A	3.55	54.34	
Time: 09:35	0	0.0	0	0.0	0.0	20.3	0.0	0	0	N/A			
	15	0.0	0	0.0	0.1	20.3	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1029	30	0.0	0	0.0	0.2	20.3	0.0	0	0	N/A			
	45	0.0	0	0.0	0.1	20.3	0.0	0	0	N/A			
	60	0.0	0	0.0	0.1	20.3	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1029	120			0.0	0.1	20.3	0.0	0	0				
	180			0.0	0.1	20.3	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: BH119	Atmospheric Conditions	0.0	0	0.0	0.0	21.0	0.0	0	0	N/A	3.00	57.70	
Time: 14:50	0	0.0	0.0	0.0	0.0	20.0	0.0	0	0	N/A			
	15	0.0	0.0	0.0	1.2	17.9	0.0	0	0	N/A			
Atmospheric pressure (mb) before: 1022	30	0.0	0.0	0.0	1.3	17.8	0.0	0	0	N/A			
	45	0.0	0.0	0.0	1.3	17.5	0.0	0	0	N/A			
	60	0.0	0.0	0.0	1.3	17.5	0.0	0	0	N/A			
Atmospheric pressure (mb) after: 1022	120			0.0	1.7	16.5	0.0	0	0				
	180			0.0	1.7	16.0	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 430	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1010 - 1035 (falling)	Sunny / Dry	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	30m Black	Temperature range:	14 - 24°c		
Test Date:	13/06/2023	Operator:	OD	Rainfall:	0.0mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: BH120	Atmospheric Conditions	0.0	0	0.0	0.0	21.0	0.0	0	0	N/A	2.97	20.10	
Time: 13:00	0	0.0	0	0.0	0.0	20.5	0.0	0	0	N/A			
	15	0.0	0	0.9	1.3	15.6	22.9	0	0	N/A			
Atmospheric pressure (mb) before: 1021	30	0.0	0	0.9	1.1	18.0	17.2	0	0	N/A			
	45	0.0	0	0.8	1.0	18.9	12.4	0	0	N/A			
	60	0.0	0	0.7	0.9	19.4	9.9	0	0	N/A			
Atmospheric pressure (mb) after: 1021	120			0.3	0.7	19.4	3.3	0	0				
	180			0.0	0.5	19.4	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref:	Atmospheric Conditions												
Time:	0												
	15												
Atmospheric pressure (mb) before:	30												
	45												
	60												
Atmospheric pressure (mb) after:	120												
	180												
Well Condition:													
Well Diameter:													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref:	Atmospheric Conditions												
Time:	0												
	15												
Atmospheric pressure (mb) before:	30												
	45												
	60												
Atmospheric pressure (mb) after:	120												
	180												
Well Condition:													
Well Diameter:													

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 430	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1005 - 1020 (falling)	Wet; Overcast; Occasional Showers	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	15m Green	Temperature range:	13 - 18°c		
Test Date:	10/07/2023	Operator:	RK	Rainfall:	6.2mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: WS01	Atmospheric Conditions	0.0	0	0.0	0.0	21.2	0.0	0	0	0.0	Dry	2.45	
Time: 16:30	0	0.0	0	0.0	0.0	20.9	0.0	0	0	0.0			
	15	0.0	0	0.0	0.0	20.0	0.0	0	0	0.0			
Atmospheric pressure (mb) before: 1011	30	0.0	0	0.0	0.0	19.7	0.0	0	0	0.0			
	45	0.0	0	0.0	0.0	19.7	0.0	0	1	0.0			
	60	0.0	0	0.0	0.0	19.8	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1012	120			0.0	0.0	19.7	0.0	0	0				
	180			0.0	0.0	19.7	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: WS03	Atmospheric Conditions	0.0	0	0.0	0.0	21.1	0.0	0	0	0.0	Dry	2.36	
Time: 15:15	0	0.0	0	0.0	0.0	20.8	0.0	0	0	0.0			
	15	0.0	0	0.0	0.0	20.8	0.0	0	0	0.0			
Atmospheric pressure (mb) before: 1015	30	0.0	0	0.0	0.0	20.9	0.0	0	0	0.0			
	45	0.0	0	0.0	0.0	20.8	0.0	0	0	0.0			
	60	0.0	0	0.0	0.0	20.8	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1015	120			0.0	0.0	20.8	0.0	0	0	0.0			
	180			0.0	0.0	20.8	0.0	0	0	0.0			
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: WS06	Atmospheric Conditions	0.0	0	0.0	0.0	21.7	0.0	0	0	0.0	0.91	2.55	
Time: 12:10	0	0.0	0.0	0.0	0.0	20.4	0.0	0	0	0.0			
	15	0.0	0.0	0.0	0.0	20.0	0.0	0	0	0.0			
Atmospheric pressure (mb) before: 1014	30	0.0	0.0	0.0	0.0	20.0	0.0	0	0	0.0			
	45	0.0	0.0	0.0	0.0	20.0	0.0	0	0	0.0			
	60	0.0	0.0	0.0	0.0	20.0	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1013	120			0.0	0.0	20.0	0.0	0	0				
	180			0.0	0.0	20.1	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 430	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1005 - 1020 (falling)	Wet; Overcast; Occasional Showers	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	15m Green	Temperature range:	13 - 18°c		
Test Date:	10/07/2023	Operator:	RK	Rainfall:	6.2mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: WS07	Atmospheric Conditions	0.0	0	0.0	0.0	21.2	0.0	0	0	0.0	1.19	3.19	
Time: 12:25	0	0.0	0	0.0	0.0	20.4	0.0	0	0	0.0			
	15	0.0	0	0.0	5.0	8.1	0.0	0	0	0.1			
Atmospheric pressure (mb) before: 1013	30	0.1	1	0.0	5.1	6.1	0.0	0	0	0.1			
	45	0.0	0	0.0	5.2	5.9	0.0	0	0	0.1			
	60	0.0	0	0.0	5.2	5.8	0.0	0	0	0.1			
Atmospheric pressure (mb) after: 1013	120			0.0	5.3	5.8	0.0	0	0				
	180			0.0	5.3	5.8	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: WS10	Atmospheric Conditions	0.0	0	0.0	0.0	20.7	0.0	0	0	0.0	3.34	4.70	
Time: 13:55	0	0.0	0	0.0	0.0	20.1	0.0	0	0	0.0			
	15	0.0	0	0.0	2.1	10.5	0.0	0	0	0.1			
Atmospheric pressure (mb) before: 1013	30	0.0	0	0.0	2.1	9.5	0.0	0	0	0.1			
	45	0.0	0	0.0	2.1	9.5	0.0	0	0	0.1			
	60	0.0	0	0.0	2.1	9.3	0.0	0	0	0.1			
Atmospheric pressure (mb) after: 1013	120			0.0	2.1	9.1	0.0	0	0				
	180			0.0	2.2	9.0	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: WS11	Atmospheric Conditions	0.0	0	0.0	0.0	21.4	0.0	0	0	0.0	1.84	3.32	
Time: 15:00	0	0.0	0.0	0.0	0.1	20.8	0.0	0	0	0.0			
	15	0.0	0.0	0.0	0.1	20.5	0.0	0	0	0.0			
Atmospheric pressure (mb) before: 1014	30	0.0	0.0	0.0	0.2	20.4	0.0	0	0	0.0			
	45	0.0	0.0	0.0	0.4	20.3	0.0	0	0	0.0			
	60	0.0	0.0	0.0	0.5	20.2	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1013	120			0.0	0.8	19.9	0.0	0					
	180			0.0	0.9	19.8	0.0	0					
Well Condition: Good													
Well Diameter: 50mm													

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 430	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1005 - 1020 (falling)	Wet; Overcast; Occasional Showers	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	15m Green	Temperature range:	13 - 18°c		
Test Date:	10/07/2023	Operator:	RK	Rainfall:	6.2mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS101	Atmospheric Conditions	0.0	0	0.0	0.0	20.9	0.0	0	0	0.0	1.89	2.17	
Time: 14:45	0	0.0	0	0.0	0.0	20.3	0.0	0	0	0.0			
	15	0.0	0	0.0	0.6	20.2	0.0	0	0	0.0			
Atmospheric pressure (mb) before: 1015	30	0.0	0	0.0	0.8	20.0	0.0	0	0	0.1			
	45	0.0	0	0.0	0.8	20.1	0.0	0	0	0.0			
	60	0.0	0	0.0	0.8	20.0	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1015	120	0.0	0	0.0	0.9	19.9	0.0	0	0				
	180	0.0	0	0.0	1.0	19.9	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS102	Atmospheric Conditions	0.0	0	0.0	0.0	20.9	0.0	0	0	0.0	Dry	0.92	
Time: 14:10	0	0.9	7	0.0	0.0	20.2	0.0	0	0	0.0			
	15	0.0	0	0.0	0.8	0.9	0.0	0	0	0.0			
Atmospheric pressure (mb) before: 1014	30	0.0	0	0.0	0.8	12.1	0.0	0	0	0.0			
	45	0.0	0	0.0	0.7	12.6	0.0	0	0	0.0			
	60	0.0	0	0.0	0.7	13.4	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1015	120			0.0	0.5	14.5	0.0	0	0				
	180			0.0	0.5	14.9	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS103	Atmospheric Conditions	0.0	0	0.0	0.0	20.8	0.0	0	0	0.0	1.59	4.36	
Time: 14:20	0	2.8	3	0.0	0.0	20.2	0.0	0	0	0.0			
	15	0.0	0	0.0	0.0	19.2	0.0	0	0	0.1			
Atmospheric pressure (mb) before: 1015	30	0.0	0	0.0	0.0	19.0	0.0	0	0	0.2			
	45	0.0	0	0.0	0.0	19.0	0.0	0	0	0.3			
	60	0.0	0	0.0	0.0	19.0	0.0	0	0	0.3			
Atmospheric pressure (mb) after: 1014	120			0.0	0.0	18.9	0.0	0	0				
	180			0.0	0.0	18.9	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 430	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1005 - 1020 (falling)	Wet; Overcast; Occasional Showers	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	15m Green	Temperature range:	13 - 18°c		
Test Date:	10/07/2023	Operator:	RK	Rainfall:	6.2mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS104	Atmospheric Conditions	0.0	0	0.0	0.0	21.2	0.0	0	0	0.0	2.00	4.19	
Time: 09:20	0	0.0	0	0.0	0.0	20.7	0.0	0	0	0.1			
	15	0.0	0	0.0	1.2	18.0	0.0	0	0	0.1			
Atmospheric pressure (mb) before: 1015	30	0.0	0	0.0	1.2	17.4	0.0	0	1	0.1			
	45	0.0	0	0.0	1.2	17.2	0.0	0	0	0.0			
	60	0.0	0	0.0	1.2	17.1	0.0	0	1	0.0			
Atmospheric pressure (mb) after: 1014	120			0.0	1.2	17.0	0.0	0	0				
	180			0.0	1.2	17.0	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS105	Atmospheric Conditions	0.0	0	0.0	0.0	21.2	0.0	0	0	0.0	Dry	2.74	
Time: 09:45	0	0.0	0	0.0	0.0	20.3	0.0	0	0	0.1			
	15	0.0	0	0.0	0.5	10.4	0.0	0	0	0.3			
Atmospheric pressure (mb) before: 1015	30	0.0	0	0.0	0.5	8.5	0.0	0	0	0.3			
	45	0.0	0	0.0	0.5	8.2	0.0	0	0	0.3			
	60	0.0	0	0.0	0.5	8.1	0.0	0	0	0.3			
Atmospheric pressure (mb) after: 1014	120			0.0	0.5	8.0	0.0	0	0				
	180			0.0	0.5	8.0	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS106	Atmospheric Conditions	0.0	0	0.0	0.0	21.3	0.0	0	0	0.0	2.50	3.61	
Time: 09:00	0	0.0	0.0	0.0	0.2	20.4	0.0	0	0	0.0			
	15	0.0	0.0	0.0	0.8	19.5	0.0	0	0	0.0			
Atmospheric pressure (mb) before: 1015	30	0.0	0.0	0.0	0.8	19.2	0.0	0	0	0.0			
	45	0.0	0.0	0.0	0.8	19.2	0.0	0	0	0.0			
	60	0.0	0.0	0.0	0.8	19.2	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1015	120			0.0	0.9	19.1	0.0	0	0				
	180			0.0	0.9	19.1	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 430	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1005 - 1020 (falling)	Wet; Overcast; Occasional Showers	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	15m Green	Temperature range:	13 - 18°c		
Test Date:	10/07/2023	Operator:	RK	Rainfall:	6.2mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS107	Atmospheric Conditions	0.0	0	0.0	0.0	20.6	0.0	0	0	0.0	1.21	4.39	
Time: 11:30	0	0.0	0	0.0	0.0	20.1	0.0	0	0	0.0			
	15	0.0	0	0.0	2.4	17.9	0.0	0	0	0.0			
Atmospheric pressure (mb) before: 1014	30	0.0	0	0.0	2.4	17.5	0.0	0	0	0.0			
	45	0.0	0	0.0	2.5	17.4	0.0	0	0	0.0			
	60	0.0	0	0.0	2.5	17.3	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1014	120			0.0	2.6	17.3	0.0	0	0				
	180			0.0	2.6	17.3	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS108	Atmospheric Conditions	0.0	0	0.0	0.0	21.1	0.0	0	0	0.0	2.20	3.51	
Time: 11:25	0	0.0	0	0.0	0.0	20.4	0.0	0	0	0.1			
	15	0.0	0	0.0	2.9	18.2	0.0	0	0	0.1			
Atmospheric pressure (mb) before: 1015	30	0.0	0	0.0	2.9	18.0	0.0	0	0	0.2			
	45	0.0	0	0.0	2.9	17.9	0.0	0	0	0.1			
	60	0.0	0	0.0	3.0	17.8	0.0	0	0	0.1			
Atmospheric pressure (mb) after: 1015	120			0.0	3.2	17.7	0.0	0	0				
	180			0.0	3.3	17.6	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS109	Atmospheric Conditions	0.0	0	0.0	0.0	20.9	0.0	0	0	0.0	1.05	1.32	
Time: 10:50	0	0.0	0	0.0	0.0	20.2	0.0	0	0	0.1			
	15	0.0	0	0.0	0.0	9.6	0.0	0	0	0.2			
Atmospheric pressure (mb) before: 1014	30	0.0	0	0.0	0.0	7.1	0.0	0	1	0.2			
	45	0.0	0	0.0	0.0	6.8	0.0	0	0	0.2			
	60	0.0	0	0.0	0.0	6.7	0.0	0	0	0.2			
Atmospheric pressure (mb) after: 1014	120			0.0	0.0	6.7	0.0	0	0				
	180			0.0	0.0	6.7	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 430	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1005 - 1020 (falling)	Wet; Overcast; Occasional Showers	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	15m Green	Temperature range:	13 - 18°c		
Test Date:	10/07/2023	Operator:	RK	Rainfall:	6.2mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS110	Atmospheric Conditions	0.0	0	0.0	0.0	20.8	0.0	0	0	0.0	2.83	4.00	
Time: 13:20	0	0.2	2	0.0	0.0	20.2	0.0	0	0	0.0			
	15	0.0	0	0.0	1.5	4.0	0.0	0	0	0.1			
Atmospheric pressure (mb) before: 1013	30	0.7	3	0.0	1.5	0.6	0.0	0	0	0.2			
	45	0.0	0	0.0	1.6	0.2	0.0	0	0	0.2			
	60	0.0	0	0.0	1.6	0.2	0.0	0	0	0.2			
Atmospheric pressure (mb) after: 1013	120			0.0	1.6	0.2	0.0	0	0				
	180			0.0	1.6	0.3	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS111	Atmospheric Conditions	0.0	0	0.0	0.0	21	0.0	0	0	0.0	Dry	1.64	
Time: 12:40	0	0.0	0	0.0	0.0	20.2	0.0	0	0	0.0			
	15	0.0	0	0.0	0.0	16.4	0.0	0	0	0.0			
Atmospheric pressure (mb) before: 1013	30	0.0	0	0.0	0.0	16.3	0.0	0	0	0.0			
	45	0.0	0	0.0	0.0	16.1	0.0	0	0	0.0			
	60	0.0	0	0.0	0.0	16.0	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1014	120			0.0	0.0	15.9	0.0	0	0				
	180			0.0	0.0	16.0	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS112	Atmospheric Conditions	0.0	0	0.0	0.0	20.8	0.0	0	0	0.0	2.61	4.49	
Time: 13:00	0	0.7	3	0.0	0.0	20.1	0.0	0	0	0.0			
	15	0.0	0	0.0	2.2	10.5	0.0	0	0	0.1			
Atmospheric pressure (mb) before: 1013	30	0.0	0	0.0	2.1	8.9	0.0	0	0	0.0			
	45	0.1	1	0.0	2.2	8.6	0.0	0	0	0.0			
	60	0.0	0	0.0	2.2	8.5	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1013	120			0.0	2.2	8.4	0.0	0	0				
	180			0.0	2.2	8.3	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 430	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1005 - 1020 (falling)	Wet; Overcast; Occasional Showers	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	15m Green	Temperature range:	13 - 18°c		
Test Date:	10/07/2023	Operator:	RK	Rainfall:	6.2mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS113	Atmospheric Conditions	0.0	0	0.0	0.0	21.3	0.0	0	0	0.0	1.34	4.45	
Time: 11:55	0	2.2	2	0.0	0.0	20.9	0.0	0	0	0.0			
	15	0.0	0	0.0	0.9	19.1	0.0	0	0	0.0			
Atmospheric pressure (mb) before: 1014	30	0.0	0	0.0	0.9	18.8	0.0	0	0	0.1			
	45	0.0	0	0.0	0.9	18.7	0.0	0	0	0.2			
	60	0.0	0	0.0	0.9	18.6	0.0	0	0	0.1			
Atmospheric pressure (mb) after: 1014	120			0.0	0.9	18.6	0.0	0	0				
	180			0.0	0.9	18.5	0.0	0	0				
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref:	Atmospheric Conditions												
Time:	0												
	15												
Atmospheric pressure (mb) before:	30												
	45												
	60												
Atmospheric pressure (mb) after: 1015	120												
	180												
Well Condition:													
Well Diameter:													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref:	Atmospheric Conditions												
Time:	0												
	15												
Atmospheric pressure (mb) before:	30												
	45												
	60												
Atmospheric pressure (mb) after:	120												
	180												
Well Condition:													
Well Diameter:													

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 436	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1001 - 1011 (rising)	Wet; Overcast; Occasional Showers	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	30m Dual Phase / 100m Black	Temperature range:	12 - 19°c		
Test Date:	24/07/2023	Operator:	RK	Rainfall:	7.8mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: WS01	Atmospheric Conditions	0.0	0	0.0	0.0	20.7	0.0	0	0	0.0	Dry	2.45	Dual Phase Dipmeter = Intermittent = Water
Time: 16:40	0	0.0	0	0.0	0.0	20.1	0.0	0	0	0.0			
	15	0.0	0	0.0	0.0	20.0	0.0	0	0	0.0			
Atmospheric pressure (mb) before: 1009	30	0.0	0	0.0	0.1	20.0	0.0	0	0	0.0			
	45	0.0	0	0.0	0.1	20.0	0.0	0	0	0.0			
	60	0.0	0	0.0	0.1	20.0	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1010	120	0.0	0	0.0	0.0	19.9	0.0	0	0	0.0			
	180	0.0	0	0.0	0.0	19.9	0.0	0	0	0.0			
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: WS03	Atmospheric Conditions	0.0	0	0.0	0.0	20.7	0.0	0	0	0.0	Dry	2.35	Dual Phase Dipmeter = Intermittent = Water Silty sand at base.
Time: 12:55	0	0.0	0	0.0	0.0	20.2	0.0	0	0	0.0			
	15	0.0	0	0.0	2.3	18.4	0.0	0	0	0.0			
Atmospheric pressure (mb) before: 1008	30	0.0	0	0.0	2.4	18.1	0.0	0	0	0.0			
	45	0.0	0	0.0	2.4	18.0	0.0	0	0	0.0			
	60	0.0	0	0.0	2.4	18.0	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1007	120	0.0	0	0.0	2.4	18.0	0.0	0	0	0.0			
	180	0.0	0	0.0	2.4	18.1	0.0	0	0	0.0			
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: WS06	Atmospheric Conditions	0.0	0	0.0	0.0	20.7	0.0	0	0	0.0	0.8	2.55	Dual Phase Dipmeter = Intermittent = Water Standing water around borehole.
Time: 14:25	0	0.0	0.0	0.0	0.0	20.4	0.0	0	0	0.0			
	15	0.0	0.0	0.0	0.0	20.4	0.0	0	0	0.0			
Atmospheric pressure (mb) before: 1008	30	0.0	0.0	0.0	0.0	20.4	0.0	0	0	0.0			
	45	0.0	0.0	0.0	0.0	20.3	0.0	0	0	0.0			
	60	0.0	0.0	0.0	0.0	20.3	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1008	120	0.0	0.0	0.0	0.0	20.3	0.0	0	0	0.0			
	180	0.0	0.0	0.0	0.0	20.3	0.0	0	0	0.0			
Well Condition: Good													
Well Diameter: 50mm													

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 436	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1001 - 1011 (rising)	Wet; Overcast; Occasional Showers	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	30m Dual Phase / 100m Black	Temperature range:	12 - 19°c		
Test Date:	24/07/2023	Operator:	RK	Rainfall:	7.8mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: WS07	Atmospheric Conditions	0.0	0	0.0	0.0	20.3	0.0	0	0	0.0	0.93	3.19	Additional sample taken for dissolved methane testing. Dual Phase Dipmeter = Intermittent = Water
Time: 08:10	0	41.4	80	0.0	0.0	20.2	0.0	0	0	0.0			
	15	8.7	54	1.3	8.0	1.8	0.0	0	0	0.1			
Atmospheric pressure (mb) before: 1007	30	3.4	19	1.8	8.4	0.4	0.0	0	0	0.0			
	45	0.9	5	1.9	8.5	0.2	0.0	0	0	0.0			
	60	0.0	0	1.9	8.5	0.1	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1007	120	0.1	0	1.9	8.5	0.1	0.0	0	0	0.0			
	180	0.1	0	1.9	8.5	0.0	0.0	0	0	0.0			
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: WS10	Atmospheric Conditions	0.0	0	0.0	0.0	20.4	0.0	0	0	0.0	3.29	4.69	Dual Phase Dipmeter = Intermittent = Water
Time: 12:00	0	0.1	0	0.0	0.0	20.2	0.0	0	0	0.1			
	15	0.0	0	0.0	0.9	18.0	0.0	0	0	0.0			
Atmospheric pressure (mb) before: 1008	30	0.1	0	0.0	0.9	17.5	0.0	0	0	0.0			
	45	0.0	0	0.0	0.9	17.4	0.0	0	0	0.0			
	60	0.0	0	0.0	0.9	17.4	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1008	120	0.0	0	0.0	0.9	17.3	0.0	0	0	0.0			
	180	0.0	0	0.0	0.9	17.4	0.0	0	0	0.0			
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: WS11	Atmospheric Conditions	0.0	0	0.0	0.0	20.7	0.0	0	0	0.0	1.95	3.3	Dual Phase Dipmeter = Intermittent = Water
Time: 13:25	0	0.0	0.0	0.0	0.0	20.6	0.0	0	0	0.0			
	15	0.0	0.0	0.0	0.0	20.4	0.0	0	0	0.0			
Atmospheric pressure (mb) before: 1008	30	0.0	0.0	0.0	0.0	20.4	0.0	0	0	0.0			
	45	0.0	0.0	0.0	0.1	20.2	0.0	0	0	0.0			
	60	0.0	0.0	0.0	0.0	20.2	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1009	120	0.0	0.0	0.0	0.1	20.2	0.0	0	0	0.0			
	180	0.0	0.0	0.0	0.0	20.3	0.0	0	0	0.0			
Well Condition: Good													
Well Diameter: 50mm													

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 436	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1001 - 1011 (rising)	Wet; Overcast; Occasional Showers	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	30m Dual Phase / 100m Black	Temperature range:	12 - 19°c		
Test Date:	24/07/2023	Operator:	RK	Rainfall:	7.8mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS101	Atmospheric Conditions	0.0	0	0.0	0.0	20.6	0.0	0	0	0.0	1.9	2.17	Dual Phase Dipmeter = Intermittent = Water
Time: 12:30	0	0.0	0	0.0	0.0	20.4	0.0	0	0	0.0			
	15	0.0	0	0.0	0.0	20.2	0.0	0	0	0.0			
Atmospheric pressure (mb) before: 1008	30	0.0	0	0.0	0.0	20.2	0.0	0	0	0.0			
	45	0.0	0	0.0	0.1	20.0	0.0	0	0	0.0			
	60	0.0	0	0.0	0.1	20.1	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1008	120	0.0	0	0.0	0.0	20.1	0.0	0	0	0.0			
	180	0.0	0	0.0	0.1	20.1	0.0	0	0	0.0			
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS102	Atmospheric Conditions	0.0	0	0.0	0.0	20.7	0.0	0	0	0.0	Dry	0.92	Dual Phase Dipmeter = Intermittent = Water
Time: 14:50	0	0.1	1	0.0	0.1	20.1	0.0	0	0	0.1			
	15	0.0	0	0.0	1.3	5.2	0.0	0	0	0.0			
Atmospheric pressure (mb) before: 1009	30	0.0	0	0.0	1.1	5.4	0.0	0	0	0.0			
	45	0.1	0	0.0	1.0	6.2	0.0	0	0	0.1			
	60	0.0	0	0.0	0.9	8.1	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1009	120	0.0	0	0.0	0.8	11.2	0.0	0	0	0.0			
	180	0.0	0	0.0	0.7	11.6	0.0	0	0	0.0			
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS103	Atmospheric Conditions	0.0	0	0.0	0.0	20.8	0.0	0	0	0.0	1.21	4.36	Dual Phase Dipmeter = Intermittent = Water
Time: 14:35	0	0.0	0	0.0	0.0	20.2	0.0	0	0	0.1			
	15	0.0	0	0.0	0.0	3.5	0.0	0	0	0.0			
Atmospheric pressure (mb) before: 1009	30	0.0	0	0.0	0.0	2.6	0.0	0	0	0.0			
	45	0.0	0	0.0	0.0	3.1	0.0	0	0	0.1			
	60	0.0	0	0.0	0.0	5.2	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1009	120	0.0	0	0.0	0.0	2.8	0.0	0	0	0.0			
	180	0.0	0	0.0	0.0	8.2	0.0	0	0	0.0			
Well Condition: Good													
Well Diameter: 50mm													

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 436	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1001 - 1011 (rising)	Wet; Overcast; Occasional Showers	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	30m Dual Phase / 100m Black	Temperature range:	12 - 19°c		
Test Date:	24/07/2023	Operator:	RK	Rainfall:	7.8mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS104	Atmospheric Conditions	0.0	0	0.0	0.0	20.5	0.0	0	0	0.0	1.88	4.20	Dual Phase Dipmeter = Intermittent = Water
Time: 10:30	0	0.1	0	0.0	0.0	20.4	0.0	0	0	0.0			
	15	0.0	0	0.0	1.7	16.2	0.0	0	0	0.1			
Atmospheric pressure (mb) before: 1008	30	0.0	0	0.0	1.8	15.1	0.0	0	0	0.0			
	45	0.0	0	0.0	1.9	14.9	0.0	0	0	0.0			
	60	0.0	0	0.0	1.9	14.7	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1008	120	0.0	0	0.0	2.3	13.3	0.0	0	0	0.1			
	180	0.0	0	0.0	2.5	12.7	0.0	0	0	0.0			
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS105	Atmospheric Conditions	0.0	0	0.0	0.0	20.7	0.0	0	0	0.0	Dry	2.74	Dual Phase Dipmeter = Intermittent = Water Silt at base.
Time: 10:05	0	3.8	20	0.0	0.0	20.4	0.0	0	0	0.0			
	15	0.0	0	0.0	0.7	11.4	0.0	0	0	0.0			
Atmospheric pressure (mb) before: 1007	30	0.0	0	0.0	0.7	10.7	0.0	0	0	0.0			
	45	0.0	0	0.0	0.7	10.4	0.0	0	0	0.0			
	60	0.0	0	0.0	0.8	10.1	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1008	120	0.0	0	0.0	0.8	9.9	0.0	0	0	0.0			
	180	0.0	0	0.0	0.8	9.8	0.0	0	0	0.0			
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS106	Atmospheric Conditions	0.0	0	0.0	0.0	20.5	0.0	0	0	0.0	2.54	3.61	Dual Phase Dipmeter = Intermittent = Water
Time: 11:00	0	2.1	15.0	0.0	0.0	20.2	0.0	0	0	0.0			
	15	0.0	0.0	0.0	1.9	4.8	0.0	0	0	0.0			
Atmospheric pressure (mb) before: 1009	30	0.0	0.0	0.0	2.0	3.6	0.0	0	0	0.1			
	45	0.0	0.0	0.0	2.2	3.2	0.0	0	0	0.0			
	60	0.0	0.0	0.0	2.1	3.0	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1010	120	0.0	0.0	0.0	2.1	3.2	0.0	0	0	0.0			
	180	0.0	0.0	0.0	2.0	3.4	0.0	0	0	0.0			
Well Condition: Good													
Well Diameter: 50mm													

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 436	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1001 - 1011 (rising)	Wet; Overcast; Occasional Showers	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	30m Dual Phase / 100m Black	Temperature range:	12 - 19°c		
Test Date:	24/07/2023	Operator:	RK	Rainfall:	7.8mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS107	Atmospheric Conditions	0.0	0	0.0	0.0	20.4	0.0	0	0	0.0	1.01	4.39	Dual Phase Dipmeter = Intermittent = Water
Time: 09:10	0	0.4	3	0.0	0.0	20.2	0.0	0	0	0.0			
	15	0.0	0	0.0	4.2	15.3	0.0	0	0	0.0			
Atmospheric pressure (mb) before: 1007	30	0.0	0	0.0	4.4	14.3	0.0	0	0	0.0			
	45	0.0	0	0.0	4.4	14.1	0.0	0	0	0.0			
	60	0.0	0	0.0	4.5	14.0	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1007	120	0.0	0	0.0	4.5	13.9	0.0	0	0	0.0			
	180	0.0	0	0.0	4.6	13.8	0.0	0	0	0.0			
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS108	Atmospheric Conditions	0.0	0	0.0	0.0	20.6	0.0	0	0	0.0	2.31	3.51	Dual Phase Dipmeter = Intermittent = Water
Time: 13:10	0	0.0	0	0.0	0.0	20.2	0.0	0	0	0.0			
	15	0.0	0	0.0	4.1	16.2	0.0	0	0	0.1			
Atmospheric pressure (mb) before: 1008	30	0.0	0	0.0	4.3	15.7	0.0	0	0	0.2			
	45	0.0	0	0.0	4.4	15.7	0.0	0	0	0.2			
	60	0.0	0	0.0	4.5	15.5	0.0	0	0	0.2			
Atmospheric pressure (mb) after: 1008	120	0.0	0	0.0	4.7	15.2	0.0	0	0	0.1			
	180	0.0	0	0.0	4.7	15.1	0.0	0	0	0.1			
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS109	Atmospheric Conditions	0.0	0	0.0	0.1	20.5	0.0	0	0	0.0	0.93	1.38	Dual Phase Dipmeter = Intermittent = Water Silty sand at base.
Time: 09:30	0	0.0	0	0.0	0.0	18.0	0.0	0	0	0.0			
	15	0.0	0	0.0	4.1	12.9	0.0	0	0	0.1			
Atmospheric pressure (mb) before: 1008	30	0.0	0	0.0	4.4	11.9	0.0	0	0	0.0			
	45	0.0	0	0.0	4.5	11.6	0.0	0	0	0.1			
	60	0.0	0	0.0	5.0	10.1	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1008	120	0.0	0	0.0	5.5	9.5	0.0	0	0	0.0			
	180	0.0	0	0.0	5.8	9.2	0.0	0	0	0.0			
Well Condition: Good													
Well Diameter: 50mm													

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 436	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1001 - 1011 (rising)	Wet; Overcast; Occasional Showers	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	30m Dual Phase / 100m Black	Temperature range:	12 - 19°c		
Test Date:	24/07/2023	Operator:	RK	Rainfall:	7.8mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS110	Atmospheric Conditions	0.0	0	0.0	0.0	20.4	0.0	0	0	0.0	1.86	4.00	Dual Phase Dipmeter = Intermittent = Water
Time: 12:15	0	0.5	5	0.0	0.0	19.9	0.0	0	0	0.0			
	15	0.0	0	0.0	2.0	3.1	0.0	0	0	0.0			
Atmospheric pressure (mb) before: 1009	30	0.1	0	0.0	2.1	1.7	0.0	0	0	0.0			
	45	0.0	0	0.0	2.1	1.3	0.0	0	0	0.0			
	60	0.0	0	0.0	2.1	1.1	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1008	120	0.0	0	0.0	2.1	0.7	0.0	0	0	0.1			
	180	0.0	0	0.0	2.1	0.5	0.0	0	0	0.0			
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS111	Atmospheric Conditions	0.0	0	0.0	0.1	20.6	0.0	0	0	0.0	Dry	1.64	Dual Phase Dipmeter = Intermittent = Water
Time: 14:10	0	0.0	0	0.0	0.1	20.1	0.0	0	0	0.0			
	15	0.0	0	0.0	0.4	17.5	0.0	0	0	0.0			
Atmospheric pressure (mb) before: 1008	30	0.0	0	0.0	0.4	16.0	0.0	0	0	0.1			
	45	0.0	0	0.0	0.5	15.6	0.0	0	0	0.0			
	60	0.0	0	0.0	0.5	15.1	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1010	120	0.0	0	0.0	0.5	15.2	0.0	0	0	0.0			
	180	0.0	0	0.0	0.5	15.2	0.0	0	0	0.0			
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS112	Atmospheric Conditions	0.0	0	0.0	0.0	20.4	0.0	0	0	0.0	2.69	4.49	Dual Phase Dipmeter = Intermittent below 2.75m = Water and Solid between 2.61m and 2.75m = Product.
Time: 11:35	0	-0.6	-3	0.0	0.0	20.1	0.0	0	0	0.0			
	15	0.0	0	0.0	3.6	3.0	0.0	0	0	0.0			
Atmospheric pressure (mb) before: 1009	30	0.0	0	0.0	3.8	1.8	0.0	0	0	0.1			
	45	0.0	0	0.0	3.8	1.4	0.0	0	0	0.0			
	60	0.0	0	0.0	3.9	1.2	0.0	0	0	0.1			
Atmospheric pressure (mb) after: 1008	120	0.0	0	0.0	3.9	1.1	0.0	0	0	0.0			
	180	0.0	0	0.0	3.9	1.0	0.0	0	0	0.0			
Well Condition: Good													
Well Diameter: 50mm													

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 436	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1001 - 1011 (rising)	Wet; Overcast; Occasional Showers	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	30m Dual Phase / 100m Black	Temperature range:	12 - 19°c		
Test Date:	24/07/2023	Operator:	RK	Rainfall:	7.8mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: DS113	Atmospheric Conditions	0.0	0	0.0	0.0	20.5	0.0	0	0	0.0	1.16	4.45	Dual Phase Dipmeter = Intermittent = Water
Time: 08:50	0	2.4	16	0.0	0.0	20.0	0.0	0	0	0.0			
	15	0.4	2	0.0	3.4	12.4	0.0	0	0	0.0			
Atmospheric pressure (mb) before: 1007	30	0.2	1	0.0	3.8	10.0	0.0	0	0	0.0			
	45	0.4	2	0.0	3.8	9.8	0.0	0	0	0.0			
	60	0.2	1	0.0	3.8	9.7	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1007	120	0.2	1	0.0	3.8	9.7	0.0	0	0	0.0			
	180	0.4	2	0.0	3.8	9.7	0.0	0	0	0.0			
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: BH02	Atmospheric Conditions	0.0	0	0.0	0.0	20.6	0.0	0	0	0.0	3.40	24.14	Additional sample taken for dissolved methane testing. Dual Phase Dipmeter = Intermittent = Water
Time: 12:45	0	0.0	0	0.0	0.0	19.8	0.0	0	0	0.1			
	15	0.0	0	67.0	4.5	6.0	>>>.>	0	100	0.1			
Atmospheric pressure (mb) before: 1008	30	0.1	1	67.4	4.7	5.8	>>>.>	0	120	0.3			
	45	0.0	0	67.0	4.6	5.5	>>>.>	0	160	0.3			
	60	0.0	0	61.4	4.2	6.4	>>>.>	0	210	0.3			
Atmospheric pressure (mb) after: 1008	120	0.0	0	55.1	3.9	7.4	>>>.>	0	220	0.3			
	180	0.0	0	47.9	3.4	9.3	>>>.>	0	200	0.3			
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: BH03A	Atmospheric Conditions	0.0	0	0.0	0.0	20.4	0.0	0	0	0.0	2.94	19.87	Additional sample taken for dissolved methane testing. Dual Phase Dipmeter = Intermittent = Water
Time: 09:45	0	4.7	25	0.0	0.1	20.3	0.0	0	0	0.1			
	15	0.5	2	34.4	2.4	11.4	>>>.>	0	0	0.1			
Atmospheric pressure (mb) before: 1008	30	0.0	0	38.7	2.4	10.6	>>>.>	0	0	0.1			
	45	0.0	0	40.0	2.4	10.4	>>>.>	0	0	0.1			
	60	0.0	0	40.2	2.4	10.2	>>>.>	0	0	0.0			
Atmospheric pressure (mb) after: 1008	120	0.0	0	40.4	2.5	10.1	>>>.>	0	0	0.1			
	180	0.0	0	40.4	2.5	10.1	>>>.>	0	0	0.0			
Well Condition: Good													
Well Diameter: 50mm													

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 436	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1001 - 1011 (rising)	Wet; Overcast; Occasional Showers	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	30m Dual Phase / 100m Black	Temperature range:	12 - 19°c		
Test Date:	24/07/2023	Operator:	RK	Rainfall:	7.8mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: BH105	Atmospheric Conditions	0.0	0	0.0	0.0	20.7	0.0	0	0	0.0	3.28	22.4	Additional sample taken for dissolved methane testing. Dual Phase Dipmeter = Intermittent = Water
Time: 16:00	0	1.5	10	0.0	0.0	20.1	0.0	0	0	0.0			
	15	0.0	0	18.3	3.4	15.5	>>>.>	0	0	0.1			
Atmospheric pressure (mb) before: 1008	30	0.0	0	20.1	3.5	14.7	>>>.>	0	0	0.0			
	45	0.0	0	19.5	3.4	14.9	>>>.>	0	0	0.0			
	60	0.0	0	19.4	3.3	14.8	>>>.>	0	0	0.1			
Atmospheric pressure (mb) after: 1009	120	0.0	0	19.1	3.3	14.8	>>>.>	0	0	0.0			
	180	0.0	0	18.8	3.2	15.0	>>>.>	0	0	0.0			
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: BH107	Atmospheric Conditions	0.0	0	0.0	0.0	20.8	0.0	0	0	0.0	3.64	21.23	Dual Phase Dipmeter = Intermittent = Water
Time: 15:30	0	0.0	0	0.0	0.1	20.6	0.0	0	0	0.1			
	15	0.0	0	0.0	0.4	20.3	0.0	0	0	0.0			
Atmospheric pressure (mb) before: 1008	30	0.0	0	0.0	0.4	20.3	0.0	0	0	0.0			
	45	0.0	0	0.0	0.2	20.6	0.0	0	0	0.0			
	60	0.0	0	0.0	0.2	20.6	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1009	120	0.0	0	0.0	0.2	20.6	0.0	0	0	0.0			
	180	0.0	0	0.0	0.2	20.6	0.0	0	0	0.0			
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: BH111	Atmospheric Conditions	0.0	0	0.0	0.0	20.6	0.0	0	0	0.0	2.23	18.00	Additional sample taken for dissolved methane testing. Dual Phase Dipmeter = Intermittent = Water
Time: 08:30	0	0.0	0.0	0.0	0.0	20.4	0.0	0	0	0.1			
	15	0.0	0.0	1.5	0.7	18.4	31.2	0	0	0.1			
Atmospheric pressure (mb) before: 1007	30	0.0	0.0	1.5	0.7	18.3	34.7	0	0	0.0			
	45	0.0	0.0	1.3	0.6	18.5	30.5	0	0	0.0			
	60	0.0	0.0	0.5	0.5	19.3	9.4	0	0	0.1			
Atmospheric pressure (mb) after: 1007	120	0.0	0.0	0.4	0.5	19.3	9.1	0	0	0.1			
	180	0.0	0.0	0.3	0.4	19.3	6.2	0	0	0.0			
Well Condition: Good													
Well Diameter: 50mm													

Ground Gas Monitoring Results

Project:	Production Facility	Gas analyser:	GFM 436	Preceding Weather Conditions		On-site weather conditions	General Site Conditions / Ground Conditions / On-site Activities
Project Number:	2111006.005	Condition:	Calibrated	Atmospheric trend:	1001 - 1011 (rising)	Wet; Overcast; Occasional Showers	Partially Overgrown / Derelict Site
Location:	Port Talbot	Dip meter:	30m Dual Phase / 100m Black	Temperature range:	12 - 19°c		
Test Date:	24/07/2023	Operator:	RK	Rainfall:	7.8mm		

GAS MONITORING TO BE UNDERTAKEN IN ACCORDANCE WITH TEC METHOD STATEMENT

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: BH112	Atmospheric Conditions	0.0	0	0.0	0.0	20.4	0.0	0	0	0.0	0.99	7.40	Additional sample taken for dissolved methane testing (elevated levels recorded in 1st monitoring round). Dual Phase Dipmeter = Intermittent = Water Silt at base.
Time: 08:20	0	0.0	0	0.0	0.0	20.1	0.0	0	0	0.0			
	15	0.0	0	0.0	0.5	19.8	0.0	0	0	0.0			
Atmospheric pressure (mb) before: 1009	30	0.0	0	0.0	0.7	19.3	0.0	0	0	0.0			
	45	0.0	0	0.0	0.8	19.1	0.0	0	0	0.0			
	60	0.0	0	0.0	0.8	19.1	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1009	120	0.0	0	0.0	0.9	18.9	0.0	0	0	0.0			
	180	0.0	0	0.0	0.9	18.9	0.0	0	0	0.0			
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref: BH120	Atmospheric Conditions	0.0	0	0.0	0.0	20.7	0.0	0	0	0.0	3.22	20.10	Additional sample taken for dissolved methane testing (elevated levels recorded in 1st monitoring round). Dual Phase Dipmeter = Intermittent = Water
Time: 15:15	0	0.0	0	0.0	0.0	20.4	0.0	0	0	0.0			
	15	0.0	0	0.0	0.3	20.2	0.0	0	0	0.0			
Atmospheric pressure (mb) before: 1009	30	0.0	0	0.0	0.3	20.2	0.0	0	0	0.0			
	45	0.0	0	0.0	0.2	20.3	0.0	0	0	0.0			
	60	0.0	0	0.0	0.2	20.3	0.0	0	0	0.0			
Atmospheric pressure (mb) after: 1009	120	0.0	0	0.0	0.2	20.4	0.0	0	0	0.0			
	180	0.0	0	0.0	0.2	20.4	0.0	0	0	0.0			
Well Condition: Good													
Well Diameter: 50mm													

Borehole Information	Time (s)	Borehole Flow Rate (l/hr)	DP (Pa)	Gas Concentrations							Groundwater Level (mbgl)	Borehole Depth (mbgl)	Comments
				CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	LEL (%)	CO (ppm)	H2S (ppm)	VOC (ppm)			
BH ref:	Atmospheric Conditions												
Time:	0												
	15												
Atmospheric pressure (mb) before:	30												
	45												
	60												
Atmospheric pressure (mb) after:	120												
	180												
Well Condition:													
Well Diameter:													

Appendix H

Geophysical Survey Report -
Cross-Hole Seismic Survey and Soil Resistivity Testing

GEOPHYSICAL SURVEY REPORT

Project

Cross-hole seismic survey and soil resistivity testing

Location

Phoenix Wharf, Port Talbot

Client

TEC

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TERRA DAT
down to earth **geophysics**

Job reference:	7897
Date:	May 2023
Version:	1

GEOPHYSICAL SURVEY REPORT

Project

Cross-hole seismic survey and soil resistivity testing

Location

Phoenix Wharf, Port Talbot

Client

TEC

Project Geophysicist:	J Thomas PhD BSc FGS	
Reviewer:	S Hughes PhD BSc FGS	
Job Reference:	7897	
Date:	June 2023	

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1 EXECUTIVE SUMMARY

A cross-hole (P-wave and S_v-wave) seismic and soil resistivity survey was carried out as part of the enhanced feasibility study for a proposed new facility at Phoenix Warf, Port Talbot. The survey work was commissioned by TEC and took place between the 30th and 31st of May, 2023. The seismic element aimed to measure the P-wave and S_v-wave velocities between a set of boreholes to provide ground strength information, while the soil resistivity testing would provide information on the electrical properties of the sub-surface.

The cross-hole survey was based on a series of three inline boreholes approximately 5m apart and was carried out in accordance with ASTM D4428/D4428M-14 "Standard Test Methods for Cross-hole Seismic Testing" and utilised both P and S_v-waves. A total of ten soil resistivity tests were undertaken based on IEEE81-2012 and utilised the Wenner electrode array with 'a' spacings of 0.3, 0.9, 1.5, 3.0, 4.5, 6.1, 9.1, 15.2, 21.3, 27.4, 33.5, 39.6 and 45.7 m.

The combined P and S_v-wave seismic cross-hole surveys have provided seismic velocity information from the surface to a depth of 30 m below ground level. The resulting P and Sv-wave velocity profiles are very consistent between both clusters, and the overall range of P-wave (~200 to 3500 m/s) and Sv-wave (~100 to 700 m/s) velocities would suggest soft to moderately dense and stiff sediments, overlying weak to competent mudstone rock material. The most notable observations are the local velocity variations within the superficial deposits, particularly within the alluvium, and the sharp increase in velocity towards the base of the boreholes, which correlates with the transition into the mudstone bedrock.

The derived Poisson's ratio and elastic moduli (Shear (G), Young's (E) and Bulk (K)) appear to be relatively consistent with the modelled velocities and lithologies encountered at the site.

The apparent resistivity profiles are reasonably consistent and appear to show a near-surface band of high resistivity values (~110 ohm.m) that decreases to around ~5 ohm.m at around 5m deep. Beyond the 5 m depth range, the resistivity is relatively steady and suggests a gradual increase to around 15 ohm.m at depth. When comparing each test location, there is a wide spread of values for the smaller 'a' spacing, which reflects the variation in near-surface made ground/gravel layer. Below 8 m, the profiles are very similar; however, one set of readings exhibits slightly elevated values. It is uncertain if this is more representative of the local geology or is subject to some form of interference from buried structures.

2 INTRODUCTION

This report describes a cross-hole (P-wave and S_v-wave) seismic and soil resistivity survey that was carried out as part of the enhanced feasibility study for a proposed new facility at Phoenix Wharf, Port Talbot. The survey work was commissioned by TEC and took place between the 30th and 31st of May, 2023. The seismic element aimed to measure the P-wave and S_v-wave velocities between a set of boreholes to provide ground strength information, while the soil resistivity testing would provide information on the electrical properties of the sub-surface.

2.1 Site Description and Geology

The site lies adjacent to Phoenix Wharf Road, which forms part of the wider Port Talbot dockland area. The survey area is centred on OSGB 276412E, 188679N and consists of a relatively open area which is generally overgrown with a central hardstanding area (Plate 1).

Plate 1: *General location of the survey area (red outline) within the Phoenix Warf site.*

Based on the online British Geological Survey (BGS) geology viewer, the underlying bedrock geology consists of mudstone, siltstone and sandstone from the South Wales Middle Coal Measures Formation. The superficial deposits consist of clays, muds and silts from the Tidal Flat Deposits.

2.2 Survey objectives

The specific objectives of the survey are as follows:

- Determine the P and S_v-wave velocity structure.
- Calculate Poisson's ratio and elastic moduli (Shear (G), Young's (E) and Bulk (K)).
- Provide soil resistivity measurements.

2.3 Survey design

The cross-hole survey was carried out in accordance with ASTM D4428/D4428M-14 "Standard Test Methods for Cross-hole Seismic Testing" and utilised both P and S_v-waves.

The cross-hole testing was based on two separate borehole clusters, each cluster comprising 2 to 3 boreholes and extending down to a depth of up to 30 m (Figure 1). The configuration and coordinates for each borehole setup can be seen in Table 1 and Plate 3.

The survey design for the soil resistivity testing was specified in the tender documentation and based on IEEE81-2012 and utilised the Wenner electrode array with 'a' spacings of 0.3, 0.9, 1.5, 3.0, 4.5, 6.1, 9.1, 15.2, 21.3, 27.4, 33.5, 39.6 and 45.7 m. There were a total of 5 test locations (Plate 2), each with a set of perpendicular survey lines.

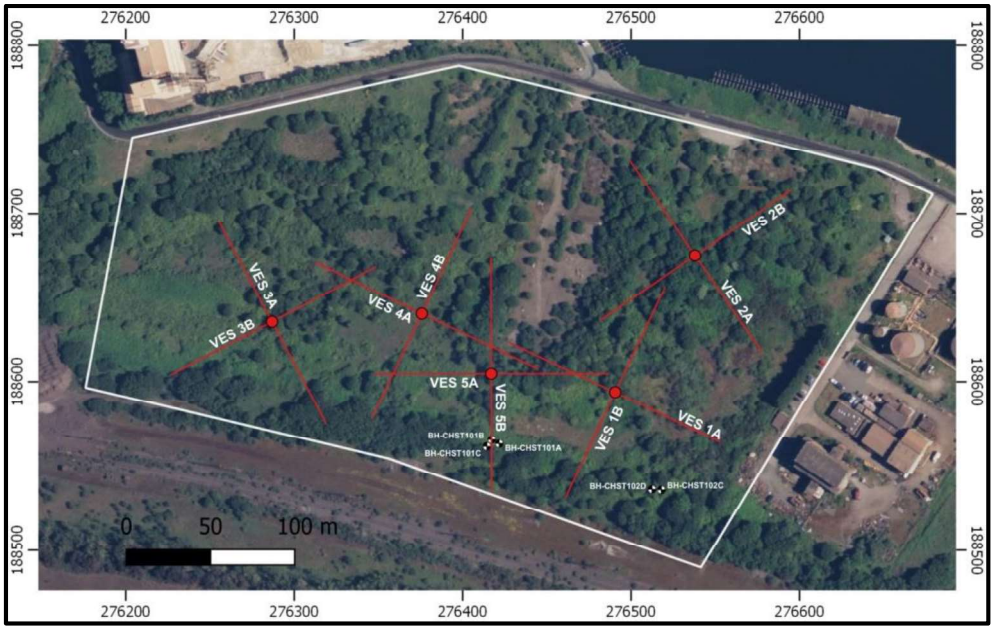


Plate 2: *Survey area layout.*

To derive the detailed elastic moduli parameters, density information was provided by European Geophysical Services (EGS).

2.4 Quality control

The geophysical data set was collected in line with normal operating procedures as outlined by the instrument manufacturer and TerraDat company policy. On completion of the survey, the data were downloaded from the survey instrument onto a computer and backed up appropriately. The acquired data set was initially checked for errors that may be caused by instrument noise, low batteries, positional discrepancies, etc. Field notes are either written up or incorporated in the initial data processing stage. The data set is then processed using the standard processing routines, and once completed, the resulting plots are subject to peer review to ensure the integrity of the interpretation. TerraDat's quality control standards are BS EN ISO 9001:2015 certified.

3 SURVEY DESCRIPTION

The Geophysical survey may be considered as two separate elements as described below:

- Cross-hole seismic survey (P-wave and S_v-wave)
- Soil resistivity testing

3.1 Survey layout and topographic survey

A Topcon Network RTK dGPS system was used to survey the borehole positions utilised for the seismic testing, and they were transformed to National Grid (OSTN02) using the Topcon network correction. A suitable local datum level (0 m Local Datum) was established for each cluster before commencing the seismic survey to enable consistent positioning of the source and receivers within the borehole (Table 1).

Cluster	id	Eastings	Northings	Ground level (m OD)	Local Datum (m OD)
1	BH-CHST101A	276421.75	188563.16	8.48	8.99
1	BH-CHST101B	276417.28	188565.75	8.42	8.99
1	BH-CHST101C	276414.23	188561.61	8.21	8.99
2	BH-CHST102C	276518.03	188535.95	7.95	8.44
2	BH-CHST102D	276512.46	188536.23	7.93	8.44

Table 1: *Borehole coordinates used for the seismic processing*

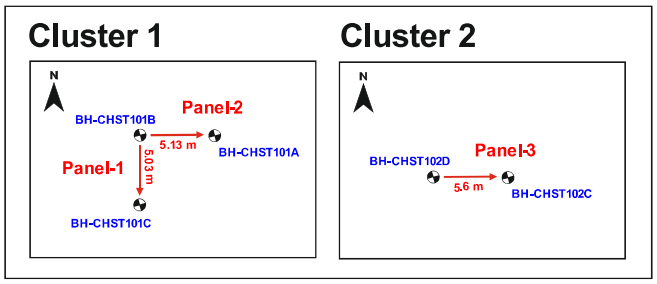


Plate 3: *Borehole survey configuration. The source borehole for cluster 1 was BH-CHST101B, and for cluster 2 was BH-CHST102D*

For the soil resistivity testing, the start and end points of each profile were staked out on-site by the Client, and then the midpoint along each profile was identified. In some cases, both the profile line and the midpoint were moved slightly to accommodate the largest possible 'a' spacing and avoid any obstructions. The mid-point position and maximum 'a' spacing are listed in Table 2 below.

Profile Name	Eastings	Northings	Profile Orientation	Maximum 'a' Spacing (m)
VES 1A	276490.523	188593.717	E - W	45.7
VES 1B			N - S	45.7
VES 2A	276537.997	188675.103	NW - SE	45.7
VES 2B			NE - SW	45.7
VES 3A	276286.841	188635.778	NW - SE	45.7
VES 3B			NE - SW	45.7
VES 4A	276375.787	188640.534	NW - SE	45.7
VES 4B			NE - SW	45.7
VES 5A	276416.924	188604.941	E - W	45.7
VES 5B			N - S	45.7

Table 2: Soil resistivity test locations in OSGB coordinates.

3.2 Seismic cross-hole survey

The cross-hole survey involves the measurement of horizontal travel times between shots to receivers that are incrementally moved down a set of boreholes (Plates 4 and 5).

Item	Description
Recording equipment	2x GEODE
Channels	Up to 48
P-wave receivers	2x 24-channel 1 m spaced hydrophone arrays
S-wave receivers	2x Geostuff 3-components clamping geophones
Receiver interval	1m
P-wave borehole source	Geotomographie IPG800 P-wave sparker
S_v-wave borehole source	Ballard S-wave hammer
Shot interval	1m
Record length	30ms (P-wave) and 60-80ms (S-wave)
Sample interval	0.031ms (P-wave) and 0.063ms (S-wave)
Stacking	1 to 3 shots

Table 3: *Cross-hole seismic testing equipment list and data acquisition parameters.*

3.2.1 Cross-hole survey – field activity

For the P-wave survey, the boreholes were filled with water, and the survey was carried out using a battery-powered borehole sparker source and multi-channel hydrophone array. The S_v-wave data were recorded using a clamping S_v-wave borehole hammer and a 3-component clamping geophone. The S_v-wave borehole hammer generates vertically polarised S-waves (S_v), which are recorded via the vertical sensor within the clamping geophone. The borehole hammer can produce reverse polarity (i.e. 'up' and 'down') waves, which are used to identify the S_v-wave arrival. The shear signal reverses polarity with a change in strike direction, while any residual P-wave signal retains polarity. Prior to the S_v-wave survey, the designated source boreholes were pumped dry to allow the full operation of the S_v-wave hammer source.

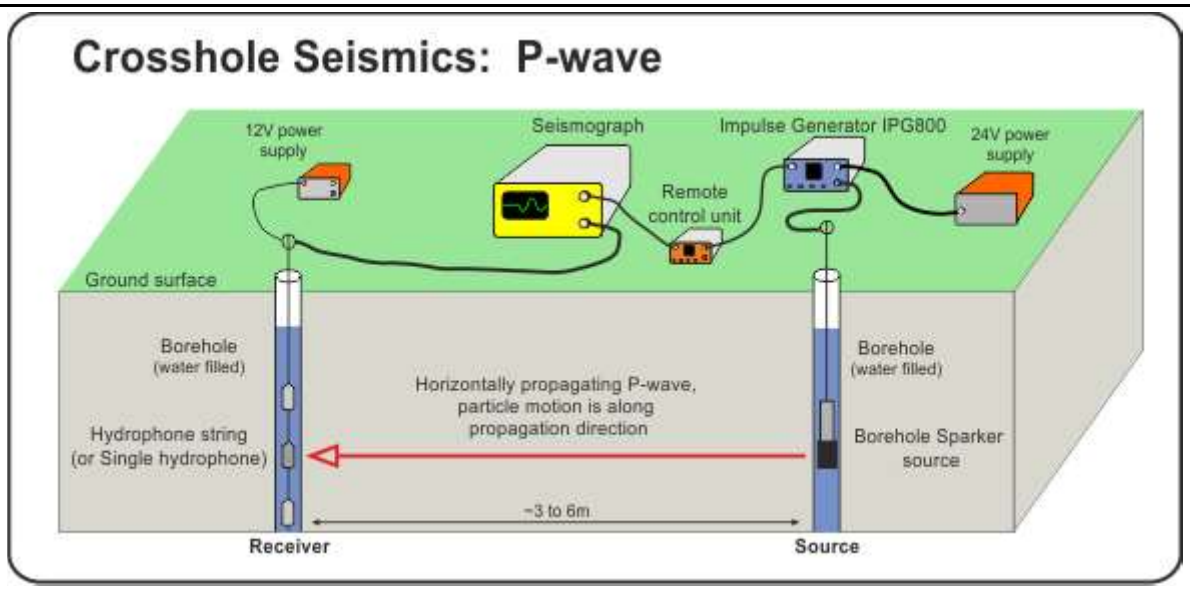


Plate 4: *Cross-hole P-wave survey configuration.*

The data for both the P-wave and S-wave surveys were acquired at uniform intervals of 1 m, starting at a depth of 2 m and extending to the base of the borehole.

With regards to the trigger timing, both the P-wave and S-wave seismic sources have integrated trigger mechanisms that are set to a time zero. To ensure correct operation, the trigger pulse can be observed on the shot record, as illustrated in Appendix A.

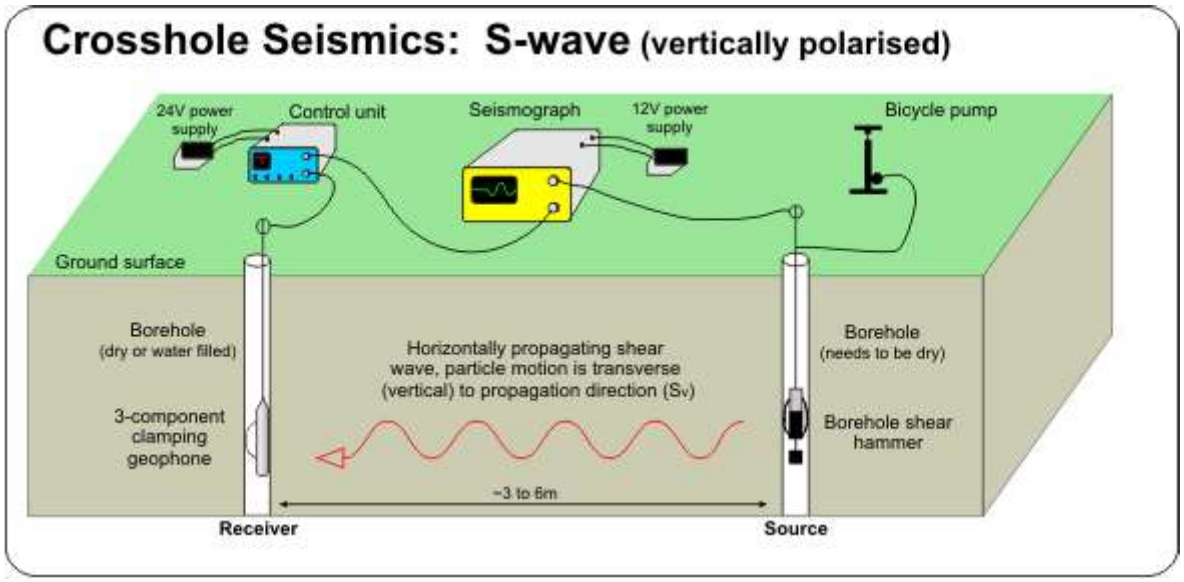


Plate 5: *Cross-hole shear (S_v) wave configuration.*

3.2.2 Cross-hole - data processing

The recorded seismic data were first compiled using *IXseg2segy* and then analysed using *PICKWIN* software to determine the first-arrival times for all shot-to-geophone combinations. To enhance the first arrival, a bandpass filter may be applied to the shot record to remove unwanted background noise. However, it is important not to compromise the main frequency component of the seismic pulse. The accuracy of the first arrival determination depends on the frequency component of the recorded seismic signal. In ideal conditions, the P-wave component is usually picked to +/- 0.1 msec, while the S-wave can be up to +/- 0.3 msec.

The measured first-arrival data was integrated with the borehole verticality survey, and by using a ray-tracing program (*GEOTOMCG*), a velocity model for the ground between the respective boreholes/shot points was developed. The velocity models were derived through a forward modelling and inversion process that involves the iterative adjustment of the velocity layers until a final velocity model is obtained. The resulting velocity profiles/sections were transferred to Excel for editing and then graphically plotted before being exported to CORELDRAW for final annotation.

The velocity model for both P and S_v-wave cross-hole data sets was based on a 1 m grid cell interval (vertical). To stabilise the velocity models, upper limits of V_p 4000 m/s and V_s 1000 m/s were set for the P and S_v-wave surveys, respectively.

3.3 Soil resistivity survey

3.3.1 Soil resistivity survey – background information

Resistivity measurements are made by passing a DC electrical current through the ground using a pair of electrodes and measuring the resulting potential gradient within the subsurface using a second electrode pair. There are several different electrode configurations; the most common type used is the Wenner array, which uses equal-spaced electrodes (Plate 6).

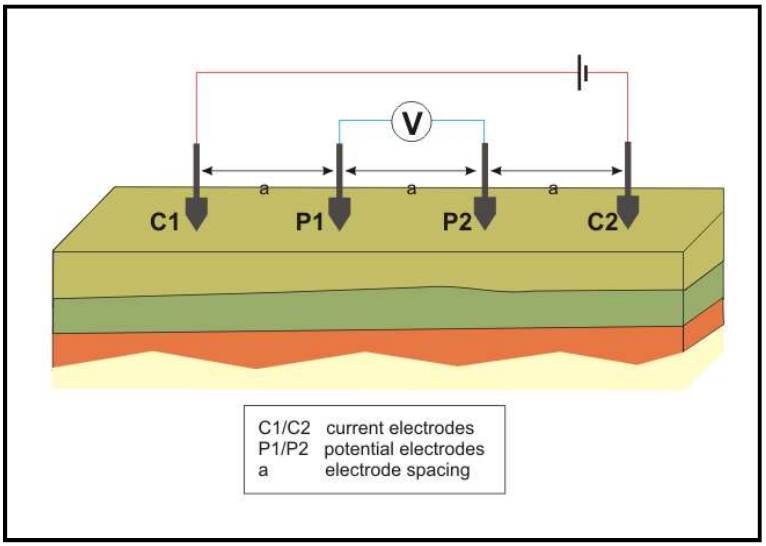


Plate 6: *Resistivity testing setup (Wenner array).*

For a given electrode spacing 'a', the resistivity calculation is based on

$$\rho a = 2\pi aR$$

where

ρa Apparent resistivity

a electrode spacing

R voltage/current (V/I)

By gradually increasing the spacing between the current/potential electrodes, the depth of investigation is increased.

3.3.2 Soil resistivity survey – field activity

A 72-channel *IRIS Syscal* junior resistivity system (Plate 7) was used to acquire the soil resistivity data along ten specified profile lines (Figure 1) using electrode spacings of 0.3, 0.9, 1.5, 3.0, 4.5, 6.1, 9.1, 15.2, 21.3, 27.4, 33.5, 39.6 and 45.7 m. To ensure the quality of the data, contact resistances were checked before each reading cycle, and if required, the electrodes were either repositioned or water was added.

The calibration certificate for this meter is included in the Appendix.

Item	Description
System	1x IRIS SYSCAL Junior (# 279)
Cables	4x single cables
Electrodes	4x stainless steel electrodes
Electrode spacing	0.3 to 45.7m
Array Type	Wenner
Cycles/time	Min 3 stack / 500ms

Table 4: ERT equipment list and data acquisition parameters.

Plate 7: *Resistivity testing setup (library photo)*

3.3.3 Soil resistivity survey – data processing

The data set was compiled in Excel for editing and then graphically plotted in GRAPHER before being exported to CORELDRAW for final annotation.

4 RESULTS AND DISCUSSION

The results of the cross-hole seismic and soil resistivity survey are presented in Figures 2 to 12 as a series of compiled profiles/sections and tables.

4.1 Cross-hole seismic survey

The results of the cross-hole seismic surveys are presented as a series of compiled profiles/sections and tables in Figures 2 to 5. The displayed plots for the cross-hole element include velocity tomograms, velocity profiles, density, Poisson's Ratio, Shear modulus (G), Young's modulus (E), Bulk modulus (K) and summary results.

The quality of the P-wave and S_v-wave data sets was generally very good to excellent for both clusters, as illustrated by the example sections in Appendix A.

Seismic tomograms

The presented velocity tomograms for the P-wave and S_v-wave cross-hole surveys are based on a 1.0 m vertical grid cell interval. To preserve subtle velocity variations for each data set, a separate colour scale has been adopted for the P-wave and S_v-wave surveys. The position of each receiver and source, together with the respective ray paths, are also shown. Please note that there are maximum velocity limits imposed on the resulting models (V_p 4000 m/s and V_s 1000 m/s), which were based on the maximum velocities calculated along direct ray paths.

Seismic velocity profile and borehole description

The P-wave and S_v-wave velocity data have been extracted from the final inverted velocity tomogram models (cross-hole) and plotted against a simplified borehole lithology. The resulting velocity profile for each element is presented separately and as a compiled plot in Figure 5b for comparison.

Density

The density data were provided by European Geophysical Services (EGS), and the data has been extracted at 1 m depth intervals to match the seismic data. Please refer to the EGS results for complete density profile information. The density values should be considered as

'relative' or 'approximate' as they were recorded through the plastic liner (i.e. measurements do not consider the influence of the plastic casing/grout).

Poisson's Ratio, Shear modulus, Young's modulus and Bulk modulus

The extracted P-wave and S_v-wave velocity data for the cross-hole survey, together with the density information, has been used to calculate Poisson's Ratio and the various elastic moduli using the equations shown in Plate 7.

Poisson's Ratio (σ) $= \frac{2-(V_p/V_s)^2}{2-2(V_p/V_s)^2}$

Shear Modulus (G) $= dV_s^2$

Young's Modulus (E) $= 2G(1+\sigma)$

Bulk Modulus (K) $= \frac{1}{3} \cdot \frac{E}{(1-2\sigma)}$

where
V_p = P-wave seismic velocity
V_s = S-wave seismic velocity
d = Density

Plate 7: *Respective moduli equations*

4.1.1 Summary discussion - Cluster-1 cross-hole (Figures 2 & 3)

Velocity Profile

The P-wave and S_v-wave profiles (Figure 2b) show excellent agreement with each other. The P-wave velocity profiles appear to show notable fluctuations in velocity, ranging between ~500 and ~1600 m/s, down to around 24 m Below Local Datum (m BLD). Peaks in velocity appear to occur at around 9, 15 and 23 m BLD and are likely to represent harder, more compacted layers of sediment (e.g. gravel-rich layers) as well as variations in sediment saturation. The P-wave velocity is generally higher between 8 and 15 m BLD (more obviously shown in the tomograms), which correlates very well with the position of the alluvium layer. From ~25 m BLD to the base of the boreholes, the P-wave velocities increase from ~1200 m/s to ~3600 m/s due to the influence of the mudstone bedrock. The velocities suggest this to be initially weathered but developing into a much more competent bedrock lithology towards the base of the boreholes.

The S_v-wave velocity profile appears to be more straightforward, with initially low velocities of 100 to 200 m/s indicating the presence of soft sediments. At ~10 m BLD (Panel 1) and ~14 m BLD (Panel 2), there is a small increase in velocity starting within the alluvium, indicating a minor increase in sediment stiffness, especially within the cobble layer. A far more significant increase in velocity from around 200 to 300 m/s up to 600 m/s+ can be seen from around ~26 m BLD and indicates the transition into the initially weathered mudstone bedrock.

Density

Given that the density profile should be considered relative or approximate (i.e. being acquired in a lined borehole), for the majority, the 'mean' average density profiles for both panels seem relatively consistent, varying between 1200 and 2000 kg/m^3. However, some local variations within each borehole are likely to signify local changes in ground/installation conditions. A reduction in density shown between ~9 and 16 m BLD correlates with the position of the alluvium layer as well as the zone of low P-wave velocity. Densities appear stable and elevated between ~17 and 24 m BLD, which correlates with the 'cobble' layer and a minor increase in S_v-wave velocity. From ~26 m BLD to the base of the borehole, an increase in density signifies the transition into mudstone bedrock and correlates with increases in both P-wave and S_v-wave velocity in both panels.

Poisson's ratios

The derived Poisson's ratio appears to be coherent with the modelled velocities and lithologies encountered at the site. It seems to vary from 0.4 to 0.5, which are generally in line with published values, and are likely to reflect the local variations in the P and S_v-wave velocities. There is a notable zone of lower Poisson's Ratio shown between ~16 and 21 m BLD when the contrast between the modelled P and S_v-wave velocities is small (i.e. within the upper part of the cobble layer).

Elastic Moduli

The calculation for the Shear (G), Young's (E) and Bulk (K) moduli was based on using the mean density value for both boreholes (as logged by EGS). This density value is not absolute as it does not take into account the plastic liner and variations in grout thickness. Even though the results generally appear consistent, variabilities are shown, which will be governed by the local variations in the P and S_h-wave velocities as well as the logged density.

4.1.2 Summary discussion - Cluster-2 cross-hole (Figures 4 & 5)

Velocity Profile

The P-wave and S_v-wave profiles (Figure 4b) show excellent agreement with the profiles for Panels 1 and 2 within Cluster 1 (Figure 5b). This is best illustrated by the peaks in P-wave velocity at ~8 to 9, 15 and 23 m BLD suggesting the presence of localised 'bands' of varying lithology (e.g. gravel-rich layers). The main differences between the clusters are the slightly lower P-wave velocities within the sand layer (Panel 3) and an earlier and more notable increase in P-wave velocity starting at around 21 to 22 m BLD (Panel 3) within the cobble

layer, as opposed to ~26 m BLD (Panels 1 and 2). This latter observation may be due to the over-compaction of the sediments above the mudstone bedrock, or it may indicate a thicker weathered bedrock zone which is more 'cobble-rich.'

Density

Given that the density profile should be considered relative or approximate (i.e. being acquired in a lined borehole), for the majority, the 'mean' average density profile for Panel 3 seems relatively stable and consistently higher than observed within Panels 1 and 2, varying between 1600 and 2000 kg/m^3. However, some local variations within each borehole are likely to signify local changes in ground/installation conditions.

Poisson's ratios

The derived Poisson's ratio appears to be coherent with the modelled velocities and lithologies encountered at the site. It seems to vary from 0.4 to 0.5, which are generally in line with published values, and are likely to reflect the local variations in the P and S_v-wave velocities. There is a notable zone of lower Poisson's Ratio shown between ~14 and 22 m BLD when the contrast between the modelled P and S_v-wave velocities is small (i.e. within the upper part of the cobble layer).

Elastic Moduli

The calculation for the Shear (G), Young's (E) and Bulk (K) moduli was based on using the mean density value for both boreholes (as logged by EGS). This density value is not absolute as it does not take into account the plastic liner and variations in grout thickness. Even though the results generally appear consistent, variabilities are shown, which will be governed by the local variations in the P and S_h-wave velocities as well as the logged density. A prominent peak in the Bulk moduli plot at around 8 to 9 m BLD, shown on all panels, is of interest.

4.2 Soil resistivity survey

The results of the soil resistivity tests are presented in Figures 5 to 12 and include depth profiles and summary tables. The apparent resistivity (***ρ)*** for the Wenner array is calculated using the formula (***ρ***=2*π****aR***), where resistance (***R***) is derived from the current and potential readings as (***R***=***V/I***).

For each measurement setup, the electrode resistance check seemed to be relatively constant, and there was good repeatability. For most of the test locations, the apparent resistivity profiles appear to show a near-surface band of high resistivity values (~110 ohm.m) that decreases to around ~5 ohm.m at around 5m deep. Beyond the 5 m depth range, the resistivity is relatively steady and suggests a gradual increase to around 15 ohm.m at depth.

When comparing each test location (Figure 7), there is a wide spread of values for the smaller 'a' spacing, which reflects the variation in near-surface made ground/gravel layer. VES 1 and VES 2 seem to be similar, but both VES 4 and VES 5 exhibit much higher values within the top 5m. Below 8 m, the profiles are very similar; the only exception is VES 2A, which displays slightly elevated values. It is uncertain if this is more representative of the local geology or is subject to some form of interference from buried structures.

The only other feature of note is the apparent rogue point at 16 m depth for VES3A, which, although proved to be repeatable, is assumed to be due to interference.

5 CONCLUSIONS

- The combined P and S_v-wave seismic cross-hole surveys have provided seismic velocity information from the surface to a depth of just under 30 m below ground level. The overall quality of both the P-wave and the S_v-wave was very good to excellent!

- The resulting P and S_v-wave velocity profiles are very consistent between both clusters, and the overall range of P-wave (~200 to 3500 m/s) and S_v-wave (~100 to 700 m/s) velocities would suggest soft to moderately dense and stiff sediments, overlying weak to competent mudstone rock material. The most notable observations are the local velocity variations within the superficial deposits, particularly within the alluvium, and the sharp increase in velocity towards the base of the boreholes, which correlates with the transition into the mudstone bedrock.

- The derived Poisson's ratios appear to be consistent with the modelled velocities and lithologies encountered at the site. Any discrepancy from the published values is likely to reflect the local variations in the P and S_v-wave velocities. The main feature of note is a zone of lower Poisson's ratio values in all panels between ~15 and 21 m BLD and within the cobble layer.

- The calculation for the Shear (G), Young's (E) and Bulk (K) moduli was based on using the mean density value recorded for the respective clusters. This density value is not absolute as it does not take into account the plastic liner and variations in grout thickness. The resulting values reveal some variabilities, which are governed to some degree by the local variations in the P and S_v-wave velocities.

- The quality of the soil resistivity data was good, and for most of the test locations, the apparent resistivity profiles are consistent and appear to show a near-surface band of high resistivity values (~110 ohm.m) that decreases to around ~5 ohm.m at around 5m deep. Beyond the 5 m depth range, the resistivity is relatively steady and suggests a gradual increase to around 15 ohm.m at depth. When comparing each test location, there is a wide spread of values for the smaller 'a' spacing, which reflects the variation in near-surface made ground/gravel layer. Below 8 m, the profiles are very similar; the only exception is VES 2A, which displays slightly

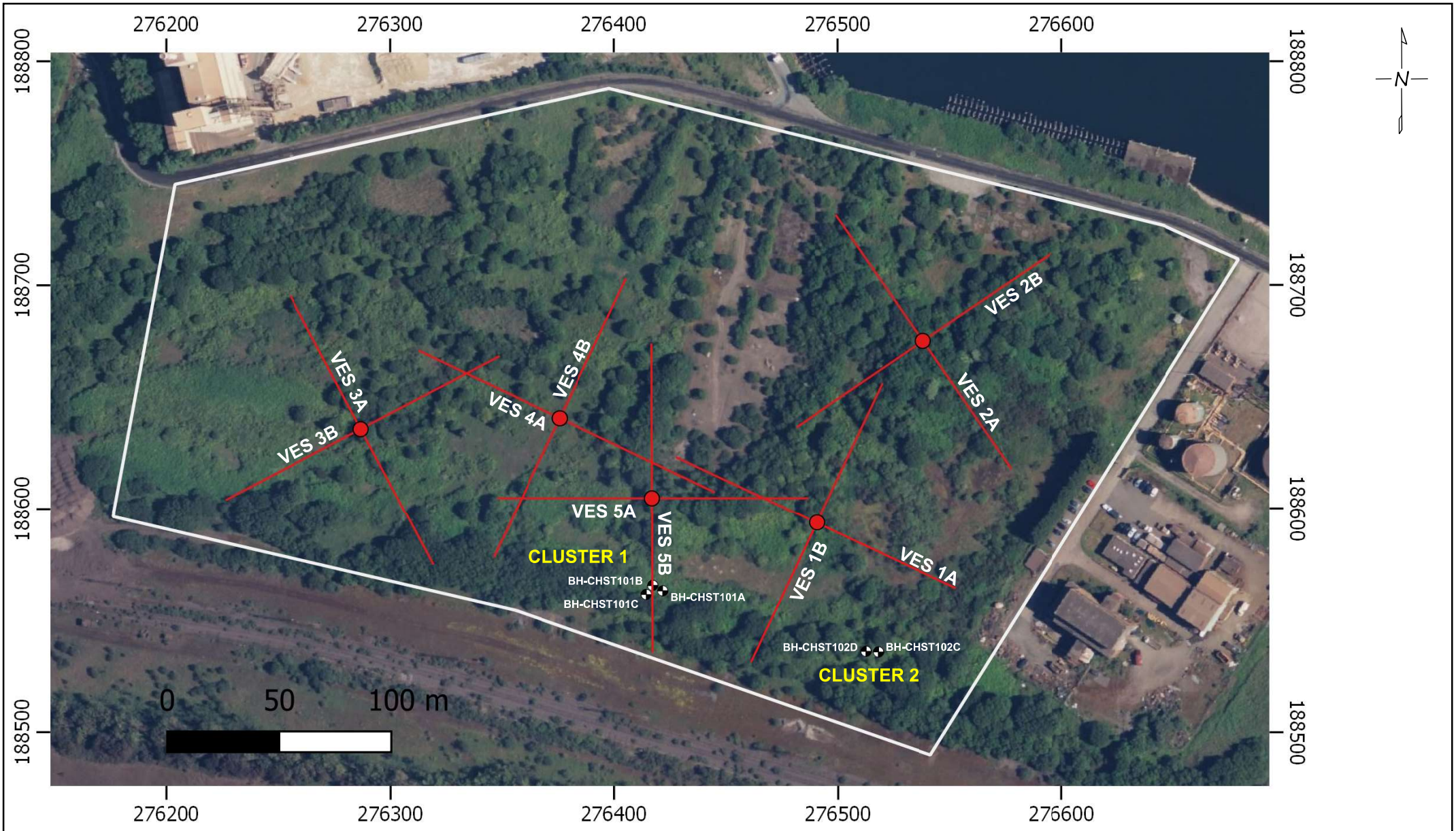
elevated values. It is uncertain if this is more representative of the local geology or is subject to some form of interference from buried structures.

- If any additional borehole/seismic/laboratory data become available (e.g. SPT/RQD values), it may be possible to extend/refine the interpretation and further calibrate the acquired datasets.

Disclaimer

This report represents an opinionated interpretation of the geophysical data. It is intended for guidance with follow-up invasive investigation. Features that do not produce measurable geophysical anomalies or are hidden by other features may remain undetected. Geophysical surveys complement invasive/destructive methods and provide a tool for investigating the subsurface; they do not produce data that can be taken to represent all the ground conditions found within the surveyed area. Areas that have not been surveyed due to obstructed access or any other reason are excluded from the interpretation.

Figures



KEY

- VES station
- VES survey lines
- Survey Area
- Boreholes

NOTES/OBSERVATIONS

Project: **PHOENIX WHARF PORT TALBOT**

Title: **Location plan**

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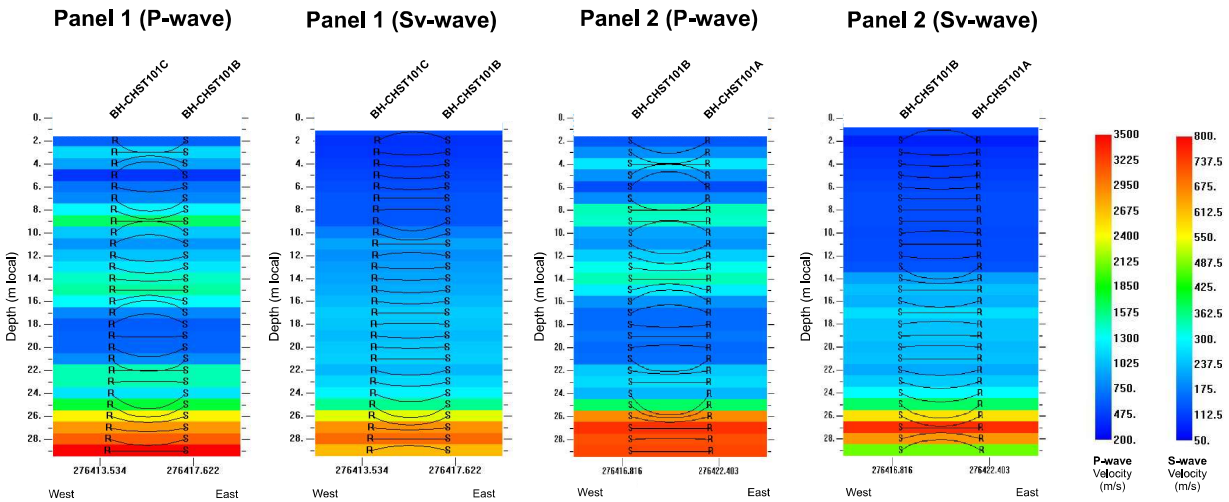
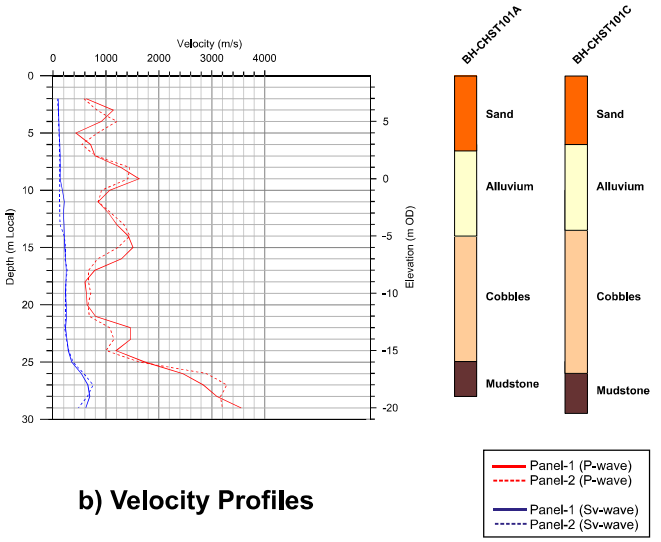
Date:	30 JUNE 2023

FIGURE 1

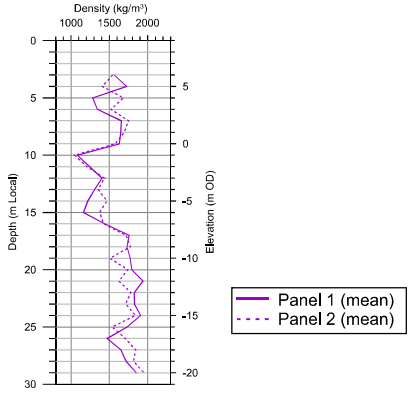


a) Tomograms

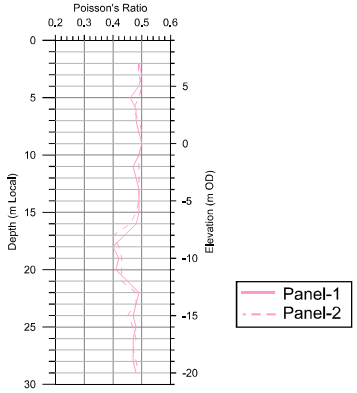
S = source borehole
R = receiver borehole



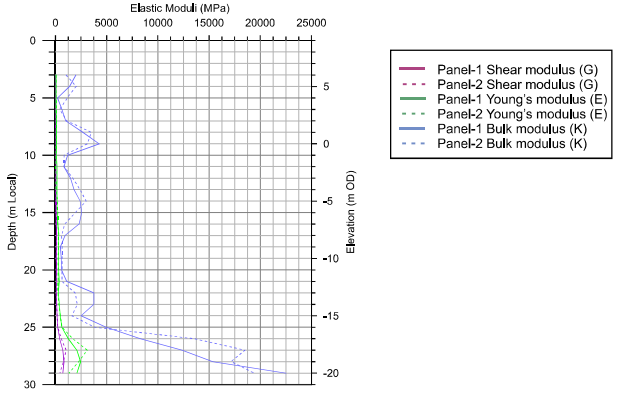
b) Velocity Profiles



c) Density Profiles



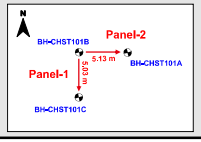
d) Poission's Ratio



e) Combined Elastic Moduli
(based on inversion velocity and mean density)

BOREHOLE LAYOUT

Local datum (0m BLD) was based on the top of the plastic liner for BH-CHST101A, which is at 8.99 m OD. Ground level was around 8.3-8.4 m OD.



NOTES/OBSERVATIONS

1): BH-CHST101B was used as the source hole.

Project: **PHOENIX WHARF PORT TALBOT**

Title: **SETUP 1 - TOMOGRAMS, VELOCITY PROFILES & ELASTIC MODULI**

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FIGURE 2

Panel 1								
Depth	Elevation	Velocity - P	Velocity - S	Density-mean	Poisson's	Shear	Young's	Bulk
(m local)	(m OD)	(m/s)	(m/s)	(kg/m3)	Ratio	G (Mpa)	E (Mpa)	K (Mpa)
0	8.99	-	-	-	-	-	-	-
1	7.99	-	-	-	-	-	-	-
2	6.99	629	100	-	0.49	-	-	-
3	5.99	1139	103	1561	0.50	17	50	2004
4	4.99	910	110	1724	0.49	21	62	1400
5	3.99	430	118	1281	0.46	18	52	214
6	2.99	706	128	1344	0.48	22	65	641
7	1.99	795	137	1656	0.48	31	92	1004
8	0.99	1278	135	1648	0.49	30	90	2653
9	-0.01	1628	135	1630	0.50	30	89	4283
10	-1.01	1071	175	1082	0.49	33	99	1198
11	-2.01	853	212	1242	0.47	56	163	829
12	-3.01	1050	194	1406	0.48	53	157	1479
13	-4.01	1206	206	1308	0.49	55	164	1828
14	-5.01	1425	213	1218	0.49	55	164	2398
15	-6.01	1509	221	1161	0.49	57	168	2571
16	-7.01	1294	235	1441	0.48	79	235	2305
17	-8.01	788	250	1758	0.44	110	318	946
18	-9.01	602	244	1730	0.40	103	289	488
19	-10.01	630	234	1772	0.42	97	276	574
20	-11.01	644	247	1792	0.41	110	310	598
21	-12.01	805	253	1941	0.45	124	359	1093
22	-13.01	1458	233	1825	0.49	99	294	3746
23	-14.01	1465	263	1827	0.48	126	374	3751
24	-15.01	1191	290	1909	0.47	161	472	2495
25	-16.01	1733	353	1733	0.48	216	640	4912
26	-17.01	2453	536	1471	0.47	422	1246	8282
27	-18.01	2840	658	1650	0.47	715	2105	12359
28	-19.01	3098	695	1718	0.47	831	2449	15379
29	-20.01	3559	618	1853	0.48	709	2104	22528

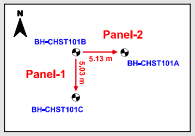
a) Panel 1 - Table of Results

Panel 2								
Depth	Elevation	Velocity - P	Velocity - S	Density-mean	Poisson's	Shear	Young's	Bulk
(m local)	(m OD)	(m/s)	(m/s)	(kg/m3)	Ratio	G (Mpa)	E (Mpa)	K (Mpa)
0	8.99	-	-	-	-	-	-	-
1	7.99	-	-	-	-	-	-	-
2	6.99	584	82	-	0.49	-	-	-
3	5.99	827	99	1545	0.49	15	45	1036
4	4.99	1206	106	1407	0.50	16	47	2027
5	3.99	839	112	1683	0.49	21	63	1157
6	2.99	545	120	1521	0.47	22	65	423
7	1.99	809	127	1752	0.49	28	84	1110
8	0.99	1447	128	1693	0.50	28	83	3507
9	-0.01	1413	127	1579	0.50	26	77	3120
10	-1.01	916	122	1044	0.49	15	46	856
11	-2.01	854	124	1206	0.49	19	55	856
12	-3.01	1099	125	1435	0.49	22	67	1703
13	-4.01	1338	134	1356	0.49	24	73	2396
14	-5.01	1450	209	1468	0.49	64	191	3000
15	-6.01	1225	240	1374	0.48	79	234	1955
16	-7.01	840	225	1426	0.46	72	212	910
17	-8.01	669	268	1720	0.40	124	347	606
18	-9.01	671	243	1774	0.42	104	297	659
19	-10.01	712	243	1507	0.43	89	256	645
20	-11.01	661	233	1740	0.43	95	271	633
21	-12.01	684	238	1625	0.43	92	264	637
22	-13.01	1069	218	1780	0.48	85	251	1922
23	-14.01	1152	251	1713	0.48	108	319	2130
24	-15.01	1002	299	1841	0.45	165	479	1628
25	-16.01	1633	376	1537	0.47	218	641	3810
26	-17.01	2897	579	1707	0.48	572	1692	13563
27	-18.01	3286	756	1843	0.47	1052	3097	18494
28	-19.01	3165	651	1816	0.48	770	2276	17159
29	-20.01	3201	478	1951	0.49	446	1327	19393

b) Panel 2 - Table of Results

BOREHOLE LAYOUT

Local datum (0m BLD) was based on the top of the plastic liner for BH-CHST101A, which is at 8.99 m OD. Ground level was around 8.3-8.4 m OD.



NOTES/OBSERVATIONS

1): BH-CHST101B was used as the source hole.

Elastic moduli formula

Poisson's Ratio (σ) $= \frac{2-2(V_p/V_s)^2}{2-(V_p/V_s)^2}$

where
V_p = P-wave seismic velocity
V_s = S-wave seismic velocity
d = Density

Shear Modulus (G) $= dV_s^2$

Young's Modulus (E) $= 2G(1+\sigma)$

Bulk Modulus (K) $= \frac{1}{3} \cdot \frac{E}{(1-2\sigma)}$

Project: **PHOENIX WHARF PORT TALBOT**

Title: **SETUP 1 - TABLE OF RESULTS**

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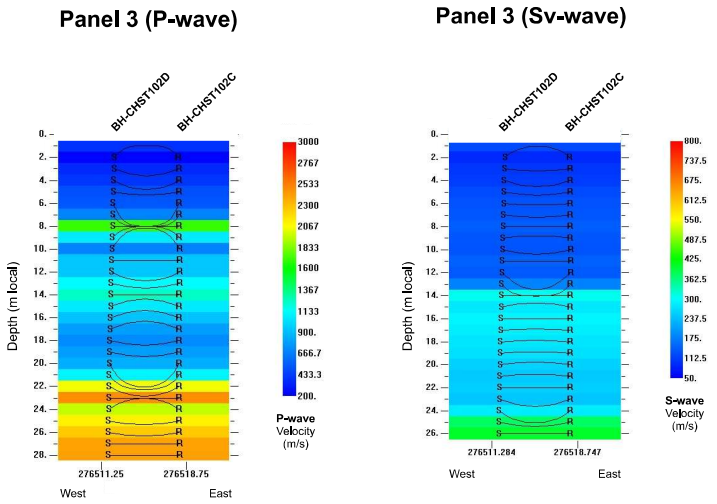
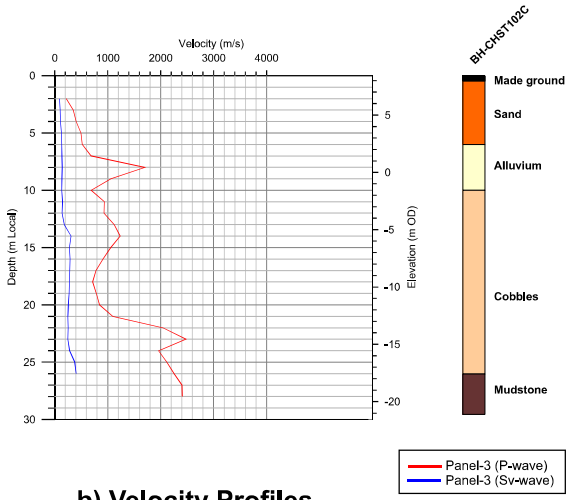
FIGURE 3

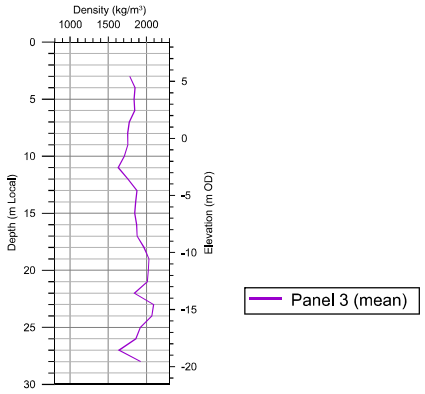


a) Tomograms

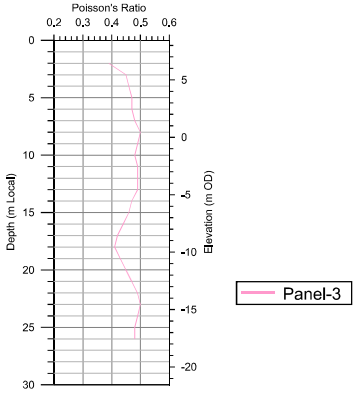
S = source borehole
R = receiver borehole



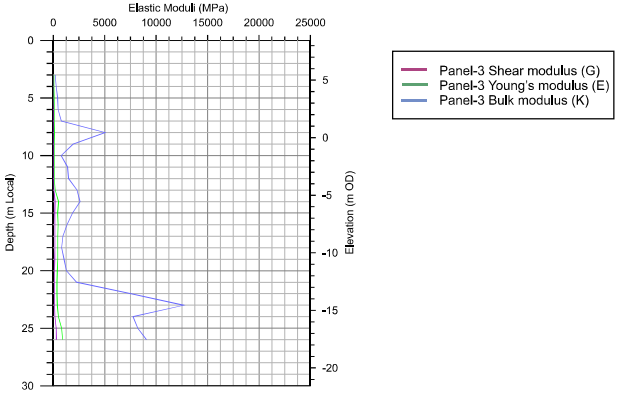
b) Velocity Profiles



c) Density Profiles



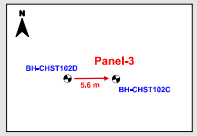
d) Poission's Ratio



e) Combined Elastic Moduli
(based on inversion velocity and mean density)

BOREHOLE LAYOUT

Local datum (0m BLD) was based on the top of the plastic liner for BH-CHST102D, which is at 8.44 m OD. Ground level was around 7.9 m OD.



NOTES/OBSERVATIONS

1): BH-CHST102D was used as the source hole.

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Title: **SETUP 2 - TOMOGRAMS, VELOCITY PROFILES & ELASTIC MODULI**

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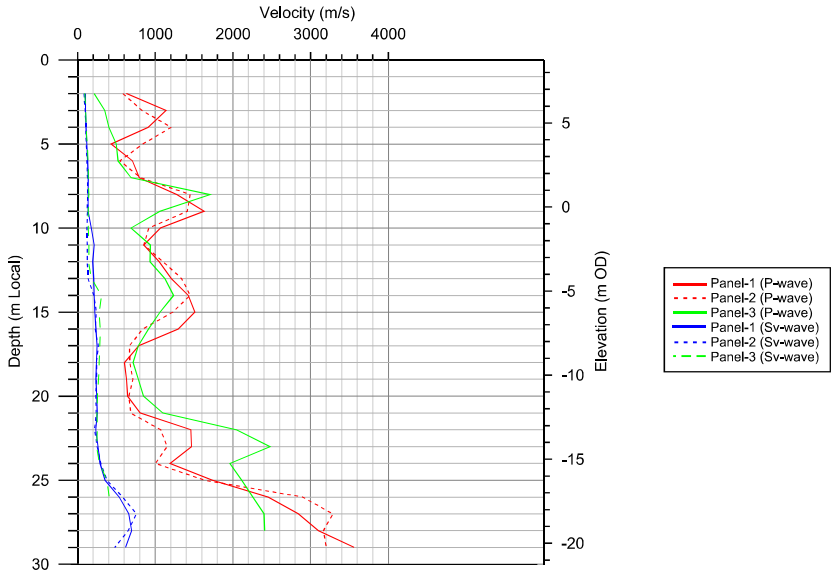
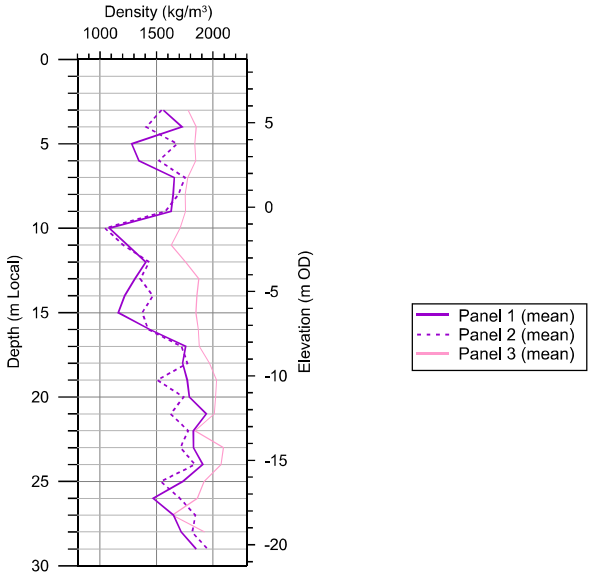
FIGURE 4

Panel 3								
Depth	Elevation	Velocity - P	Velocity - S	Density-mean	Poisson's	Shear	Young's	Bulk
(m local)	(m OD)	(m/s)	(m/s)	(kg/m3)	Ratio	G (Mpa)	E (Mpa)	K (Mpa)
0	8.44	-	-	-	-	-	-	-
1	7.44	-	-	-	-	-	-	-
2	6.44	214	91	-	0.39	-	-	-
3	5.44	350	105	1781	0.45	20	57	192
4	4.44	403	109	1851	0.46	22	65	272
5	3.44	498	125	1838	0.47	29	84	417
6	2.44	521	133	1846	0.47	33	96	457
7	1.44	686	137	1776	0.48	33	98	791
8	0.44	1703	143	1753	0.50	36	107	5035
9	-0.56	1060	136	1755	0.49	32	96	1931
10	-1.56	688	134	1710	0.48	31	91	769
11	-2.56	935	147	1630	0.49	35	104	1379
12	-3.56	932	140	1755	0.49	34	102	1478
13	-4.56	1125	180	1874	0.49	61	181	2290
14	-5.56	1235	307	1857	0.47	176	515	2598
15	-6.56	1060	279	1848	0.46	144	421	1882
16	-7.56	914	292	1870	0.44	159	460	1351
17	-8.56	780	284	1877	0.42	152	432	941
18	-9.56	715	276	1968	0.41	150	423	806
19	-10.56	783	270	2032	0.43	148	424	1047
20	-11.56	847	257	2024	0.45	134	388	1272
21	-12.56	1095	249	2011	0.47	124	366	2246
22	-13.56	2048	254	1842	0.49	119	356	7566
23	-14.56	2478	246	2093	0.50	126	378	12683
24	-15.56	1961	282	2070	0.49	165	491	7740
25	-16.56	2114	377	1921	0.48	273	809	8216
26	-17.56	2257	405	1860	0.48	305	905	9066
27	-18.56	2401	-	1641	-	-	-	-
28	-19.56	2408	-	1924	-	-	-	-

a) Panel 3 - Table of Results



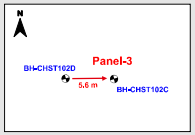
b) Velocity Profiles - All Panels



c) Density (mean) Profiles - All pPnels

BOREHOLE LAYOUT

Local datum (0m BLD) was based on the top of the plastic liner for BH-CHST102D, which is at 8.44 m OD. Ground level was around 7.9 m OD.



NOTES/OBSERVATIONS

1): BH-CHST102D was used as the source hole.

Elastic moduli formula

Poisson's Ratio (σ) $= \frac{2-2(V_p/V_s)^2}{2-2(V_p/V_s)^2}$

where
V_p = P-wave seismic velocity
V_s = S-wave seismic velocity
d = Density

Shear Modulus (G) $= dV_s^2$

Young's Modulus (E) $= 2G(1+\sigma)$

Bulk Modulus (K) $= \frac{1}{3} \cdot \frac{E}{(1-2\sigma)}$

Project: **PHOENIX WHARF PORT TALBOT**

Title: **SETUP 2 - TABLE OF RESULTS AND SUMMARY PLOTS**

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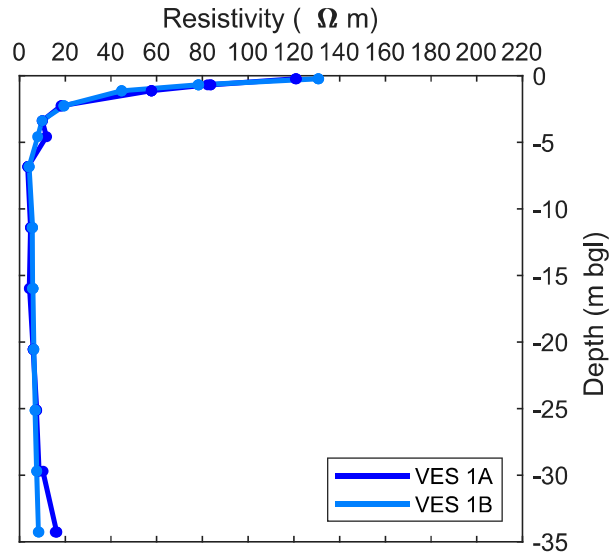
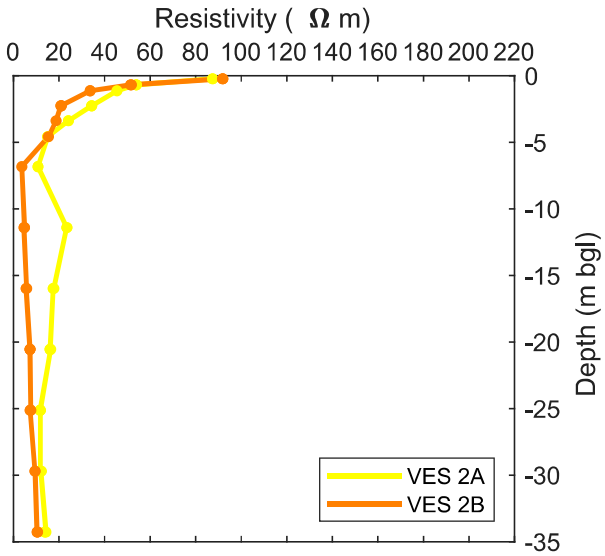
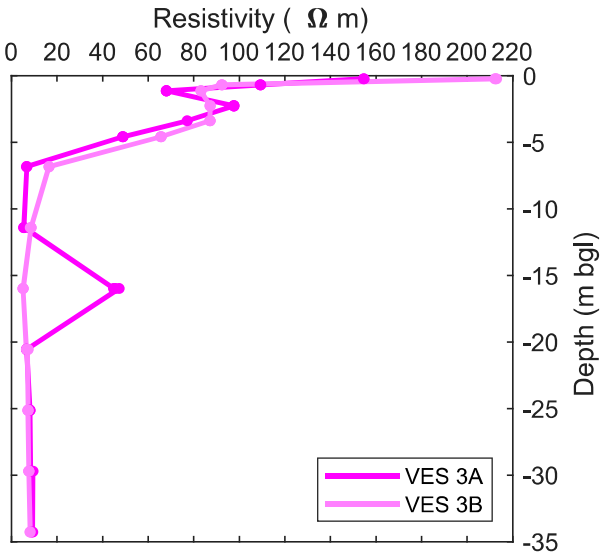
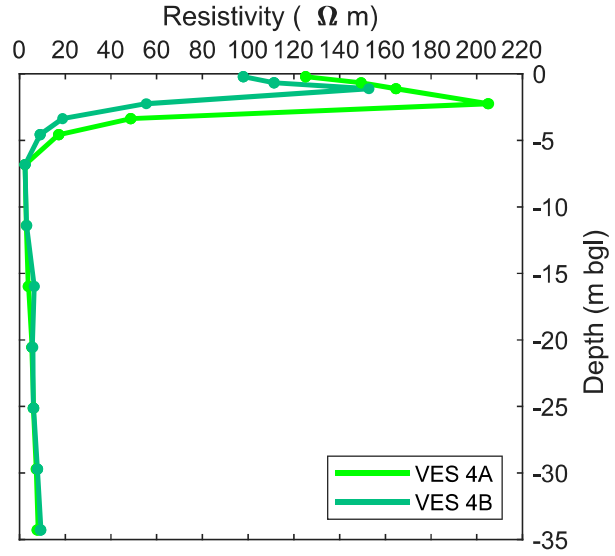
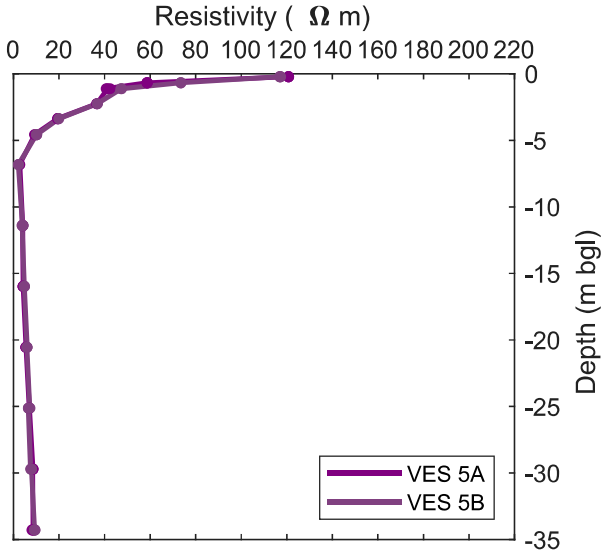
FIGURE 5











NOTES/OBSERVATIONS

1. Depth plotting based on 0.75 x 'a' electrode spacing.

Project: **Phoenix Wharf Port Talbot**

Title: **Individual VES plots**

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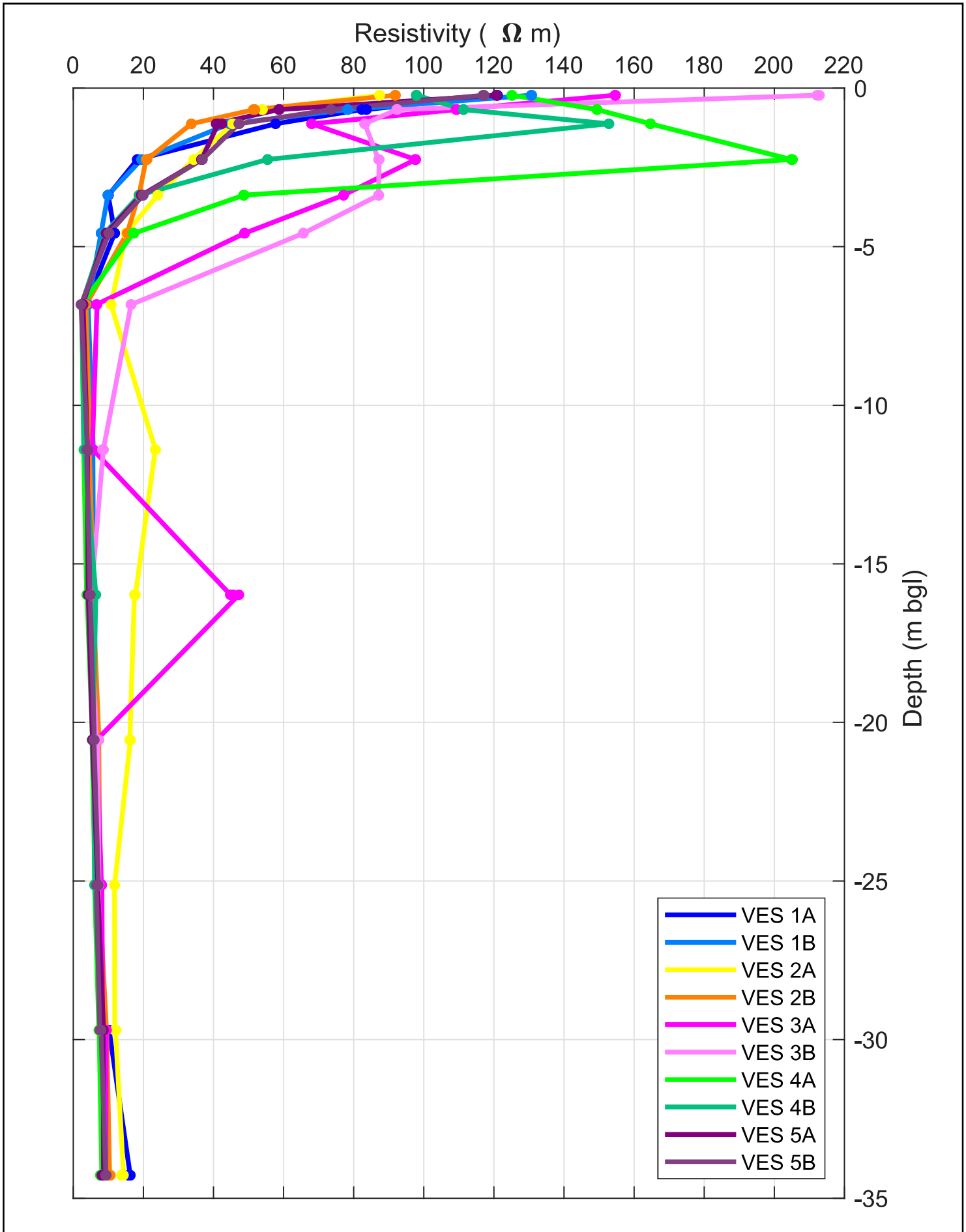
Drawn by/Ref: OP/7897/6
Date: 5 JUNE 2023

FIGURE 6



NOTES/OBSERVATIONS

1. Depth plotting based on 0.75 x 'a' electrode spacing.

Project: **Phoenix Wharf Port Talbot**

Title: **Combined VES plot**

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Drawn by/Ref: OP/7897/7

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FIGURE 7

VES 1A			SOIL RESISTIVITY SOUNDINGS WENNER METHOD				
'a' spacing (m)	Distance 'x' to potential probes (m)	Distance 'y' to current probes (m)	Deviation	Voltage (mV)	Current (mA)	Rho (ohm.m)	Average Rho (ohm.m)
0.3	0.15	0.45	0	328.427	5.116	121.01	120.91
0.3	0.15	0.45	0	304.048	4.748	120.71	
0.3	0.15	0.45	0	286.179	4.457	121.03	
0.9	0.45	1.35	1	319.421	21.621	83.54	83.17
0.9	0.45	1.35	1	308.797	20.87	83.67	
0.9	0.45	1.35	0	349.723	24.034	82.28	
1.5	0.75	2.25	0	322.25	52.646	57.69	57.71
1.5	0.75	2.25	0	323.439	52.815	57.72	
1.5	0.75	2.25	0	321.936	52.575	57.71	
3	1.5	4.5	0	216.904	223.523	18.29	18.27
3	1.5	4.5	0	209.697	216.438	18.26	
3	1.5	4.5	0	206.747	213.457	18.26	
4.5	2.25	6.75	0	57.771	162.486	10.05	9.99
4.5	2.25	6.75	0	55.968	159.107	9.95	
4.5	2.25	6.75	0	55.707	158.094	9.96	
6.1	3.05	9.15	0	82.01	265.72	11.83	11.82
6.1	3.05	9.15	0	80.907	262.391	11.82	
6.1	3.05	9.15	0	80.433	261.05	11.81	
9.1	4.55	13.65	0	6.615	102.576	3.69	3.68
9.1	4.55	13.65	1	6.345	97.049	3.74	
9.1	4.55	13.65	0	6.119	96.399	3.63	
15.2	7.6	22.8	1	3.646	71.805	4.85	4.87
15.2	7.6	22.8	0	3.846	75.251	4.88	
15.2	7.6	22.8	1	3.831	75.183	4.87	
21.3	10.65	31.95	1	1.678	52.18	4.30	4.40
21.3	10.65	31.95	6	1.984	59.932	4.43	
21.3	10.65	31.95	1	2.247	67.242	4.47	
27.4	13.7	41.1	0	7.439	214.213	5.98	6.00
27.4	13.7	41.1	0	7.435	212.64	6.02	
27.4	13.7	41.1	0	7.356	211.165	6.00	
33.5	16.75	50.25	2	9.518	266.535	7.52	7.43
33.5	16.75	50.25	0	9.336	266.33	7.38	
33.5	16.75	50.25	0	9.346	266.101	7.39	
39.6	19.8	59.4	3	4.772	137.625	8.63	9.73
39.6	19.8	59.4	7	5.685	137.04	10.32	
39.6	19.8	59.4	0	5.636	136.784	10.25	
45.7	22.85	68.55	2	5.814	102.856	16.23	16.06
45.7	22.85	68.55	1	5.557	101.956	15.65	
45.7	22.85	68.55	1	5.738	101.148	16.29	

VES 1B			SOIL RESISTIVITY SOUNDINGS WENNER METHOD				
'a' spacing (m)	Distance 'x' to potential probes (m)	Distance 'y' to current probes (m)	Deviation	Voltage (mV)	Current (mA)	Rho (ohm.m)	Average Rho (ohm.m)
0.3	0.15	0.45	0	292.791	4.223	130.69	130.71
0.3	0.15	0.45	0	290.649	4.188	130.82	
0.3	0.15	0.45	0	285.702	4.123	130.62	
0.9	0.45	1.35	0	325.773	23.5	78.39	78.29
0.9	0.45	1.35	0	323.112	23.34	78.28	
0.9	0.45	1.35	0	320.855	23.205	78.19	
1.5	0.75	2.25	0	312.316	65.917	44.65	44.64
1.5	0.75	2.25	0	317.584	67.064	44.63	
1.5	0.75	2.25	0	315.136	66.536	44.64	
3	1.5	4.5	0	293.618	284.607	19.45	19.45
3	1.5	4.5	0	289.205	280.25	19.45	
3	1.5	4.5	0	286.913	278.024	19.45	
4.5	2.25	6.75	0	89.315	255.787	9.87	9.88
4.5	2.25	6.75	0	88.546	253.433	9.88	
4.5	2.25	6.75	0	88.132	252.114	9.88	
6.1	3.05	9.15	0	30.26	146.027	7.94	7.94
6.1	3.05	9.15	0	30.311	146.222	7.95	
6.1	3.05	9.15	0	30.088	145.202	7.94	
9.1	4.55	13.65	0	21.397	292.572	4.18	4.19
9.1	4.55	13.65	0	21.162	289.031	4.19	
9.1	4.55	13.65	0	21.13	286.747	4.21	
15.2	7.6	22.8	3	3.751	62.842	5.7	5.64
15.2	7.6	22.8	0	4.288	72.599	5.64	
15.2	7.6	22.8	0	4.505	77.164	5.58	
21.3	10.65	31.95	0	5.678	132.122	5.75	5.82
21.3	10.65	31.95	0	5.744	132.318	5.81	
21.3	10.65	31.95	0	5.846	132.323	5.91	
27.4	13.7	41.1	0	5.474	150.042	6.28	6.26
27.4	13.7	41.1	0	5.506	150.865	6.28	
27.4	13.7	41.1	0	5.426	149.87	6.23	
33.5	16.75	50.25	1	10.443	316.922	6.94	6.88
33.5	16.75	50.25	0	10.277	315.567	6.86	
33.5	16.75	50.25	0	10.208	314.371	6.83	
39.6	19.8	59.4	0	9.346	308.891	7.53	7.54
39.6	19.8	59.4	0	9.324	307.452	7.55	
39.6	19.8	59.4	0	9.311	307.006	7.55	
45.7	22.85	68.55	2	8.224	284.396	8.3	8.40
45.7	22.85	68.55	1	8.329	283.069	8.45	
45.7	22.85	68.55	0	8.313	282.535	8.45	

NOTES/OBSERVATIONS

1. Depth plotting based on 0.75 x 'a' electrode spacing.

Project:

PHOENIX WHARF PORT TALBOT

Title:

VES 1 DATA

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Scale: NTS at A4

Drawn by/Ref: OP/7897/8

Date: 30JUNE 2023

FIGURE 8

VES 2A			SOIL RESISTIVITY SOUNDINGS WENNER METHOD				
'a' spacing (m)	Distance 'x' to potential probes (m)	Distance 'y' to current probes (m)	Deviation	Voltage (mV)	Current (mA)	Rho (ohm.m)	Average Rho (ohm.m)
0.3	0.15	0.45	0	285.486	5.859	91.85	91.86
0.3	0.15	0.45	0	335.726	6.893	91.8	
0.3	0.15	0.45	0	326.052	6.685	91.93	
0.9	0.45	1.35	0	323.582	35.628	51.36	51.59
0.9	0.45	1.35	0	330.798	36.105	51.81	
0.9	0.45	1.35	0	339.909	37.257	51.59	
1.5	0.75	2.25	0	343.931	96.262	33.67	33.68
1.5	0.75	2.25	0	339.591	95.023	33.68	
1.5	0.75	2.25	0	344.385	96.359	33.68	
3	1.5	4.5	0	290.213	260.637	20.99	20.94
3	1.5	4.5	0	288.757	258.651	21.04	
3	1.5	4.5	1	284.129	257.61	20.79	
4.5	2.25	6.75	0	203.991	308.076	18.72	18.72
4.5	2.25	6.75	0	202.678	306.052	18.72	
4.5	2.25	6.75	0	201.998	305.127	18.72	
6.1	3.05	9.15	0	141.929	354.009	15.37	15.37
6.1	3.05	9.15	0	141.233	352.067	15.38	
6.1	3.05	9.15	0	140.734	350.857	15.37	
9.1	4.55	13.65	0	17.141	268.336	3.65	3.65
9.1	4.55	13.65	0	16.969	266.066	3.65	
9.1	4.55	13.65	0	16.867	264.69	3.64	
15.2	7.6	22.8	0	14.524	286.236	4.85	4.76
15.2	7.6	22.8	0	14.442	284.882	4.84	
15.2	7.6	22.8	2	13.679	284.121	4.6	
21.3	10.65	31.95	0	13.835	321.534	5.76	5.67
21.3	10.65	31.95	3	13.495	319.017	5.66	
21.3	10.65	31.95	1	13.278	317.348	5.6	
27.4	13.7	41.1	0	12.35	291.486	7.29	7.27
27.4	13.7	41.1	0	12.188	289.565	7.25	
27.4	13.7	41.1	0	12.185	288.81	7.26	
33.5	16.75	50.25	0	10.808	297.552	7.65	7.47
33.5	16.75	50.25	0	10.408	294.719	7.43	
33.5	16.75	50.25	0	10.23	293.427	7.34	
39.6	19.8	59.4	0	15.523	408.405	9.46	9.49
39.6	19.8	59.4	0	15.551	408.231	9.48	
39.6	19.8	59.4	0	15.564	406.848	9.52	
45.7	22.85	68.55	0	8.736	241.617	10.38	10.49
45.7	22.85	68.55	0	8.694	238.122	10.48	
45.7	22.85	68.55	0	8.682	235.226	10.6	

VES 2B			SOIL RESISTIVITY SOUNDINGS WENNER METHOD				
'a' spacing (m)	Distance 'x' to potential probes (m)	Distance 'y' to current probes (m)	Deviation	Voltage (mV)	Current (mA)	Rho (ohm.m)	Average Rho (ohm.m)
0.3	0.15	0.45	0	281.656	6.075	87.39	87.41
0.3	0.15	0.45	0	330.722	7.132	87.41	
0.3	0.15	0.45	0	323.868	6.982	87.43	
0.9	0.45	1.35	0	330.516	34.693	53.87	53.92
0.9	0.45	1.35	0	327.62	34.332	53.96	
0.9	0.45	1.35	0	324.997	34.068	53.94	
1.5	0.75	2.25	0	332.07	68.908	45.42	45.43
1.5	0.75	2.25	0	340.485	70.634	45.43	
1.5	0.75	2.25	0	335.001	69.506	45.43	
3	1.5	4.5	0	346.757	190.254	34.36	34.35
3	1.5	4.5	0	344.105	188.866	34.34	
3	1.5	4.5	0	348.629	191.363	34.34	
4.5	2.25	6.75	0	294.94	345.682	24.12	24.12
4.5	2.25	6.75	0	280.425	328.793	24.12	
4.5	2.25	6.75	0	277.399	325.234	24.12	
6.1	3.05	9.15	0	114.352	292.125	15	15.02
6.1	3.05	9.15	0	108.935	277.809	15.03	
6.1	3.05	9.15	0	95.053	242.307	15.04	
9.1	4.55	13.65	0	48.901	259.799	10.76	10.77
9.1	4.55	13.65	0	41.812	222.051	10.77	
9.1	4.55	13.65	0	36.526	193.687	10.78	
15.2	7.6	22.8	0	35.839	145.841	23.47	23.42
15.2	7.6	22.8	0	30.489	124.458	23.4	
15.2	7.6	22.8	0	28.884	117.889	23.4	
21.3	10.65	31.95	0	18.164	137.239	17.71	17.56
21.3	10.65	31.95	0	15.634	119.559	17.5	
21.3	10.65	31.95	0	15.097	115.746	17.46	
27.4	13.7	41.1	0	10.242	109.496	16.1	16.17
27.4	13.7	41.1	0	9.632	103.146	16.08	
27.4	13.7	41.1	0	9.438	99.502	16.33	
33.5	16.75	50.25	4	4.484	80.243	11.76	11.77
33.5	16.75	50.25	0	4.476	80.18	11.75	
33.5	16.75	50.25	1	4.533	80.856	11.8	
39.6	19.8	59.4	0	2.073	43.6	11.83	12.03
39.6	19.8	59.4	1	2.206	44.921	12.22	
39.6	19.8	59.4	1	2.206	45.59	12.04	
45.7	22.85	68.55	1	9.708	194.696	14.32	13.97
45.7	22.85	68.55	0	9.41	196.214	13.77	
45.7	22.85	68.55	0	9.464	196.812	13.81	

NOTES/OBSERVATIONS

1. Depth plotting based on 0.75 x 'a' electrode spacing.

Project:

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VES 2 DATA

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FIGURE 9

VES 3A			SOIL RESISTIVITY SOUNDINGS WENNER METHOD				
'a' spacing (m)	Distance 'x' to potential probes (m)	Distance 'y' to current probes (m)	Deviation	Voltage (mV)	Current (mA)	Rho (ohm.m)	Average Rho (ohm.m)
0.3	0.15	0.45	0	293.853	2.602	212.88	212.52
0.3	0.15	0.45	0	275.632	2.449	212.12	
0.3	0.15	0.45	0	271.734	2.41	212.57	
0.9	0.45	1.35	0	320.788	19.66	92.27	92.36
0.9	0.45	1.35	0	319.653	19.544	92.49	
0.9	0.45	1.35	0	328.071	20.097	92.31	
1.5	0.75	2.25	0	314.554	35.655	83.15	83.14
1.5	0.75	2.25	0	320.222	36.292	83.16	
1.5	0.75	2.25	0	318.868	36.154	83.12	
3	1.5	4.5	0	318.547	68.935	87.1	87.16
3	1.5	4.5	0	317.091	68.625	87.1	
3	1.5	4.5	0	318.601	68.808	87.28	
4.5	2.25	6.75	0	191.479	62.172	87.08	87.12
4.5	2.25	6.75	0	192.544	62.49	87.12	
4.5	2.25	6.75	0	193.358	62.715	87.17	
6.1	3.05	9.15	0	327.073	190.929	65.66	65.63
6.1	3.05	9.15	0	328.185	191.741	65.6	
6.1	3.05	9.15	0	309.694	180.841	65.64	
9.1	4.55	13.65	0	32.593	113.208	16.46	16.48
9.1	4.55	13.65	0	23.597	81.854	16.48	
9.1	4.55	13.65	0	17.611	61.083	16.49	
15.2	7.6	22.8	0	4.663	51.891	8.58	8.49
15.2	7.6	22.8	1	4.562	52.575	8.29	
15.2	7.6	22.8	0	4.689	52.126	8.59	
21.3	10.65	31.95	2	3.316	86.688	5.12	5.08
21.3	10.65	31.95	5	3.139	82.748	5.08	
21.3	10.65	31.95	3	3.195	84.747	5.05	
27.4	13.7	41.1	4	2.511	65.896	6.56	6.93
27.4	13.7	41.1	3	2.899	68.615	7.27	
27.4	13.7	41.1	3	2.635	65.241	6.95	
33.5	16.75	50.25	2	2.95	84.98	7.31	7.23
33.5	16.75	50.25	1	2.775	81.609	7.16	
33.5	16.75	50.25	0	2.673	77.863	7.23	
39.6	19.8	59.4	4	2.521	82.32	7.62	7.64
39.6	19.8	59.4	3	2.67	86.487	7.68	
39.6	19.8	59.4	1	2.492	81.398	7.62	
45.7	22.85	68.55	4	4.441	154.899	8.23	8.10
45.7	22.85	68.55	4	4.582	162.732	8.09	
45.7	22.85	68.55	6	4.875	175.371	7.98	

VES 3B			SOIL RESISTIVITY SOUNDINGS WENNER METHOD				
'a' spacing (m)	Distance 'x' to potential probes (m)	Distance 'y' to current probes (m)	Deviation	Voltage (mV)	Current (mA)	Rho (ohm.m)	Average Rho (ohm.m)
0.3	0.15	0.45	0	308.832	3.762	154.73	154.61
0.3	0.15	0.45	0	304.01	3.708	154.53	
0.3	0.15	0.45	0	301.734	3.68	154.57	
0.9	0.45	1.35	0	321.433	16.654	109.14	109.29
0.9	0.45	1.35	0	319.167	16.502	109.37	
0.9	0.45	1.35	0	327.448	16.934	109.35	
1.5	0.75	2.25	0	317.619	44.047	67.96	68.00
1.5	0.75	2.25	0	318.436	44.131	68.01	
1.5	0.75	2.25	0	317.8	44.023	68.04	
3	1.5	4.5	0	320.044	61.817	97.59	97.61
3	1.5	4.5	0	317.946	61.469	97.5	
3	1.5	4.5	0	311.553	60.086	97.74	
4.5	2.25	6.75	0	202.907	74.406	77.11	77.12
4.5	2.25	6.75	0	201.922	74.029	77.12	
4.5	2.25	6.75	0	201.191	73.754	77.13	
6.1	3.05	9.15	0	74.151	58.157	48.87	48.87
6.1	3.05	9.15	0	73.023	57.305	48.84	
6.1	3.05	9.15	0	72.085	56.507	48.89	
9.1	4.55	13.65	2	15.16	132.332	6.55	6.69
9.1	4.55	13.65	1	15.615	131.901	6.77	
9.1	4.55	13.65	0	15.491	130.973	6.76	
15.2	7.6	22.8	3	2.966	52.191	5.43	5.47
15.2	7.6	22.8	3	2.978	53.582	5.31	
15.2	7.6	22.8	3	3.319	55.899	5.67	
21.3	10.65	31.95	1	39.053	116.647	44.81	45.89
21.3	10.65	31.95	0	39.326	115.417	45.6	
21.3	10.65	31.95	1	40.353	114.309	47.25	
27.4	13.7	41.1	1	5.029	130.178	6.65	6.62
27.4	13.7	41.1	1	4.539	119.216	6.56	
27.4	13.7	41.1	0	4.759	123.294	6.64	
33.5	16.75	50.25	1	7.346	191.764	8.06	8.05
33.5	16.75	50.25	0	7.07	187.289	7.95	
33.5	16.75	50.25	0	7.238	186.932	8.15	
39.6	19.8	59.4	3	5.083	150.339	8.41	8.83
39.6	19.8	59.4	1	5.15	147.933	8.66	
39.6	19.8	59.4	3	5.891	155.543	9.42	
45.7	22.85	68.55	3	4.473	137.967	9.31	9.27
45.7	22.85	68.55	10	4.354	127.328	9.82	
45.7	22.85	68.55	3	4.037	133.448	8.69	

NOTES/OBSERVATIONS

1. Depth plotting based on 0.75 x 'a' electrode spacing.

Project:

PHOENIX WHARF PORT TALBOT

Title:

VES 3 DATA

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Scale: NTS at A4
Drawn by/Ref: OP/7897/10
Date: 30 JUNE 2023

FIGURE 10

VES 4A			SOIL RESISTIVITY SOUNDINGS WENNER METHOD				
'a' spacing (m)	Distance 'x' to potential probes (m)	Distance 'y' to current probes (m)	Deviation	Voltage (mV)	Current (mA)	Rho (ohm.m)	Average Rho (ohm.m)
0.3	0.15	0.45	0	306.69	5.91	97.82	97.90
0.3	0.15	0.45	0	327.225	6.301	97.9	
0.3	0.15	0.45	0	324.193	6.237	97.98	
0.9	0.45	1.35	0	316.334	16.068	111.33	111.34
0.9	0.45	1.35	0	324.67	16.487	111.36	
0.9	0.45	1.35	0	327.283	16.626	111.32	
1.5	0.75	2.25	0	331.768	20.466	152.78	152.80
1.5	0.75	2.25	0	334.845	20.652	152.81	
1.5	0.75	2.25	0	335.611	20.7	152.81	
3	1.5	4.5	0	220.649	75.026	55.44	55.45
3	1.5	4.5	0	231.667	78.731	55.47	
3	1.5	4.5	0	238.657	81.151	55.43	
4.5	2.25	6.75	0	64.481	96.797	18.84	18.84
4.5	2.25	6.75	0	68.283	102.447	18.85	
4.5	2.25	6.75	0	69.237	103.889	18.84	
6.1	3.05	9.15	0	23.632	100.548	9.01	9.05
6.1	3.05	9.15	0	23.298	98.376	9.08	
6.1	3.05	9.15	0	23.184	98.178	9.05	
9.1	4.55	13.65	2	5.182	123.463	2.4	2.42
9.1	4.55	13.65	0	5.153	120.944	2.44	
9.1	4.55	13.65	0	5.083	120.147	2.42	
15.2	7.6	22.8	1	3.862	118.777	3.11	3.13
15.2	7.6	22.8	1	3.901	118.739	3.14	
15.2	7.6	22.8	0	3.827	116.754	3.13	
21.3	10.65	31.95	2	5.891	122.304	6.45	5.13
21.3	10.65	31.95	8	3.794	111.536	4.55	
21.3	10.65	31.95	6	3.834	116.728	4.4	
27.4	13.7	41.1	1	5.08	157.113	5.57	5.63
27.4	13.7	41.1	1	4.854	153.491	5.44	
27.4	13.7	41.1	1	5.194	152.445	5.87	
33.5	16.75	50.25	3	6.526	226.271	6.07	6.13
33.5	16.75	50.25	0	6.418	219.725	6.15	
33.5	16.75	50.25	0	6.374	217.583	6.17	
39.6	19.8	59.4	0	7.385	233.875	7.86	7.86
39.6	19.8	59.4	0	7.216	227.779	7.88	
39.6	19.8	59.4	0	7.13	226.234	7.84	
45.7	22.85	68.55	0	5.016	154.2	9.34	9.26
45.7	22.85	68.55	2	5.166	159.517	9.3	
45.7	22.85	68.55	0	5.077	159.469	9.14	

VES 4B			SOIL RESISTIVITY SOUNDINGS WENNER METHOD				
'a' spacing (m)	Distance 'x' to potential probes (m)	Distance 'y' to current probes (m)	Deviation	Voltage (mV)	Current (mA)	Rho (ohm.m)	Average Rho (ohm.m)
0.3	0.15	0.45	0	304.375	4.586	125.12	125.14
0.3	0.15	0.45	0	307.748	4.636	125.12	
0.3	0.15	0.45	0	308.864	4.651	125.18	
0.9	0.45	1.35	0	321.945	12.183	149.43	149.41
0.9	0.45	1.35	0	322.978	12.223	149.42	
0.9	0.45	1.35	0	322.95	12.226	149.37	
1.5	0.75	2.25	0	326.596	18.689	164.7	164.64
1.5	0.75	2.25	0	338.218	19.363	164.63	
1.5	0.75	2.25	0	319.634	18.303	164.59	
3	1.5	4.5	0	347.164	31.95	204.82	204.98
3	1.5	4.5	0	342.208	31.435	205.2	
3	1.5	4.5	0	339.366	31.215	204.93	
4.5	2.25	6.75	0	127.996	74.461	48.6	48.63
4.5	2.25	6.75	0	124.064	72.219	48.57	
4.5	2.25	6.75	0	120.882	70.149	48.72	
6.1	3.05	9.15	0	33.185	73.519	17.3	17.17
6.1	3.05	9.15	0	31.691	70.974	17.11	
6.1	3.05	9.15	0	31.179	69.895	17.1	
9.1	4.55	13.65	2	3.84	89.123	2.46	2.41
9.1	4.55	13.65	1	3.697	88.995	2.38	
9.1	4.55	13.65	2	3.7	88.423	2.39	
15.2	7.6	22.8	3	1.926	61.512	2.99	3.26
15.2	7.6	22.8	9	2.066	61.756	3.2	
15.2	7.6	22.8	28	2.468	65.653	3.59	
21.3	10.65	31.95	1	3.5	122.595	3.82	3.89
21.3	10.65	31.95	0	3.529	120.487	3.92	
21.3	10.65	31.95	0	3.49	119.306	3.92	
27.4	13.7	41.1	0	2.54	79.723	5.48	5.43
27.4	13.7	41.1	0	2.543	80.52	5.44	
27.4	13.7	41.1	0	2.486	79.818	5.36	
33.5	16.75	50.25	2	2.413	82.038	6.19	6.09
33.5	16.75	50.25	1	2.416	84.416	6.02	
33.5	16.75	50.25	3	2.352	81.609	6.07	
39.6	19.8	59.4	12	1.559	57.14	6.79	7.16
39.6	19.8	59.4	3	1.65	56.253	7.3	
39.6	19.8	59.4	1	1.631	54.894	7.39	
45.7	22.85	68.55	2	2.883	101.857	8.13	7.85
45.7	22.85	68.55	0	2.613	97.726	7.68	
45.7	22.85	68.55	2	2.686	99.596	7.74	

NOTES/OBSERVATIONS

1. Depth plotting based on 0.75 x 'a' electrode spacing.

Project:

PHOENIX WHARF PORT TALBOT

Title:

VES 4 DATA

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Scale: NTS at A4

Drawn by/Ref: OP/7897/11

Date: 30 JUNE 2023

FIGURE 11

VES 5A			SOIL RESISTIVITY SOUNDINGS WENNER METHOD				
'a' spacing (m)	Distance 'x' to potential probes (m)	Distance 'y' to current probes (m)	Deviation	Voltage (mV)	Current (mA)	Rho (ohm.m)	Average Rho (ohm.m)
0.3	0.15	0.45	0	319.475	4.986	120.77	120.75
0.3	0.15	0.45	0	319.491	4.989	120.7	
0.3	0.15	0.45	0	317.323	4.953	120.77	
0.9	0.45	1.35	0	333.955	32.12	58.79	58.71
0.9	0.45	1.35	0	330.303	31.826	58.69	
0.9	0.45	1.35	0	328.5	31.678	58.64	
1.5	0.75	2.25	2	316.786	73.315	40.72	41.49
1.5	0.75	2.25	0	326.329	72.5	42.42	
1.5	0.75	2.25	2	315.263	71.902	41.32	
3	1.5	4.5	0	310.921	160.078	36.61	36.59
3	1.5	4.5	0	298.965	154.1	36.57	
3	1.5	4.5	0	290.948	149.923	36.58	
4.5	2.25	6.75	0	76.329	110.692	19.5	19.45
4.5	2.25	6.75	0	75.293	109.964	19.36	
4.5	2.25	6.75	0	75.579	109.706	19.48	
6.1	3.05	9.15	0	40.452	165.981	9.34	9.33
6.1	3.05	9.15	0	39.349	161.736	9.32	
6.1	3.05	9.15	0	39.085	160.658	9.32	
9.1	4.55	13.65	2	3.872	81.899	2.7	2.76
9.1	4.55	13.65	3	3.939	80.681	2.79	
9.1	4.55	13.65	0	3.862	79.179	2.79	
15.2	7.6	22.8	2	3.621	85.944	4.02	4.04
15.2	7.6	22.8	0	3.567	84.34	4.04	
15.2	7.6	22.8	0	3.57	83.896	4.06	
21.3	10.65	31.95	4	4.695	148.027	4.25	4.27
21.3	10.65	31.95	0	4.832	150.907	4.29	
21.3	10.65	31.95	0	4.807	150.722	4.27	
27.4	13.7	41.1	1	5.442	171.204	5.47	5.49
27.4	13.7	41.1	0	5.334	166.65	5.51	
27.4	13.7	41.1	0	5.296	165.747	5.5	
33.5	16.75	50.25	0	6.116	184.978	6.96	6.96
33.5	16.75	50.25	0	5.926	179.725	6.94	
33.5	16.75	50.25	0	5.916	178.514	6.98	
39.6	19.8	59.4	1	4.514	130.38	8.61	8.55
39.6	19.8	59.4	0	4.428	129.086	8.54	
39.6	19.8	59.4	0	4.4	128.905	8.49	
45.7	22.85	68.55	1	2.778	92.748	8.6	8.47
45.7	22.85	68.55	2	2.712	89.592	8.69	
45.7	22.85	68.55	1	2.511	88.806	8.12	

VES 5B			SOIL RESISTIVITY SOUNDINGS WENNER METHOD				
'a' spacing (m)	Distance 'x' to potential probes (m)	Distance 'y' to current probes (m)	Deviation	Voltage (mV)	Current (mA)	Rho (ohm.m)	Average Rho (ohm.m)
0.3	0.15	0.45	0	305.11	4.921	116.87	117.07
0.3	0.15	0.45	0	320.496	5.158	117.13	
0.3	0.15	0.45	0	342.004	5.5	117.22	
0.9	0.45	1.35	0	342.322	26.318	73.55	73.47
0.9	0.45	1.35	0	340.914	26.255	73.43	
0.9	0.45	1.35	0	338.921	26.099	73.43	
1.5	0.75	2.25	0	332.922	66.219	47.38	47.30
1.5	0.75	2.25	0	332.979	66.4	47.26	
1.5	0.75	2.25	0	332.855	66.393	47.25	
3	1.5	4.5	0	196.394	100.459	36.85	36.81
3	1.5	4.5	0	188.16	96.377	36.8	
3	1.5	4.5	0	185.201	94.884	36.79	
4.5	2.25	6.75	0	83.911	118.993	19.94	19.93
4.5	2.25	6.75	0	86.543	122.816	19.92	
4.5	2.25	6.75	0	86.19	122.239	19.94	
6.1	3.05	9.15	0	33.019	124.512	10.16	10.18
6.1	3.05	9.15	0	32.346	121.479	10.21	
6.1	3.05	9.15	0	36.507	137.727	10.16	
9.1	4.55	13.65	0	5.21	134.648	2.21	2.20
9.1	4.55	13.65	0	5.112	132.011	2.21	
9.1	4.55	13.65	0	4.975	130.735	2.18	
15.2	7.6	22.8	3	5.77	136.767	4.03	4.02
15.2	7.6	22.8	1	5.906	133.462	4.23	
15.2	7.6	22.8	5	5.183	129.859	3.81	
21.3	10.65	31.95	0	5.007	139.766	4.79	4.81
21.3	10.65	31.95	0	4.915	136.215	4.83	
21.3	10.65	31.95	0	4.851	135.037	4.81	
27.4	13.7	41.1	0	6.339	182.394	5.98	5.92
27.4	13.7	41.1	1	5.824	170.724	5.87	
27.4	13.7	41.1	0	6.037	175.54	5.92	
33.5	16.75	50.25	1	3.5	102.603	7.18	6.79
33.5	16.75	50.25	0	3.338	105.419	6.66	
33.5	16.75	50.25	1	3.29	105.821	6.54	
39.6	19.8	59.4	2	7.782	256.253	7.56	7.78
39.6	19.8	59.4	0	8.332	263.731	7.86	
39.6	19.8	59.4	0	8.408	263.922	7.93	
45.7	22.85	68.55	0	7.68	237.036	9.3	9.32
45.7	22.85	68.55	1	7.572	230.187	9.45	
45.7	22.85	68.55	0	7.334	228.725	9.21	

NOTES/OBSERVATIONS

1. Depth plotting based on 0.75 x 'a' electrode spacing.

Project:

PHOENIX WHARF PORT TALBOT

Title:

VES 5 DATA

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Scale: NTS at A4

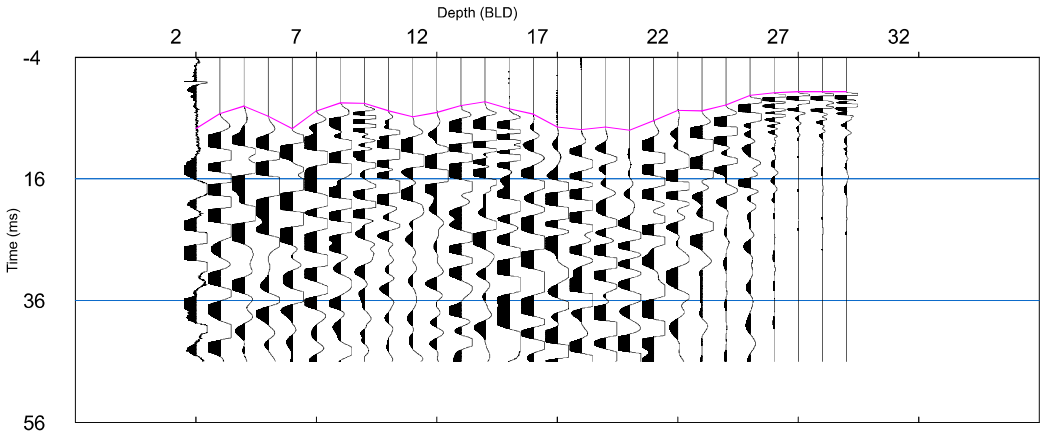
Drawn by/Ref: OP/7897/12

Date: 30 JUNE 2023

FIGURE 12

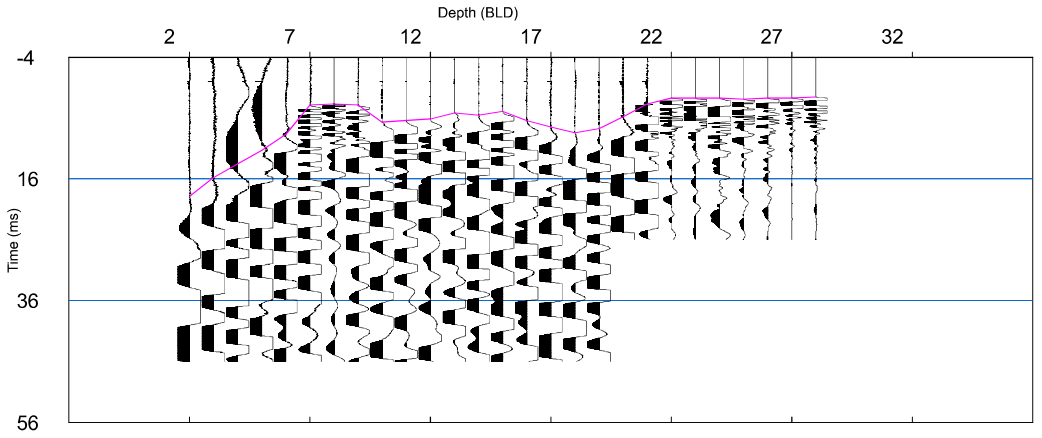
Appendices

Cross-Hole Survey (Panel 2): P-wave



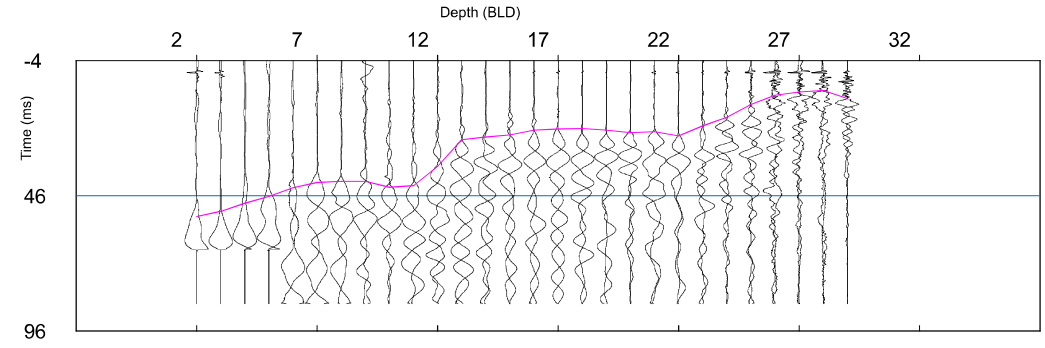
Compiled shot record for BH-CHST101A (source in BH-CHST101B)

Cross-Hole Survey (Panel 3): P-wave



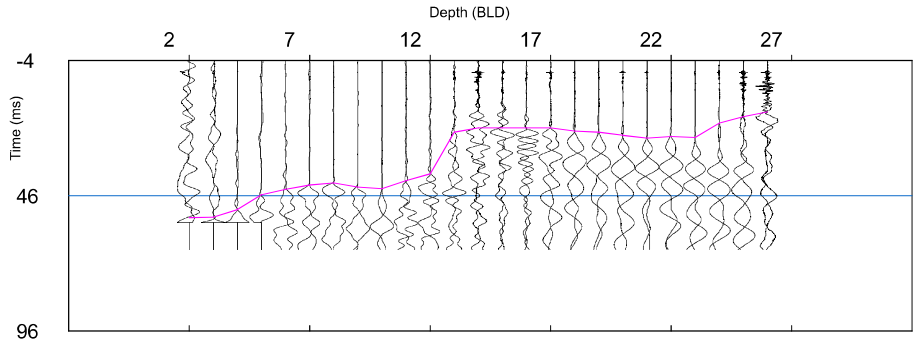
Compiled shot record for BH-CHST102C (source in BH-CHST102D)

Cross-Hole Survey (Panel 2): Sv-wave



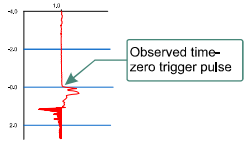
Compiled 'left' and 'right' polarity plot for BH-CHST101A (source in BH-CHST101B)

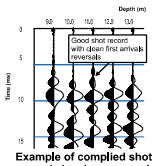
Cross-Hole Survey (Panel 3): Sv-wave



Compiled 'left' and 'right' polarity plot for BH-CHST102C (source in BH-CHST102D)

Any trigger issues or delays would prevent signal stacking (i.e. repeat hammer blows), degrade the seismic signal and cause misalignment of reversed shot signal.





Example of complied shot record showing reversed polarity S-wave arrivals

EXAMPLE SHOT RECORDS AND TRIGGER DESCRIPTION

PHOENIX WARF PORT TALBOT

Scale: NTS

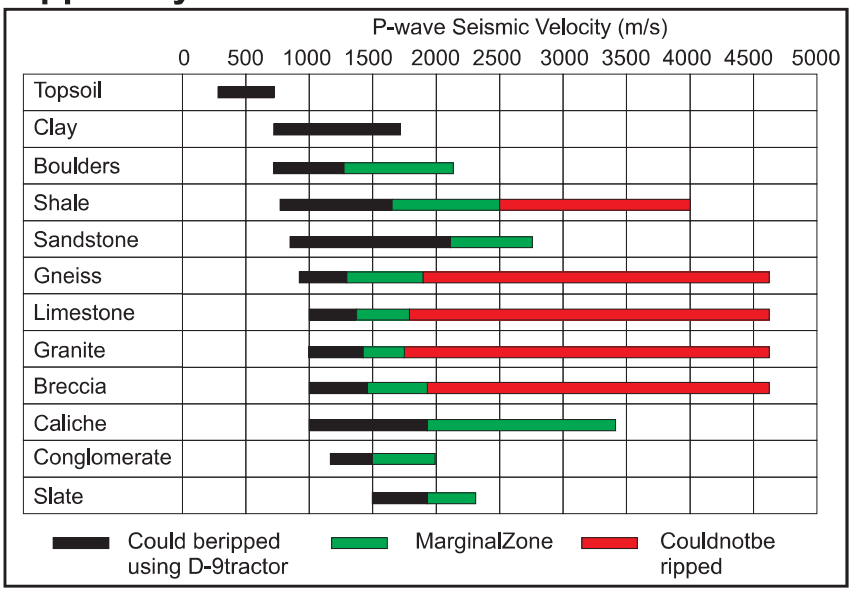
Drawn by/Ref: MB/7897/A1

Date: 20 JUNE 2023

TERRA DAT down to earth geophysics
Tel: +44 (0) 2920 700127

Appendix A1

Rippability Chart



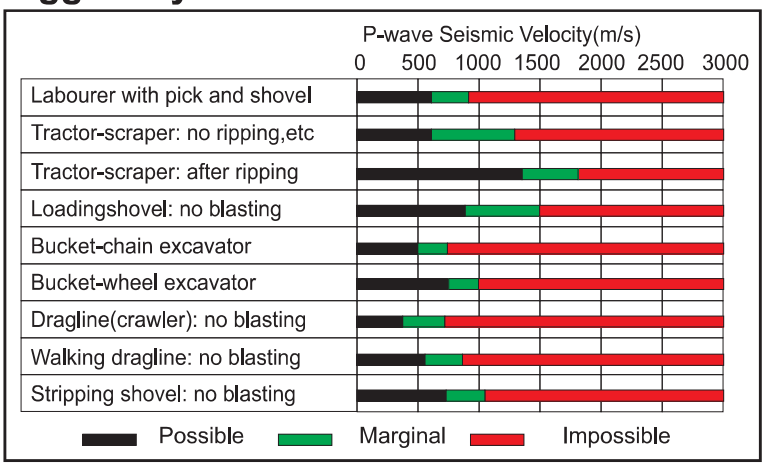
Ground preparation by ripping in open pit mining, Mining Magasine, 122, 458-469. Atkinson, 1970

Compressional P-wave velocity

Unconsolidated materials	***Vp (m/s)***
Sand (dry)	200 - 1000
Sand (water saturated)	1500 - 2000
Clay	1000 - 2500
Glacial till (water saturated)	1500 - 2500
Permafrost	3500 - 4000
Sedimentary rocks	
Sandstones	2000 - 6000
Tertiary sandstones	2000 - 2500
Pennant sandstone (Carboniferous)	4000 - 4500
Cambrian quartzite	5500 - 6000
Limestones	2000 - 6000
Cretaceous chalk	2000 - 2500
Jurassic limestones	3000 - 4000
Carboniferous limestones	5000 - 5500
Dolomites	2500 - 6500
Salt	4500 - 5000
Anhydrate	4500 - 6500
Gypsum	2000 - 3500
Igneous/Metamorphic rocks	
Granite	5500 - 6000
Gabbro	6500 - 7000
Ultramafic rocks	7500 - 8500
Serpentite	5500 - 6500
Other materials	
Steel	6100
Iron	5800
Aluminium	6600
Concrete	3600

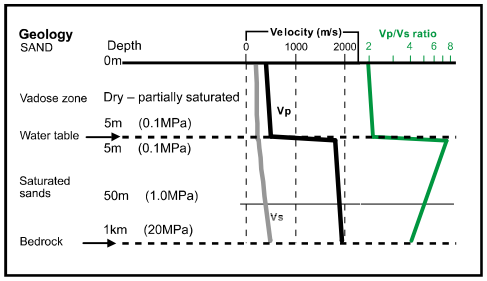
An introduction to Geophysical Exploration 3rd Ed.
Kearey, Brooks & Hill: 2002

Diggability Chart



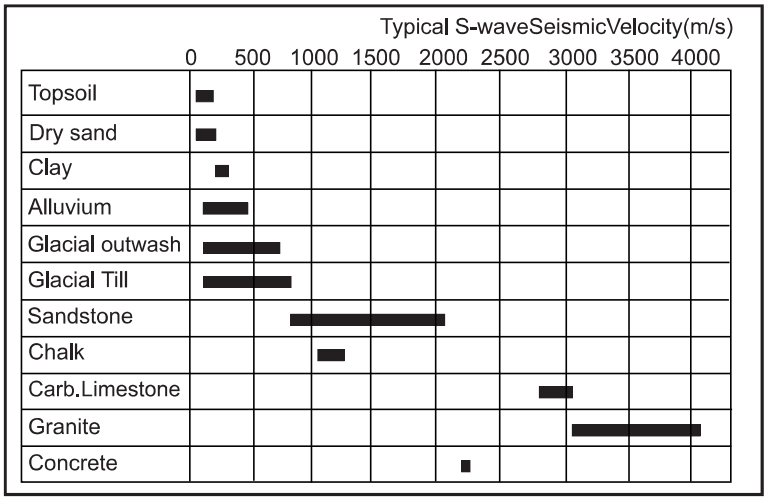
Selection of open pit excavation and loading equipment.
Transactions of the Institute of Mining and Metallurgy, 80, A101-A129, Atkinson 1971

Effect of ground water



Prasad et al., Measurement of velocities and attenuation in shallow soils, Near-Surface Geophysics Volume II Case Histories, SEG, Tulsa (2004)

Shear Waves



Rock / Soil Description (top 30m)	**S-wave velocity (m/s)**
Hard rock (*strong**)	> 1,500
Rock (*moderately strong**)	760 - 1,500
Very dense soil / soft (*weak**) rock	360 - 760
Stiff soil	180 - 360
Soft soil	<180

The NEHRP Recommended Provisions for seismic regulation for new buildings, (FEMA-222A and FEMA-223A, 1994)

** UK equivalent classification (Waltham, 1994)*

Applied Geophysics, Telford et al, 1990
Shear wave velocity determination of unlithified geologic materials (CUSEC region) Illinois State Geological Survey, Bauer, 2004.
Bauer et al., 2007, Illinois State Geological Survey.
Shear Wave Velocity, Geology and Geotechnical Data of Earth Materials in the Central U.S. Urban Hazard Mapping Areas.
An Introduction to Geophysical Exploration, 3rd Edition, Keary and Brooks, 2002.
Conceptual Overview of Rock and Fluid Factors that Impact Seismic Velocity and Impedance, Stanford Rock Physics Laboratory, n.d.

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Title: **Seismic Velocity Tables**

Project: **PHOENIX WARF PORT TALBOT**

Scale: NTS
Drawn by/Ref: MB/7897/B
Date: 20 JUNE 2023

APPENDIX B

Down-hole hydrophone array (DHA-7)

Technical Specifications

- Hydrophone Sensor Type: Proprietary Polymer
- Sensors per Group: One
- Group Interval: 1 m
- Number of channels: 24
- Frequency response: 10 Hz to 10,000 Hz ± 1.0 dB
- Capacitance: 5 nF at 22˚C
- Sensitivity: -197 dB re 1 Volt per 1 µPa
- Sensitivity with acceleration: < -70 dB re 1 Volt per g
- Preamplifier Type: Ultra-low noise differential
- Gain: 6 dB
- Current: 10 mA per channel
- Power: ±12V DC Model DHA Battery Pack on surface
- Outside diameter (hydrophone) 41.3 mm
  Length (hydrophone): 30.5 cm

Down-hole hydrophone array (MP-25)

Technical Specifications

- Hydrophone Sensor Type: Piezoelectric crystals
- Sensors per Group: One
- Group Interval: 1 m
- Number of channels: 24
- Natural Frequency: 10Hz
- Voltage Sensitivty: 11.2 Volts/Bar
- Impedance: 250ohms
- DC Resistance: 160ohms
- Outside diameter (hydrophone): 61 mm
  Length (hydrophone): 140 mm

Geostuff - wall-lock borehole geophones

Common Specifications

Number of geophones: 1 vertical and 2 horizontal in an X-Y-Z configuration

Natural Frequency: 15-Hz high-output omnidirectional is standard

Pressure rating: 300 meters (1000 ft) water depth, consult factory for deeper options

Clamp mechanism: DC motor. Requires 24 volts DC on surface (or more, depending on cable length). Requires ½ amp when moving spring (1 amp peak at clamping)

Expanded diameter: 18 cm (7 in) total diameter including probe body.

- **3-component tri-axial sensors**
- **Motor-driven clamp mechanism**
- **Fits in 2-inch (51-mm) boreholes**
- **Automatic orientation of horizontal geophones to any azimuth (Model BHG-3)**
- **Cable disconnects for convenient surface handling and extending depth**
- **Works in wet or dry holes**

BHG-2 Borehole Geophone

Diameter: 48 mm (1.9 in)
Length: 700 mm (27.5 in)
Weight: 2 kg (4 lb)

Cable

7-conductor, with two copper and 5 copperweld conductors, Kevlar-reinforced, polyurethane-jacket cable, with Reed Products SU-8 female connector molded on wet end.

BHG-3 Borehole Geophone

Diameter: 48 mm (1.9 in)
Length: 1.1 m (44 in)
Weight: 3.4 kg (7 lb)

Compass: fluxgate sensor, powered from same DC voltage as clamp mechanism.

Maximum inclination: +/- 90 degrees from vertical with standard 15-Hz sensors, much less with optional sensors.

Orientation Accuracy: better than 5 degrees

CROSS-HOLE TESTING SEISMIC RECEIVERS

PHOENIX WARF PORT TALBOT

Scale: NTS	Drawn by/Ref: MB/7897/C
TERRA DAT geophysical innovation	Date: 20 JUNE 2023
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Exploration Seismograph

Geode Specifications:

Configurations: 24 channels in weatherproof field deployable Geode module. Geode is operated from either Windows 98/NT4/ME/W2K/XP based laptop[1] or by Geometrics' ruggedized StrataVisor NZ field computer/seismograph. Basic operating software controls one Geode and can be optionally expanded to control multiple Geodes, do marine surveying, continuous recording, repeaters, sub-bottom profiling, VSP, GPS synchronization, blast and vibration monitoring and surveillance.

A/D Conversion: 24 bit result using Crystal Semiconductor sigma-delta converters and Geometrics proprietary over sampling.

Dynamic Range: 144 dB (system), 110 dB (instantaneous, measured) at 2 ms, 24 dB.

Distortion: 0.0005% @ 2 ms, 1.75 to 208 Hz.

Bandwidth: 1.75 Hz to 20 kHz. 0.6 and DC low frequency option available.

Common Mode Rejection: > 100dB at <= 100 Hz, 36 dB.

Crosstalk: -125 dB at 23.5 Hz, 24 dB, 2 ms.

Noise Floor: 0.20 uV, RFI at 2 ms, 36 dB, 1.75 to 208 Hz.

Stacking Trigger Accuracy: 1/32 of sample interval.

Maximum Input Signal: 2.8V PP, 0 dB.

Input Impedance: 20 kOhm, 0.02 uf.

Preamplifier Gains: Standard factory configuration is 24 and 36 db, selectable in software. Optionally, can be jumpered for software selectable 12 and 24 dB or can be jumpered in four channel blocks as a single fixed gain of 0 dB for high-voltage devices.

Anti-alias Filters: -3 dB at 83% of Nyquist frequency, down 90 dB.

Acquisition and Display Filters:
Low Cut: OUT, 10, 15, 25, 35, 50, 70, 100, 140, 200, 280, 400 Hz, 24 or 48 dB/octave, Butterworth.
Notch: 50, 60, 150, 180 Hz and OUT, with the 50 dB rejection bandwidth 2% of center frequency.
High Cut: OUT, 32, 64, 125, 250, 500 or 1000 Hz, 24 or 48 dB/octave.

Sample Interval: 0.02, 0.03125, 0.0625, 0.125, 0.25, 0.5, 1.0, 2.0, 4.0, 8.0, 16.0 ms.

Correlation: Optional high-speed hardware correlator available in each Geode for fast cycle time with vibrators and pseudo-random (MiniSosie) sources[2]. Correlates 16K record, unlimited channels in under 1 sec.

Record Length: 16,384 samples standard

Pre-trigger Data: Up to full record length.

Delay: 0 to 100 sec in steps of 1 sample interval.

Data Transmission: Uses Ethernet transmission standard over CAT 5 copper or multimode fiber-optic cable. Distance between boxes: CAT 5 cable up to 0.25 km; fiber-optic cable up to 1.5 km.

Optional Built-In Test Functions

Digital:
- CPU diagnostics
- Internal network test
- Digital functions
- Battery Warning

Instrument:
- Noise
- DC Offset
- Gain Accuracy
- Gain and Phase Similarity
- Distortion
- Crossfeed
- Bandwidth
- Timing Accuracy

Line:
- Noise
- Geophone similarity
- Disconnected phones

Auxiliary Channels: All Geode channels can be programmed as either AUX or DATA. Fixed data and aux channels available in StrataVisor NZ.

Roll Along: Built-in, no external roll box required

Line Testing: Real time noise monitor displays real-time output from geophones. Optional geophone pulse test helps identify bad geophones and shorted or broken cables[2].

Instrument Tests: Optional built-in daily, weekly and monthly testing available[2]. External laboratory quality test system available to measure noise, crosstalk, dynamic range, gain similarity and trigger accuracy to factory specification.

Data Formats: SEG-2 standard. SEG-D and SEG-Y available[2].

System Software:
Basic operating software includes full compliment of acquisition, display, plotting, filtering and storage features.
Other functions available as options to control multiple Geodes, add additional preamp gains, high-speed correlation, expanded record length, tape writing, geophone pulse test, expanded test and diagnostics, roll along capability, marine surveying, sub-bottom profiling, blast and vibration monitoring, continuous recording and surveillance.

Bundled Applications Software:
- SIPQC delay time refraction software from Rimrock Geophysics
- SeisImager/2D Lite refraction analysis software from OYO
- WinSeis Lite reflection processing software from Kansas GS.

Upgrades of SeisImager/2D are available; please contact the factory with your requirements.

Data Storage: Stores data locally in SEG2 on laptop/PC media.

Plotters: Drives a variety of Windows™ compatible printers including Printrex 4, 8 and 12 inch plotters. Consult factory.

Triggering: Positive, negative or contact closure, software adjustable threshold. Will self-trigger on continuous data using threshold detecting STA/LTA-like algorithm.

Power: Requires 12V external battery. Uses 0.65 W/channel during acquisition, sleep mode reduces power consumption by 70% while in standby.

Environmental: -30 to 70 degrees C. Waterproof and submersible. Withstands a 1 m drop onto concrete on 6 sides and 8 corners. Passes MIL810E/F vibration.

Physical: 10"L x 12"W x 7"D (25.4cm L x 30.5cmW x 17.75cmD). Weighs 8 lb. (3.6 kg). Uses waterproof Bendix 61 pin connector for geophone input.

Operating System: Windows 98/ME/NT4/W2K/XP.

Warranty: Three year standard, extended warranty available.

1- **Most laptop computers are NOT field devices.** They are easily damaged by harsh treatment or exposure to extreme environments Geometrics StrataVisor NZ/Cs designed to operate in harsh conditions for extended periods and should be used with the Geode for surveys where reliability is important.

- **Multi-purpose seismic recorder: refraction, reflection, earthquake monitoring, VSP, blast and vibration measurements, marine surveys, sub-bottom profiling and continuous recording**
- **Data transmitted from Geode to host computer digitally, reducing long, expensive analog cables**
- **24-bit dynamic range, low distortion and built-in geophone[2] and line testing[2], noise monitor**
- **20 kHz bandwidth provides ultra-high resolution or low frequencies for earthquake monitoring**

CROSS-HOLE TESTING SEISMOGRAPH

PHOENIX WARF PORT TALBOT

Scale: NTS | Drawn by/Ref: MB/7897/D

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Appendix D

Appendix I

CPT Report -
Cone Penetration Testing Seismic Testing Parameter Interpretation

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PORT TALBOT

SOIL INVESTIGATION

CPT REPORT

Cone penetration testing
Seismic testing
Parameter interpretation

Project Reference.: P-108298-10

Report Issue No.: 01 P-108298_01

PROJECT:	Port Talbot

CLIENT:	TEC

FIELDWORK

CPT rig(s)	17.9-tonne track-truck mounted CPT unit (UK20)
Date fieldwork started	26th April 2023
Date fieldwork completed	27th April 2023
Lankelma's representative	Emma Stickland
Client's representative	Richard Evans

DOCUMENT CHECKING

Action	Date	Name
Completed	02/05/2023	Christopher Player
Checked	02/05/2023	Joseph Hobbs
Approved	02/05/2023	Joseph Hobbs

Issue	Date	Status
01_01	02/05/2023	Final

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1 INTRODUCTION

At the request of TEC, a soils investigation was carried out on project *Port Talbot*.

Site location:

(In the general region of)

Phoenix Wharf
Port Talbot
SA13 1RA

2 DISCLAIMER

The investigation information, raw data and interpretations provided in this report are for the sole benefit of the Client identified at the front of the report.

Lankelma has exercised reasonable skill and care in the fieldwork and preparation of this report. This report has been completed based on information available to Lankelma at the time of preparation. The measurement and interpreted data in this report do not constitute recommendations for design purposes. An appropriately qualified person must review and interpret the data given in this report, together with any assumptions we have made that affect the data, before using the data for design or recommendation. Lankelma accepts no responsibility for the accuracy or suitability of any assumptions, derived soil parameters, soil classification descriptions or soil layer boundaries contained in this report.

3 COMPLETED WORKS

- 4 nr. seismic cone penetration tests with pore pressure measurement (CPTu)
- Factual report including point data interpretation of selected parameters

Appendix A contains tabulated details of the works completed together with analysis results where applicable.

4 FIELDWORK GENERAL

Fieldwork was performed with a 17.9-tonne track-truck mounted CPT unit (UK20) equipped with a 17.5-tonne capacity hydraulic ram set.

The Client was responsible for the positioning and re-survey of all investigative locations.

The target depth for the investigation was 30 m below ground level. Table 3 details the final test depths and reasons for test termination (*refusal factor).* Where required, each penetration refusal decision was verbally confirmed with the Client's on-site representative.

5 CONE PENETRATION TESTS

Cone penetration testing was carried out in general accordance with BS ISO 22476-1:2012.

Penetrometer measurements included cone tip resistance, friction sleeve resistance and dynamic pore water pressure sampled at a 10 mm resolution.

Penetrometers were calibrated in accordance with ISO 376:2011. The management of calibration records is in accordance with ISO 10012. Copies of all calibration certificates for the cones used are provided in Appendix B.

The penetrometer used was a digital model (down-hole digitisation) with internal measurement of load cell temperature. The temperature data was used for QA during the test and QC during processing. The test operative aimed to keep the rate of temperature change to less than 0.5°/min in low strength soils to maintain acceptable measurement error. The temperature data can be used to assess ground temperature at depths where the cone has paused for more than 10 minutes with an accuracy of ~+- 0.5°.

The piezometer filter element was in the u_2 position and was vacuum saturated in a > 99.9% vacuum under 1000 cSt silicone oil for > 7 days prior to mobilisation. The pore pressure system was vacuum saturated in the disassembled state under 500 cSt glycerine oil (dipropylene glycol or propylene glycol) and assembled under oil prior to each test.

5.1 GLOSSARY OF CPT TERMS AND SYMBOLS

SYMBOLS & ABBREVIATIONS

B_q	**Pore pressure ratio.** The net pore pressure normalized with respect to the net cone resistance: $B_q = (u_2 - u_0)/(q_t - \sigma_v)$
F_r	**Normalised friction sleeve resistance:** $F_r = f_s / (q_c - \sigma_v)$
f_s	**Friction sleeve resistance:** The total frictional force acting on the friction sleeve, F_s, divided by its surface area A_s: $f_s = F_s/A_s$.
G	**Shear modulus**
g	**Gravitational constant:** g **=** 9.81 m/s^2
G_0	**Small strain shear modulus**
Gs	**Specific gravity of solids**
HOC	**Heavily overconsolidated**
I_c	**Soil Behaviour Type Index:** Continuous numerical representation of Robertson (1990) soil behaviour type classification chart.
LOC	**Lightly overconsolidated**
NC	**Normally consolidated**
OC	**Overconsolidated**
q_c	**Cone resistance:** The total force acting on the cone Q_c, divided by the projected area of the cone, A_c: $q_c = Q_c/A_c$.
Q_t	**Normalised cone resistance** (Method 1): $Q_t = (q_c - \sigma_v)/\sigma'v$

q_t	**Corrected tip resistance:** The cone tip resistance q_c corrected for pore water pressure effects on the cone shoulder.
$q_{t\text{-}net}$	**Net cone resistance:** $q_{t\text{-}net} = q_t - \sigma_v$. Where q_t is unavailable q_c is applied.
q_{t1}	**Normalised cone resistance** (Method 2): $q_{t1} = (q_t)/(\sigma'_v)^{0.5}(\frac{q_t}{\sigma_{atm}})/(\frac{\sigma_{v0}'}{\sigma_{atm}})^{0.5}$
R_f	**Friction ratio:** The ratio, expressed as a percentage, of the sleeve friction, f_s, to the cone resistance, q_c, at a given depth: $R_f = (f_s/q_c) \cdot 100$
SBT or SBTn	**Soil behaviour type classification**
SPT	**Standard Penetration Test**
u_0	**Equilibrium pore pressure**
u_2	**Pore pressure:** Dynamic pore pressure measured at the shoulder position (u_2) during penetration and during dissipation tests. $u_2 = \Delta u_2 + u_0$
Δu_2	**Excess pore pressure:** $\Delta u_2 = u_2 - u_0$
V_s, V_p	**Shear wave velocity, V_s, and pressure wave velocity, V_p.** Measured with use of a seismic receiver.
z	**Depth below ground level:** Depth as penetration length without correction for inclination, or true depth after correction for inclination.

Greek

γ	**Unit weight of soil**
γ_w	**Unit weight of water**
ρ	**Volumetric mass density (or specific mass) of soil:** $\rho = \gamma/g$
σ_v	**Total overburden stress**
σ'_v	**Effective overburden stress**
σ_{atm}, **or,** P_a	**Reference atmospheric stress:** σ_{atm} **=** 101.3 kPa

TERMS

Cone or 'tip': The conical tip of the cone penetrometer.

Friction sleeve: The section of the cone penetrometer upon which the sleeve friction is measured, located behind the cone tip.

Piezocone: A cone penetrometer with a pore pressure sensor (u_2 or u_1)

Seismic cone: A cone penetrometer with a seismic receiver incorporated inside or behind.

Dynamic pore pressure: The pore pressure measured during penetration (u_2 or u_1) .

Soil behaviour type, or 'SBT': Soil classification scheme or classified soil type according to Robertson (1990, 2016) often abbreviated to SBT or according to normalised cone parameters SBTn.

Rod string: The series of hollow tube push rods that transmit force to the penetrometer.

5.2 CPT DATA REDUCTION AND PRESENTATION

The CPT results are presented in Appendix C. The corrected cone resistance (q_t), local side friction (f_s), dynamic pore water pressure (u_2), friction ratio (R_f) and inclination are all presented against depth and elevation in accordance BS ISO 22476-1:2012. CPT data and the associated derived geotechnical parameters are included in the 4.0 data file provided.

The cone tip and sleeve force measurements were converted to pressure using the nominal dimensions of the penetrometer.

Zero load output values were recorded before and after each test. The set of zero values applied to the measurements (subtracted from the raw output measurement) were those deemed to be obtained at a temperature closest to ground temperature, or the average of the two sets where appropriate.

For tests performed with digital cones, the tip sleeve and pore pressure measurements were corrected for static and transient temperature effects using parameters obtained from the *TEMPERATURE EFFECTS* section of the calibration certificate. For each CPT, the dataset was first grouped into penetration strokes (max 1.2 m) and then locally sub-grouped by tip resistance above and below 2 MPa. For each sub-group of qc < 2 MPa, the slope of the temperature (T) profile with time (t) was determined by regression to obtain the rate of temperature change $\Delta T/\Delta t$. For each recorded value, the static and transient temperature error component (apparent sensor output due to change in temperature) was subtracted from the reading.

For subtraction type cones incorporating traditional temperature compensation wiring in the strain gauge circuit, the residual apparent cone tip resistance ($q_{c:a}$) and sleeve resistance ($f_{s:a}$) due to static and transient temperature effects can be approximated by

$$q_{c:a} = a(\Delta T/\Delta t) + b(\Delta T),$$

$$f_{s:a} = a(\Delta T/\Delta t) + b(\Delta T) - q_{c:a}$$

and

$$u_a = b(\Delta T)$$

Where $q_{c:a}$ is the apparent tip resistance, $f_{s:a}$ is the apparent sleeve resistance, a is the apparent resistance due to unit transient temperature change $\Delta T/\Delta t$, and b is the change in apparent resistance per unit static temperature change relative to the temperature of the penetrometer at the time of zero load output measurement. Note that for the piezometer sensor only the static temperature component is considered and is only applied to piezometer sensors without temperature compensation circuitry.

Parameter a is established by subjecting the cone to a positive and negative nominal temperature change (ΔT ~ +- 9°) in water and measuring the apparent output corresponding to the maximum rate of temperature change at the load cells. Parameter b is established by measuring the apparent output after the cone has temperature stabilised.

The temperature corrected tip ($q_{c:c}$), sleeve resistance ($f_{s:c}$) and pore pressure ($u_{:c}$) are then found from

$q_{c:c} = q_{c:m} - q_{c:a,}$

$f_{s:c} = f_{s:m} - f_{s:a}$

$u_{:c} = u_{:m} - u_{:a}$

Where subscript '$_{:m}$', denotes the field measured resistance/pressure as recorded in the raw data files.

Notes:

1. Depending on the temperature performance of the individual cone, temperature correction of the sleeve is often not warranted as it does not substantially improve accuracy. This is because for subtraction type cones the errors in the sleeve force largely cancel with errors in the tip force when they have the same sign.

2. There is currently no recognised nomenclature for CPT parameters with temperature correction applied during post processing. To avoid confusion the nomenclature is kept unchanged in the logs and AGS data (q_c/q_t, f_s, and u_2) and unless stated otherwise, temperature correction has been applied using the parameters reported in the calibration certificate.

For piezocone tests the total cone resistance (or 'corrected cone resistance') was calculated according to the formula

$$q_t = q_c + u_2 \times (1 - a)$$

Where a is the 'area ratio' and (1- a) is the proportion of cross-sectional area between the cone tip and penetrometer body where pore pressures (positive or negative) can act to add or subtract from the total external axial force on the tip. The difference between measured and corrected values is largest in low strength collapsible soils with large excess pore pressures. The percentage adjustment is described by the curves on the chart below for a = 0.8:

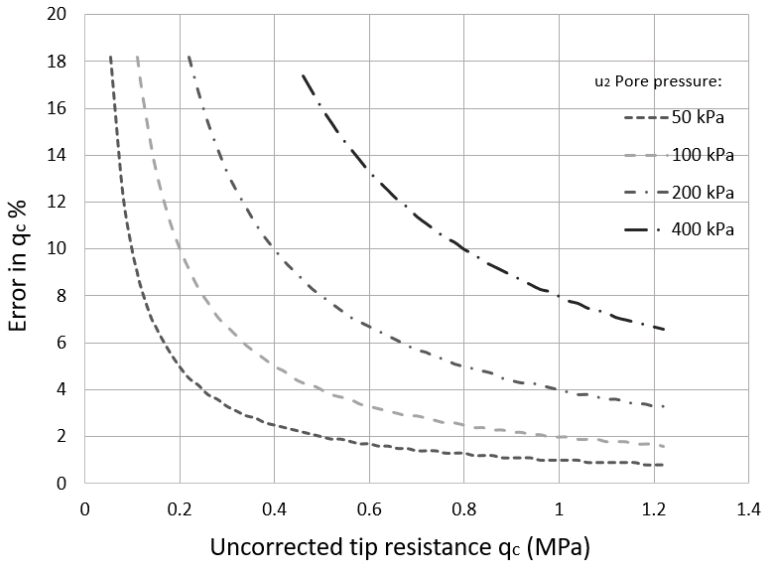


Figure 5-1 Uncorrected tip with measured tip resistance

Penetration length readings were corrected for inclination and sleeve readings were depth corrected for the dimensional offset between cone tip and sleeve during post processing. Rod spikes (artefacts of the pause for push rod addition) were filtered from the cone tip and sleeve data and replaced with an interpolated value. The data was re-sampled from 10 mm resolution to 20 mm to reduce the size of the data set to a more manageable size for end users. A 20 mm resolution is well within the intrinsic influence zone of the cone tip measurement and the loss of meaningful resolution is negligible.

The raw data is presented in Appendix C. For piezocone tests q_t is reported on all logs, and q_c only appears in the digital AGS data.

Geotechnical parameters appropriate for drained and undrained cone penetration conditions were derived for corresponding drained and undrained derived soil behaviour types (SBTs) respectively, however, to account for uncertainty in the SBT correlation with drainage behaviour, all parameters were derived over a range of transitional soils within the range $2.4 < Ic < 2.7$ (see section 6.3).

In general, the engineering parameters derived for fine grain soils (undrained) are suitable for soils of both silicate and carbonate composition, whereas parameters derived for coarse soils are intended for non-cemented silicate composition.

5.3 IN-SITU STRESS CONDITIONS

An estimate of the equilibrium pore pressure and total and effective vertical stress states is required for derivation of most soil parameters obtained from the CPT and dissipation test.

The total vertical stress with depth was calculated as the sum of the derived soil unit weight above a given depth. See section 5.4 for information on the empirical estimate of soil unit weight.

The depth of the phreatic surface applied in the calculation of effective stress was estimated for each location based on interpretation of piezocone measurements in drained soils and/or the final pressure of dissipation tests which proceeded to equilibrium pressure. The project average piezometric depth (or elevation if available) was applied to locations without direct measurements.

Note: The term phreatic surface is used here, however when it is based on piezometer measurements (piezocone) it is assumed that the piezometric level (under hydrostatic conditions) and phreatic surface coincide. The phreatic or piezometric level reported is intended to provide information about pore pressure distribution assumed for calculation purposes and may not represent the true position of the groundwater table or perched water bodies. Complex groundwater pressure distributions will be applied if they are observed from the measurements and are sufficiently well defined.

5.4 SOIL UNIT WEIGHT

The soil unit weight was estimated using the following method proposed by Robertson (2010b).

$$\frac{y}{y_w} = 0.27\,Log(R_f) + 0.36\,(Log(q_t/R_f)) + 1.236$$

Throughout pre-drilled zones (inspection pits or drill-out) the soil was assigned a nominal unit weight of 17 kN/m^3.

For depths where the friction sleeve resistance measurement was less than zero due to measurement limitations, the friction sleeve resistance input parameter was substituted with a nominal 1.0 kPa resistance for the purpose of obtaining an approximate soil unit weight necessary for estimation of total vertical stress over the entire profile.

5.5 SOIL BEHAVIOUR TYPE

The data have been interpreted using 4 soil behaviour type schemes: Robertson (1990, 2010, 2016) and Schneider et al, 2008. The Robertson (1990) scheme is widely used and forms the bases of the layer analysis whereby the profile is split into zones of common classification. The Robertson (2010 & 2016) and Schneider at al methods are less widely used but can provide better or more relevant classification in many instances. Differences in classification between the Robertson 1990, 2016 and Schneider et al schemes can also help to identify significant structure/cementation (Robertson 2016).

A dedicated soil behaviour type comparison log is provided in Appendix D.

Robertson (1990, 2010)

The soil behaviour type (SBT) was interpreted using the Robertson (1990) classification system based on the normalised cone resistance (Qt) and normalised friction sleeve resistance (Fr) for silicate and organic soils.

While the classification based on normalised parameters is more accurate, particularly for NC soils exceeding 15 m depth, the classification is often significantly in error (artificially granular/drained) at shallow depth (< 1-3 m). The error at shallow depth is associated with the potentially large difference between the estimated vertical effective stress (applied in normalisation) and the unknown horizontal stress influencing penetration resistance.

Robertson (2010) proposed a non-normalised version of the 1990 chart which uses dimensionless cone resistance (q_c/Pa) and friction ratio (Rf). The classification according to this chart can be more reliable at shallow depth.

It should be noted that:

- The SBT classification provides a general soil type and tends to show biased towards the soil fraction that dominates the mechanical behaviour.
- If fine cohesive soils are dry and overconsolidated, the classification tends to shift towards a coarser soil type (or lower I_c index)

While the repeatability and behavioural bias of the SBT is usually beneficial, the classification is not always an appropriate substitute for classification based on particle size and plasticity index tests.

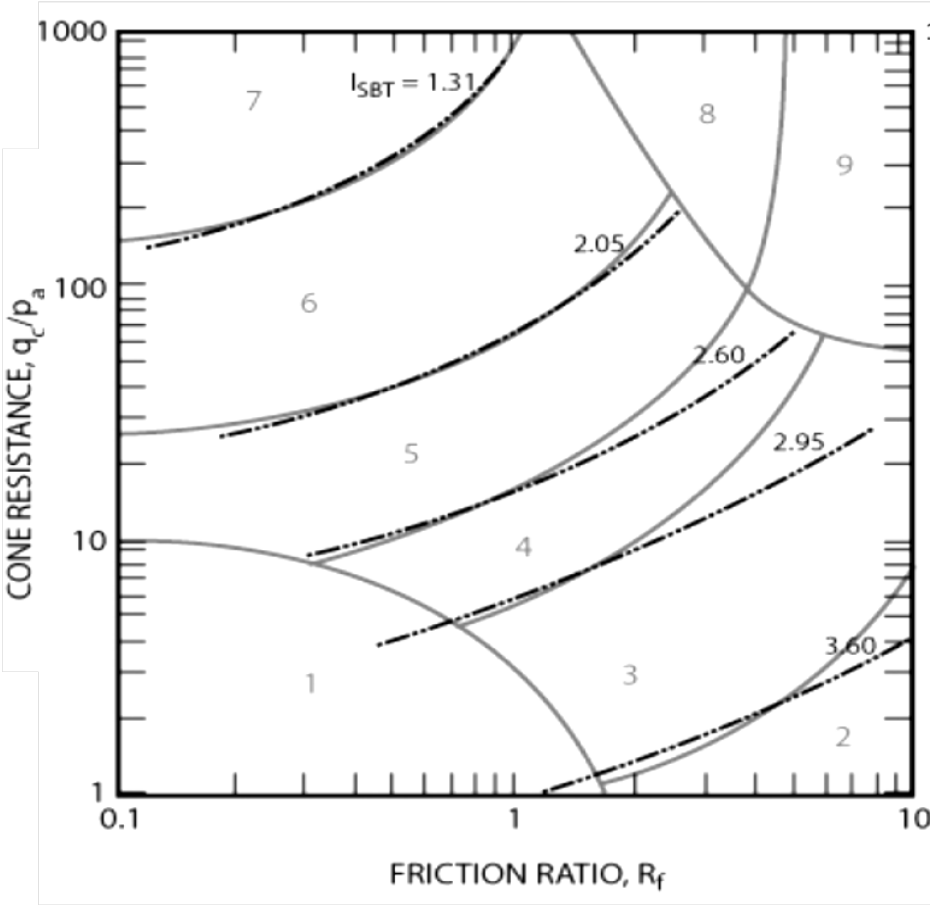


Figure 5-2 Non-normalised SBT chart by Robertson et al. (2010) based on dimensionless cone resistance (qc/Pa) and friction ration, Rf, showing contours of SBT index ISBT (denoted Ic on the test plots). The chart is also applicable to normalised tip (Q_t) and sleeve (F_r) values.

Table 1 Robertson (1990, 2010) soil behaviour type zone descriptions

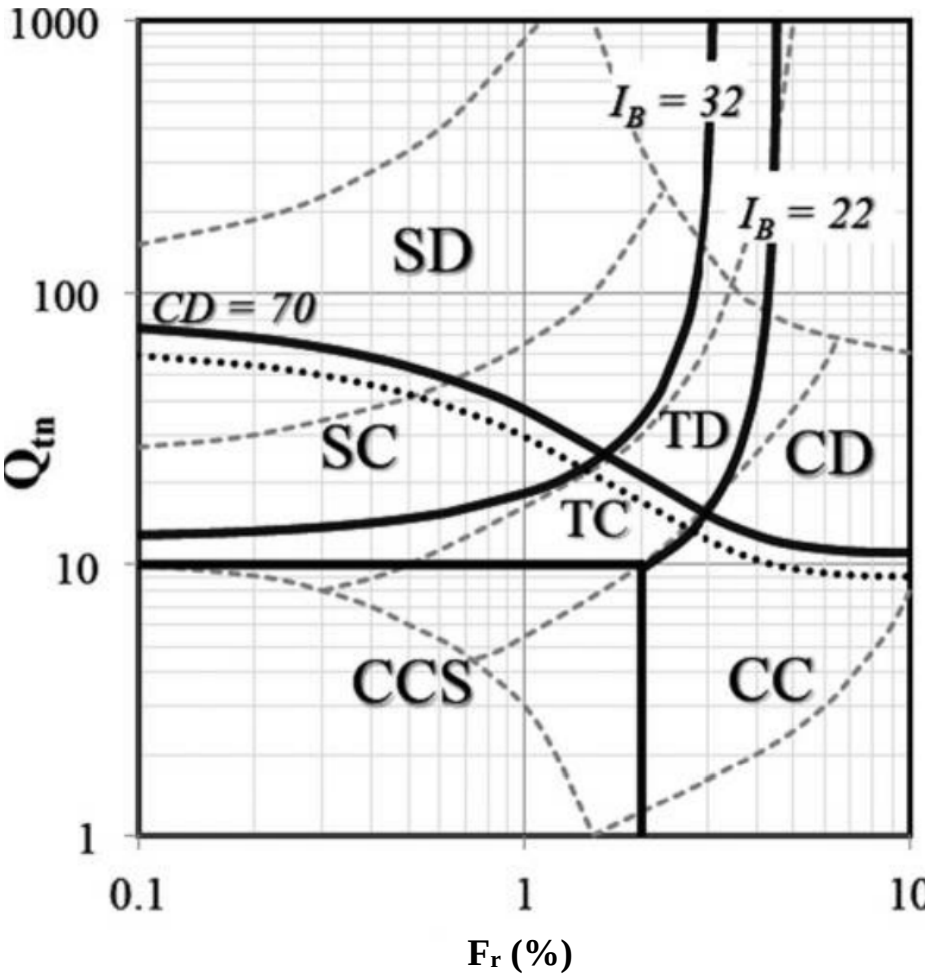
Zone	Soil Behaviour Type (SBT)		
1	Sensitive fine-grained	6	Sands - clean sand to silty sand
2	Organic soils	7	Gravelly sand to sand
3	Clays – clay to silty clay	8*	Very stiff/dense sand to clayey sand[1]
4	Silt mixtures - clayey silt to silty clay	9*	Very stiff fine grained[1]
5	Sand mixtures – silty sand to sandy silt	*Heavily overconsolidated or cemented*	

[1]Note zones 8 and 9 appear as *'Very stiff/dense sand to clayey sand – HOC or cemented'* and *'Very stiff fine grained – HOC or cemented'* within the soil unit descriptions of plots in Appendix D.

Results are presented in Appendix D.

Robertson 2016

Using the same Q_t - F_r space as above, Robertson (2016) proposed an alternative purely behavioural classification system that places less emphasis on classification according to composition/textural properties and more emphasis on mechanical behaviour – namely the tendency of the soil to dilate or collapse during large strain shear, and sensitivity.



Zone	Soil Behaviour Type (SBT)
CCS	Clay-like – contractive - sensitive
CC	Clay-like – Contractive
CD	Clay-like – Dilative
TC	Transitional - Contractive
TD	Transitional - Dilative
SC	Sand-like - Contractive
SD	Sand-like - Dilative

Figure 5-3 Robertson 2016 soil behaviour type classification chart and zone descriptions

Schneider *et al.* (2008)

Schneider *et al.* (2008) proposed a classification system based on the normalised pore pressure B_q and tip resistance Q_t. This system is particularly useful for soils of very low strength or that exhibit drainage behaviour or u_2 response inconsistent with the SBT derived from tip and sleeve measurements. However, when using this method for onshore CPT data, the u_2 piezometer response should be assessed for possible desaturation. Generally, it is safest to only use this method when the piezometer response is 'spikey' and responding dynamically to changes in tip resistance.

A set of logs showing both the Robertson and Schneider et al. classification results are provided for comparison in Appendix D.

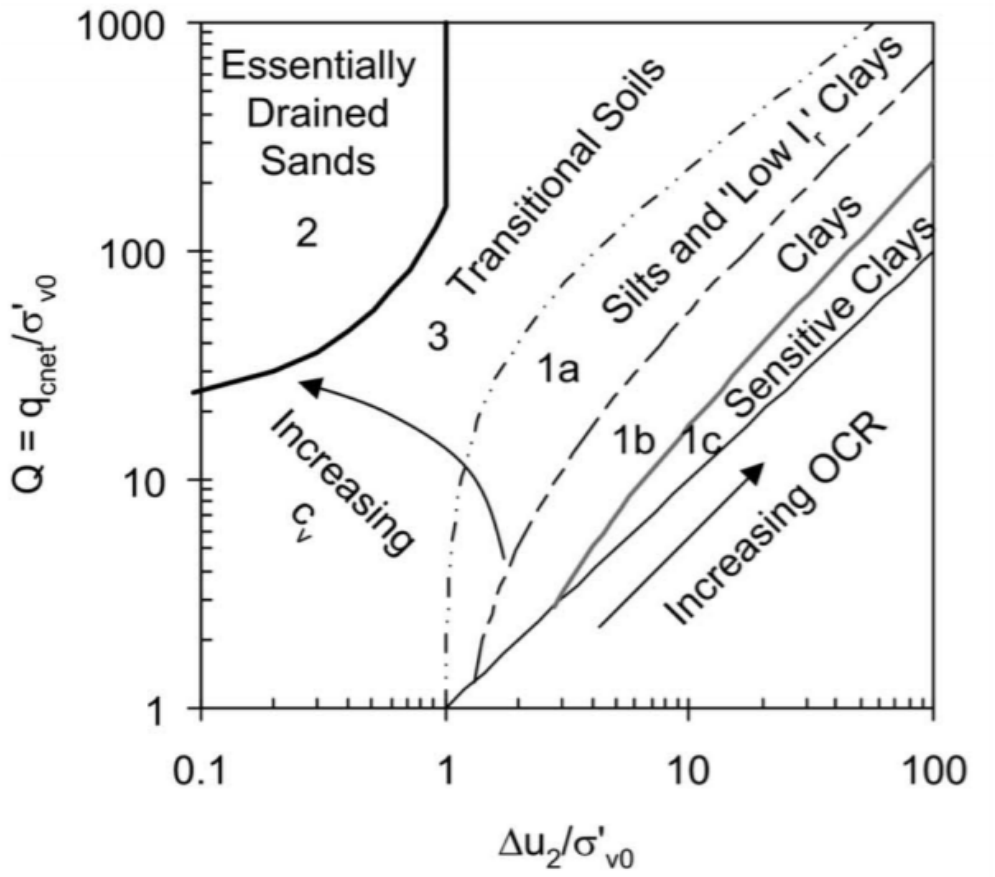


Figure 5-4 Schneider 2008 soil behaviour type classification chart and zone descriptions

Layer Analysis

The layer boundaries are manually interpreted based on broad changes in Robertson 1990 SBT classification or variance with depth. Once layer boundaries are defined, the SBT zones classified within each layer are listed together with the corresponding percentage of data points within the layer (excluding null/filtered data). The modal classification is reported in full, with abbreviated short descriptions for all secondary zones, for example - '*Clays – clay to silty clay [74%]; *Silt mixtures [20%]*', where the asterisk represents an abbreviation of the full description '*Silt mixtures – clayey silt to silty clay*'. It is important to consider that the classification zone boundaries do not exist in nature and small shifts in the cone response can lead to multiple classifications within layers of relatively uniform behaviour; especially were the layer data plot close to a zone junction and/or has spurious spikes or very thin layers. Therefore, some system is required to limit the number of classified zones that appear within each layer description. The following logic has been used to only retain high % constituent classification values:

For LT >= 1, C = 85
For 0.5 <= LT < 1, C = 75
For 0 < LT < 0.5, C = 65

Where
C = Minimum % SBT zone classification coverage within the layer description text
LT = Layer thickness (m)

For layers having a thickness of less than 1 m, 10% of data at the top and bottom of the layer are excluded to limit the effect of transition zone data (measured resistance influenced by overlying or underlying strata) being included in the classification.

The continuous SBT index I_c should be used to assess the classification distribution and variation not accounted for by the layer description.

5.6 SOIL BEHAVIOUR TYPE INDEX - I_c

The principal trend in soil behaviour type (SBT) variation can be expressed by a continuous index, I_c, proposed by Robertson and Wride (1998) based on a similar index proposed by Jefferies and Davies (1993). The index provides a continuous profile of SBT variation with depth for end-user analysis of soil units and variation within units. The equivalent non-normalised version proposed by Robertson (2010) is provided for comparison.

The basis of I_c and its approximation of the original chart classification zones may be seen from Figure 5-2. The method does not identify zones 1 (*sensitive fine grained)* or zones 8 & 9 (*heavily overconsolidated or cemented*).

Normalised SBT index I_c (Robertson and Wride, 1998)*:*

$$I_c = [(3.47 - \log Q_t)^2 + (logF_r + 1.22)^2]^{0.5}$$

Non-normalised SBT index I_c (Robertson, 2010)*:*

$$I_c = \left[\left(3.47 - \log\left(\frac{q_c}{\sigma_{atm}}\right)\right)^2 + (logR_f + 1.22)^2\right]^{0.5}$$

The normalised version of I_c is generally more accurate, while the non-normalised version is intended for compatibility with the non-normalised Robertson's (2010) SBT chart and may be more accurate at shallow depths in overconsolidated soils.

The results are presented in Appendix D.

5.7 RELATIVE DENSITY

The relative density of sands was calculated based on an empirical relationship proposed by Jamiolkowski *et al.* (2001) based on a large database of undisturbed frozen samples and calibration chamber tests. The expected accuracy may be evaluated from the figures presented below.

$$D_r = 100\left[0.268 \cdot \ln\left(\frac{q_t/\sigma_{atm}}{\sqrt{\sigma_{vo}'/\sigma_{atm}}}\right) - k\right]$$

k = Compressibility dependant constant can be taken as -0.675 for medium compressibility (applied value in our interpretation), <= 1 for high compressibility and >= 2 for compressible sands.

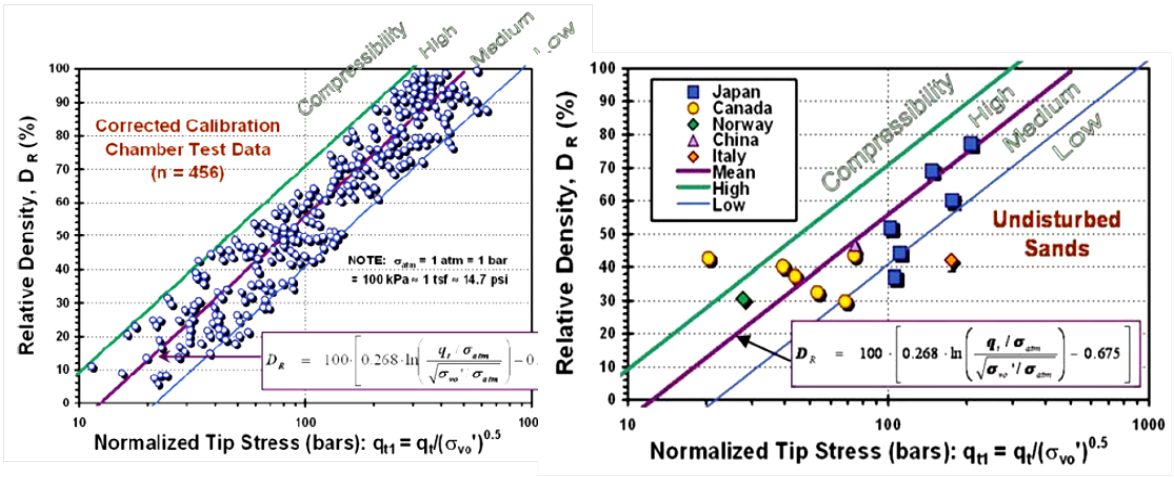


Figure 5-5 Relative density with normalised tip stress and sand compressibility from calibration chamber tests (left) and undisturbed frozen samples (right). Jamiolkowski *et al.* (2001). Reproduced from Mayne (2007).

The results are presented in Appendix F.

5.8 UNDRAINED SHEAR STRENGTH

The undrained shear strength s_u is usually estimated by the bearing capacity method, whereby the net tip resistance is divided by a factor N_k (Lunne *et al*, 1981):

$$s_u = \frac{q_c - \sigma_{v0}}{N_k}$$

Where N_k is an empirical factor which varies with soil type, stress history, structure/fabric, plasticity, and the mode of shear.

Mayne and Peuchen (2018) performed an evaluation of 407 high-quality undrained anisotropically consolidated triaxial compression tests (CAUC) with net tip resistance data pairs, resulting in N_{kt} factors with regression analysis details for five categories of clays shown in Table 2.

Table 2 Summary of CAUC s_u versus q_{net} for clays. Reproduced from Mayne and Peuchen (2018).

Clay Group	Number of sites	Nr Data	Correlation Coefficient r^2	Factor N_{kt}	Mean Pore Pressure Parameter B_q
Offshore NC-LOC	17	115	0.98	12.32	0.51
Onshore NC-LOC	30	191	0.867	12	0.53
Sensitive NC-LOC	5	43	0.507	10.33	0.84
OC Intact	5	36	0.862	13.57	0.49
OC Fissured	5	22	0.393	22.47	-0.01
All clays	62	407	0.923	13.33	0.55

Alternatively, a variable N_{kt} factor can be estimated for the profile as a function of the pore pressure parameter B_q, applicable for B_q values of > -0.01. The following equation proposed by Mayne and Peuchen is based on the same database evaluation:

$$N_{kt} = 10.5 - 4.6 \cdot \ln(B_q + 0.1)$$

Where the pore pressure parameter B_q is the ratio of excess pore pressure to net tip resistance:

$$B_q = \frac{u_2 - u_0}{q_t - \sigma_{v0}}$$

The N_{kt} estimate has a standard error of 2.4 N_k and correlation coefficient of 0.645.

The estimate based on B_q is presented as 's_u5' on the parameter plots and is only suitable for tests that have a high-quality pore pressure data, often indicated by a positive, repeatable, and dynamic response.

Note: N_{kt} (with subscript 't') indicates a N_k factor that has been established using the corrected tip resistance q_t. N_{kt} can be applied to the uncorrected tip resistance q_c (non-piezocone tests) but results in a slightly lower estimate of s_u depending on the correction magnitude (q_c - q_t) in lower strength soils.

Undrained shear strengths corresponding to selected values of N_k are presented on the plots of Appendix D. *'s_u3'* on the logs (N_k = 15) has been included as a reference for comparison to traditionally applied N_k values of 15 and 20.

The results are presented in Appendix E.

5.9 OVERCONSOLIDATION RATIO

The preconsolidation stress σ_p' was calculated based on the method proposed by Mayne et al (2009):

$$\sigma_p' = k \cdot (q_t - \sigma_{vo})^{m\prime}$$

$$OCR = \sigma_p{}'/\sigma'_{v0}{}'$$

Mayne *et al* found that the trend with mean grain size followed a power law through the addition of exponent m' and that its value can be estimated by relation to soil behaviour type index I_c:

$$m' = 1 - \frac{0.28}{1 + \left(\frac{I_c}{2.65}\right)^{25}}$$

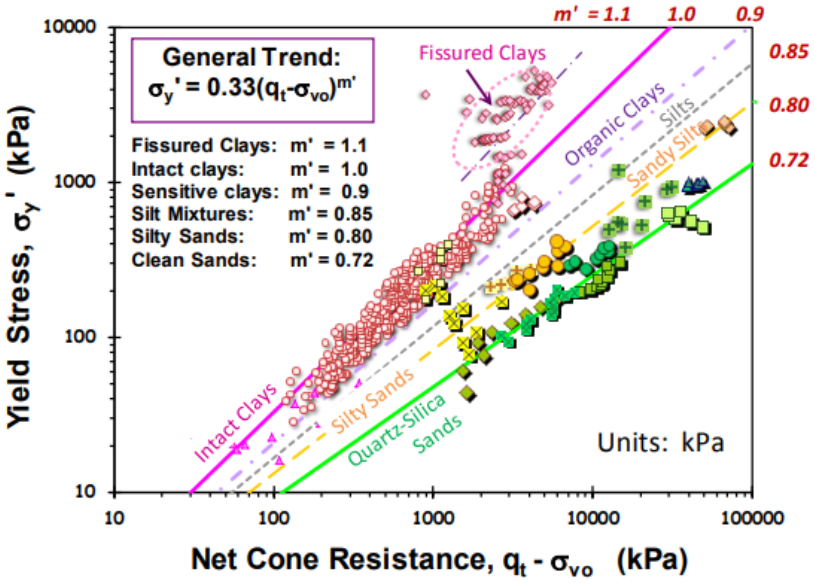


Figure 5-6 Preconsolidation stress with net cone resistance power law, reproduced from Mayne (2014).

An additional set of σ_p' and OCR values were calculated for m' = 1.1 to reflect the upper trend for over consolidated fissured clays not captured by the correlation with I_c.

The results are presented in Appendix E.

5.10 SPT N60 VALUES

Equivalent SPT N60 values, defined as the non-normalised SPT blow count over a 30 cm interval, were derived for two correlations.

Method 1 - Jefferies and Davies (1993) cited in Lunne *et al.* (1997):

$$N_{60} = \frac{q_t}{8.5 \cdot \sigma_{atm} \cdot \left(1 - \frac{I_c}{4.6}\right)}$$

Method 2 - Robertson (2012):

$$\frac{\left(\frac{q_t}{p_a}\right)}{N_{60}} = 10^{(1.268 - 0.2817 I_c)}$$

The correlations are intended for clays, silts and sands and not for carbonates or cemented geo-materials.

The results are presented in Appendix F.

5.11 FRICTION ANGLE

Sands

The peak friction angle of granular materials was calculated using the Kulhawy and Mayne (1990) method. The relationship is based on a calibration chamber database from 24 sands of varying mineralogy and is found from:

$$\phi' = 17.6 + 11.0 \cdot \log (q_{t1})$$

Where:

ϕ' = Peak friction angle (degrees)

q_{t1} = stress normalised cone resistance:

$$q_{t1} = \left(\frac{q_t}{\sigma_{atm}}\right) / \left(\frac{\sigma_{v0'}}{\sigma_{atm}}\right)^{0.5}$$

The presence of compressible minerals tends to reduce tip resistance resulting in lower estimate of friction angle, while very coarse (sand) or larger grain size tends to increase tip resistance resulting in higher estimate. Increased penetration resistance due to high k_0 conditions also results in an overestimate of friction angle.

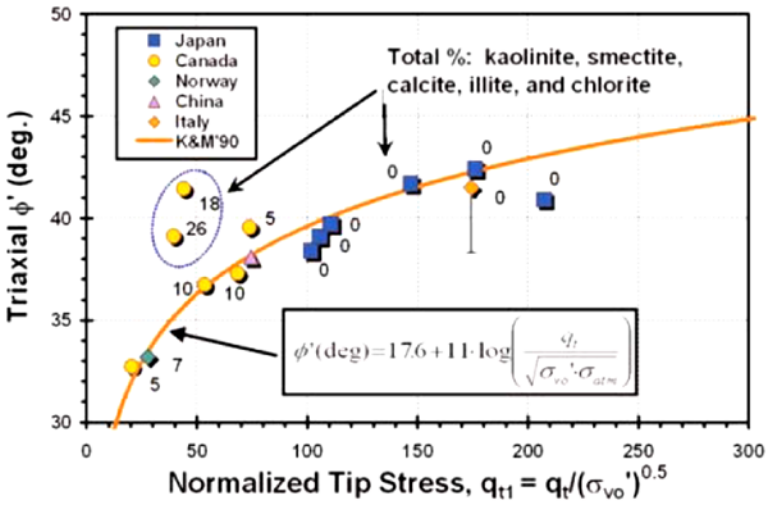


Figure 5-7 Peak triaxial friction angle from undisturbed sands with normalised cone resistance.

Fine grained soils

The effective friction angle for fine grained soils was calculated based on the Senneset *et al.* (1988, 1989) method by applying the approximate closed form solution by Mayne & Campanella (2005) as a direct function of the pore pressure parameter Bq and normalised tip resistance Q. The method is applicable where $0.1 < B_q < 1.0$ and $20° < \phi' < 45°$ and generally appropriate for non-cemented normally consolidated to lightly overconsolidated soils.

$$\phi' = 29.5° \, B_q{}^{0.121} [0.256 + 0.336 \, B_q + \log Q]$$

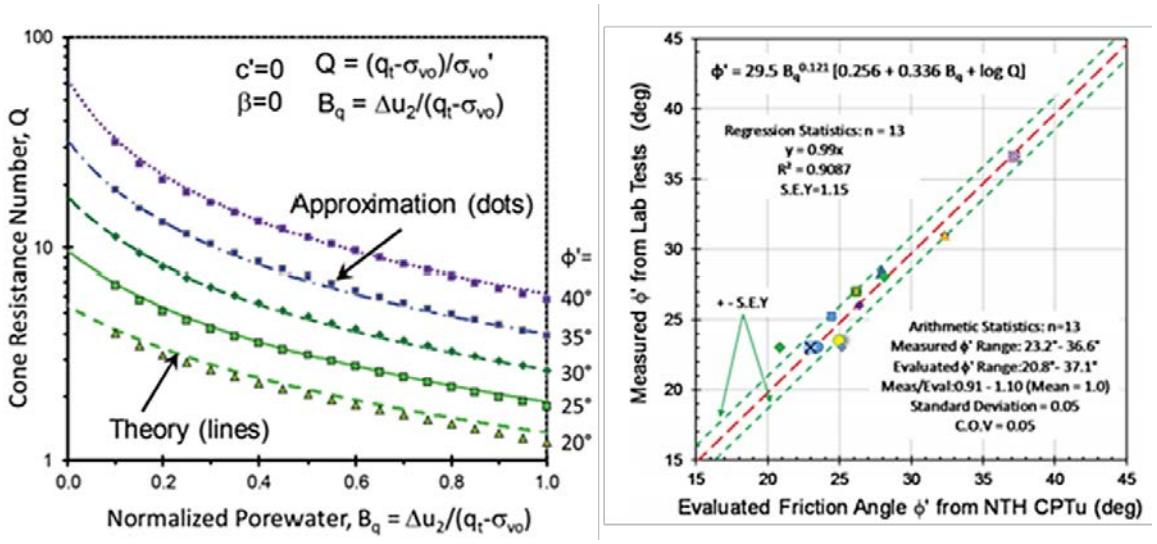


Figure 5-8 [Left] Theoretical curves with function approximation (dots) overlay [Right] calibration data from geotechnical centrifuge tests for a variety of soils. Redrawn from Ouyang & Mayne (2018).

The results are presented in Appendix F.

5.12 COEFFICIENT OF VOLUME CHANGE

Coefficient of volume change m_v defined as the inverse of the constrained modulus M, is evaluated for all soil types using the constrained modulus method proposed by Mayne (2006) cited in Mayne (2007). The value may be used to predict settlement at the end of primary consolidation and is applicable to the present state of vertical effective stress up to the pre-consolidation stress for overconsolidated soils.

$$m_v = \frac{1}{M}$$

Where:

$$M = \alpha \cdot (q_t - \sigma_v)$$

$$\alpha = 5$$

An alpha factor of 8.25 reported by Kulhawy & Mayne (1990) for fine grained soils appears to provide a better fit through the data for intact non-organic clays, reducing to around 1 to 2 for organic plastic clays.

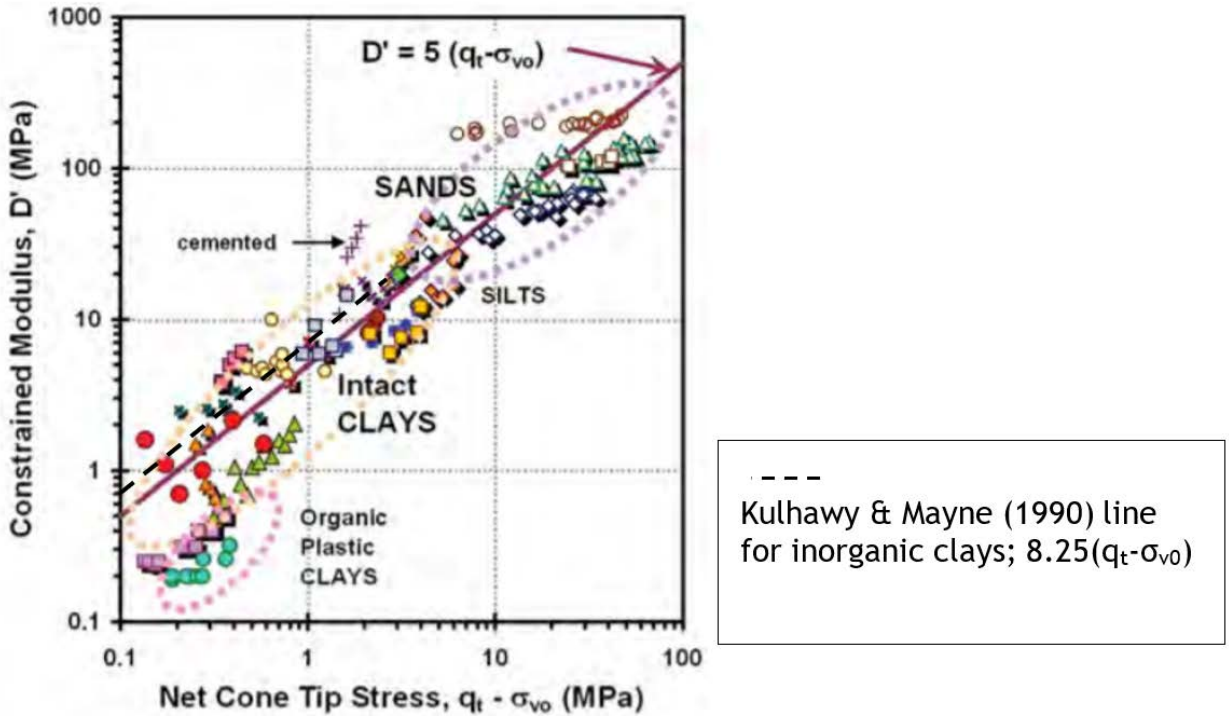


Figure 5-9 Constrained modulus of Mayne (2006). Annotated/redrawn from NCHRP Synthesis 368 (2007).

The results are presented in Appendix E.

5.13 YOUNG'S MODULUS

The secant Young's modulus E' at 25% mobilised shear strength (FOS = 4) was calculated according to the method proposed by Robertson (2009):

$E' = \alpha(q_t - \sigma_v)$
Where:

$\alpha = 0.015(10^{0.55\boldsymbol{Ic}+1.68})$

The method described by Robertson may be adapted to estimate E' for loading at different percentages of mobilised shear strength.

The results are presented in Appendix F.

5.14 SHEAR WAVE VELOCITY AND SMALL STRAIN SHEAR MODULUS (EMPIRICAL FROM CPT)

The shear wave velocity V_s (vertically propagating, horizontally polarised) has been derived according to empirical methods by Robertson (2009), Mayne and Rix (1995) and Baldi (1989) for comparison.

Method 1 (all soils)

Robertson (2009) method for all soils (coarse and fine predominantly silicate) as a function of the net tip resistance and a variable alpha factor α_{vs} which is a function of the soil behaviour type index I_c:

$$V_s = \sqrt{(\alpha_{vs}\,(q_t - \sigma_{v0})/p_a\,)} \quad (m/s)$$

Where:

$$\alpha_{vs} = 10^{(0.55\,Ic+1.68)}$$

I_c = Soil Behaviour Type Index (see section 5.6)

(See glossary of general terms and symbols Appendix A – General information)

Method 2 (clays)

Mayne & Rix (1995) (cited in Mayne, 2007) method for soft to stiff intact clays to fissured clay materials as a function of the corrected tip resistance.

$$V_s = 1.75(q_t)^{0.627} \quad (m/s)$$

This method has a correlation coefficient of 0.736.

Method 3 (sands)

Baldi *et al.* (1989) (cited in Mayne, 2007) method for sands as a function of the corrected tip resistance and effective stress.

$$V_s = 277(q_c)^{0.13}\,(\sigma'_{v0})^{0.27} \quad (m/s)$$

Small strain shear modulus G_0

For each method of deriving shear wave velocity above, the small strain shear modulus (G_0) is calculated per the relationship:

$$Go = \rho \cdot V_s^2 \quad \text{(MPa)}$$

Where: $\rho = \gamma/g$ (see section 5.4 for derivation of soil unit weight γ)

An additional estimate of G0 has been derived according to the method proposed by Rix and Stokoe (1992) for clean sand, which modifies the Baldi et al. (1989) approach to find Go/q_c as a function of $q_c/(\sigma'_{v0})$^0.5 based on calibration chamber and field measurements:

$$\frac{Go}{q_c} = 1634\left(\frac{q_c}{\sqrt{\sigma'_{v0}}}\right)^{-0.75}$$

Where Go, σ'_{v0} and q_c are in kPa.

Normalisation of tip resistance by the square root of effective stress is cited by Lunne et al (1997) as the correct method for comparison to shear wave velocity.

The results are presented in Appendix G.

6 CPT INTERPRETATION NOTES

Provided below is a non-exhaustive set of notes on interpretation of the acquired CPT data with reference to examples within the dataset where appropriate.

DRAINED AND UNDRAINED SOIL BEHAVIOUR

Geotechnical parameters appropriate for drained and undrained cone penetration conditions are derived for drained and undrained soil behaviour types (SBTs) respectively, however, to help mitigate the uncertainty in the SBT correlation with drainage behaviour, all parameters are derived over the Soil Behaviour Type range $2.4 < I_c < 2.7$. For partially drained conditions, error will be introduced within derived parameters.

Piezocone dynamic pore pressure and dissipation tests may be used to identify drainage conditions. Dissipation t_{50} values exceeding 50 seconds indicate undrained penetration behaviour based on the findings of Kim *et al.* (2008).

In partially drained materials the friction sleeve resistance may rise significantly immediately following a pause in penetration due to consolidation and increased effective stress on the friction sleeve.

DYNAMIC PORE PRESSURE u_2 (CPTu)

While the piezo system is saturated before use, testing through unsaturated soils may result in some degree of desaturation leading to a less accurate and more 'sluggish' pore pressure response. Desaturation can also occur during penetration due to suction pressure causing cavitation during dilative shear at the cone shoulder. Dissipation tests that are undertaken following desaturation are likely to have a more pronounced initial rise and the results of analysis may have some degree of error.

If the piezometer system becomes desaturated it may re-saturate at higher excess pressures later in the test as gas dissolves under pressure. The pore pressure response in saturated contractive soils should normally have a dynamic 'peaky' appearance.

The tip resistance in lower strength contractive soils without pore pressure measurement in the u_2 position is likely to be significantly lower (up to 20%, typically ~10%) than the equivalent corrected tip resistance depending on the magnitude of excess pore pressure generated during penetration.

CONE TIP AND SLEEVE OFFSET

The accuracy of the SBT over thin layers and at layer boundaries is sensitive to offset error in the friction ratio often resulting in sharp peaks or troughs at boundaries. The friction ratio is often inaccurate in heavily disturbed soils with a 'blocky' macro fabric. The last ~8 cm of data

is also not included in the SBT material description as no friction sleeve measurements are recorded.

FRICTION SLEEVE DATA

There are three common causes of friction sleeve measurement error; 1) unequal pore pressure acting on the sleeve end areas as the sleeve passes though materials of different permeability and hence excess pore pressure Δu_2, often resulting in a negative/positive spike, 2) Accuracy limitations and temperature effects in very low strength or sensitive soils, and 3) error associated with bending strain that occurs while the cone inclination deviates rapidly. Temperature effects are generally mitigated by temperature stabilisation during the test and at the time of zero output measurement.

CONE TYPE

The reference cone type has a 10 cm^2 projected cone tip area and 150 cm^2 friction sleeve area, however it is common to use a larger 15 cm^2 cone with a 225 cm^2 friction sleeve area for improved sensitivity, temperature stability, damage prevention and penetration depth potential due to the higher bending strength. Use of a 15 cm^2 cone does however require higher penetration force (reaction force) for a given penetration pressure and produces more pronounced transitions zones and thin layer effects due to the larger influence zone.

TRANSITION ZONES AND THIN LAYER EFFECTS

During penetration at the boundary between soils of contrasting stiffness, a transition zone is often evident prior to mobilisation of the true soil stiffness. These should be cautiously ignored in assessment of soil behaviour type and parameter evaluation. Where the stiff layer is thin (<~1 m) mobilised resistance may be significantly less than that of an equivalent thick layer. The effect for thin low stiffness layers is less significant. Procedures for thin-layer effect correction are provided by Robertson and Wride (1998) and Boulanger & DeJong (2018).

GRAVELS

The presence of gravel or larger clasts in a soil is often characterised by short peaks in the CPT tip and sleeve readings, possibly with associate inclinometer 'shake' and/or short sharp reductions in pore water readings due to dilation effects. Frequent gravels in soft or loose soils may generate localised erroneous friction ratio values.

7 SEISMIC TESTING

7.1 SEISMIC FIELDWORK

Surface to down-hole seismic shear wave (S-wave) data were collected using a seismic cone penetrometer assembly advanced to the required depths, with the seismic impulse generated at the ground surface adjacent to the CPT rig.

The seismic source comprised of an anvil coupled to the ground and orientated with its long axis perpendicular to the line between the source and the top of the test hole. The seismic source

offset, the lateral distance between the centre of the anvil and the top of the test hole, was recorded and accounted for in the analysis. The anvil was struck laterally with a 7 kg sledgehammer to generate shear waves.

At each depth two independent and oppositely polarised tests were performed (left/right) with up to 5 signals recorded for each polarisation direction. Repeat tests were required to verify the absence of variable trigger delay in the recorded signal and to allow post-stacking of the signals for improved signal to noise ratio.

A circuit contact trigger was used to trigger logging of the seismic signal.

The seismic receiver comprised a high precision triaxial piezoelectric accelerometer array coupled to the ground by an oversized housing mounted to a standard 15 cm² cone penetrometer. The sensor captured the acceleration waveform of elastic waves generated by the source at incremental depths. The seismic receiver was advanced to depth using the standard hydraulic ram system with the interval distance measured by a penetration depth encoder.

7.2 SEISMIC RAW DATA REDUCTION & PRESENTATION

A wide bandwidth filter of 30 to 200 Hz was applied to all signals together with a signal decay function applied to the signal before and after the initial dominant response period. Combined, this procedure largely removed random noise, reflections and source wave multiples to maximise the accuracy of the cross-correlation analysis.

Each independent signal for each polarisation/depth was stacked after removing any erroneous or outlying signals.

For each test location, the highest quality signal from the horizontal accelerometer axis (x or y) or the full waveform (x + y) was selected for interpretation of shear wave velocities.

A summary of the results is included in the Summary Tables section.

Seismograms depicting the filtered and interpreted raw data are presented in Appendix H. Each set of traces has been normalised by the maximum amplitude reading of the dataset for each profile. Interpreted data are presented together with the associated CPT results in Appendix G.

7.3 SEISMIC INTERPRETATION

The shear wave velocities for each polarisation direction were calculated using the Forward Modelling Downhill Simplex Method (FMDSM) (Baziw and Verbeek 2014) which employs Snell's law and Fermat's principal to account for refraction of the inclined source wave.

The calculation error introduced by noise increases with decreasing measurement interval distance and increasing shear wave velocity, causing deviation about the true value in homogeneous materials. To minimise this effect, the direct interval measurement is supplemented by a linear regression value over a range of 3 interval velocity values.

Small strain shear modulus (G_0) is calculated per the relationship:

$$Go = \rho \cdot V_s^2$$

$$V_s = \frac{\Delta d}{\Delta t}$$

$$\gamma = 8.32 \cdot \log(V_s) - 1.61 \cdot \log z \quad \text{(Mayne 2007)}$$

And

$$\rho = \gamma / g$$

Where G_0 is the small strain shear modulus, Vs is the shear wave velocity, Δd is the receiver depth difference for successive signals, Δt is the arrival time difference between successive shear wave signals, У is the total unit weight (kN/m3), z is depth (m), ρ is the mass density and g is the gravitational constant 9.81.

8 REFERENCES

ASTM E74-13a (2013), Standard Practice of Calibration of Force-Measuring Instruments for Verifying the Force Indication of Testing Machines, ASTM International, West Conshohocken, PA.

Boulanger, R.W. and DeJong J.T. (2018) "Inverse filtering procedure to correct cone penetration data for thin-layer effects" Proceedings, 4th International Symposium on Cone Penetration Testing (CPT'18), 21-22 June 2018, Delft, The Netherlands. CRC Press. pp. 25-44.

British Standards Institution (2003) BS 8422:2003, Force measurement – Strain gauge load cell systems – Calibration method. London: British Standards Institution.

Houlsby, G.T. and Teh, C.I. (1988). Analysis of the Piezocone in Clay. Proceedings of the International Symposium on Penetration Testing (ISOPT-1), Orlando, Vol. 2, pp. 777-783. Balkema Pub., Rotterdam.

ISO 376:201. Metallic materials — Calibration of force-proving instruments used for the verification of uniaxial testing machines (2011).

ISO 10012:2003 Measurement management systems - Requirements for measurement processes and measuring equipment. New Delhi: Bureau of Indian Standards (2003).

ISO 22476-1:2012 Geotechnical investigation and testing - Field testing - Part 1: Electrical cone and piezocone penetration test. New Delhi: Bureau of Indian Standards (2012).

ISSMGE, 1999. International reference test procedure for the cone penetrometer test CPT and the cone penetration test CPTU, Report of ISSMGE TC16 on Ground Property Characterisation for in situ Testing, In Proceedings of the 12th European conference on Soil Mechanics and Geotechnical Engineering 3:2195-222 (1999).

Idriss, I. M., and Boulanger, R. W. (2008) "Soil liquefaction during earthquakes". Monograph MNO-12, Earthquake Engineering Research Institute, Oakland, CA, pp. 261.

Jamiolkowski, M., LoPresti, D.C.F., and Manassero, M. (2001) "Evaluation of Relative Density and Shear Strength of Sands from Cone Penetration Test and Flat Dilatometer Test". Soil Behaviour and Soft Ground Construction (GSP119), American Society of Civil Engineers, pp. 201-238. Reston, Va. 2001

Jefferies, M.G. and Davies M.P. (1993), "Use of CPTu to estimate equivalent SPT N60", Geotechnical Testing Journal, 16(4), pp. 458-467.

Kim, K., Prezzi, M., Salgado, R., and Lee, W. (2008) "Effect of Penetration Rate on Cone Penetration Resistance in Saturated Clayey Soils", Journal of Geotech. Geoenviron. Eng., Vol. 134(8), pp. 1142-1153.

Kulhawy, F.H. and Mayne, P.W. (1990) "Manual on Estimating Soil Properties for Foundation Design". Report EPRI EL-6800 Research Project 1493-6, Electric Power Research Institute, Palo Alto, CA, pp. 306.

Ladd, C.C. and DeGroot, D.J. (2003) "Recommended Practice for Soft Ground Site Characterization: Arthur Casagrande Lecture". Soil & Rock America 2003 (Proceedings. 12th Pan American Conference on Soil Mechanics and Geotechnical Engineering, Boston, MA). Verlag Glückauf, Essen, Germany. pp. 3-57.

Lunne, T., Robertson, P.K. and Powell, J.J.M. (1997) "Cone Penetration Testing in Geotechnical Practice" Blackie Academic, New York 1997. (Robertson, 2009)

Lunne, T. and Kleven, A. (1981) "Role of CPT in North Sea Foundation Engineering". Session at the ASCE National Convention: Cone Penetration Testing and Materials. pp. 76-107. American Society of Engineers (ASCE).

Mayne, P.W. and Campanella, R.G. (2005) "Versatile Site Characterisation by Seismic Piezocone". Proceedings, 16th International Conference on Soil Mechanics and Geotechnical Engineering, Vol. 2. Millpress, Rotterdam, The Netherlands 2005. pp 721-724.

Mayne, P.W. and Peuchen J. (2018), "Evaluation of CPTU Nkt cone factor for undrained strength of clays". Proceedings, 4th International Symposium on Cone Penetration Testing (CPT'18), 21-22 June 2018, Delft, The Netherlands. CRC Press. pp. 423-429.

Mayne, P.W. (2007) "Cone Penetration Testing – A Synthesis of Highway Practice". NCHRP Synthesis 368, Transportation Research Board, Washington, D.C.

Mayne, P.W. (2014). KN2: "Interpretation of geotechnical parameters from seismic piezocone tests". Proceedings, 3rd International Symposium on Cone Penetration Testing (CPT'14), June 2014, ISSMGE Technical Committee TC 102, Edited by P.K. Robertson and K.I. Cabal: pp. 47-73.

Parez, L. and Fauriel, R. (1988). "Le piézocône. Améliorations apportées à la reconnaissance de sols". Revue Française de Géotech, Vol. 33, pp. 13-27.

Robertson, P.K. (2009). Cited in "Guide to Cone Penetration Testing - 6th edition (2015)", pp. 36, pp. 58, Gregg Drilling & Testing, Inc.

Robertson, P.K. (2009). Interpretation of cone penetration tests – a unified approach. Canadian Geotechnical Journal, 46, pp. 1337–1355.

Robertson, P.K. (2010a) “Soil Behaviour Type from the CPT: an update”. Proceedings, 2nd International Symposium on Cone Penetration Testing. Huntingdon Beach, CA, USA.

Robertson, P.K. (2010b) “Estimating soil unit weight from CPT”. Proceedings, 2nd International Symposium on Cone Penetration Testing. Huntingdon Beach, CA, USA.

Robertson, P.K. (2012). “Interpretation of in-situ tests – some insights”, Proceedings, 4th Int. Conf. on Geotechnical & Geophysical Site Characterization, ISC’4, Brazil, 1.

Robertson, P.K (2014) “Estimating in-situ soil permeability from CPT & CPTu”. Proceedings, 3rd International Symposium on Cone Penetration Testing (CPT'14), June, 2014, ISSMGE Technical Committee TC 102.

Senneset, K., R. Sandven, and N. Janbu (1989), “Evaluation of Soil Parameters from Piezocone Tests,” Transportation Research Record 1235, Transportation Research Board, National Research Council, Washington D.C, pp. 24-37.

Sully, J.P., Robertson, P.K., Campanella, R.G. and Woeller, D.J. (1999) “An approach to evaluation of field CPTU dissipation data in overconsolidated fine-grained soils”. Canadian Geotechnical Journal. Vol. 36, pp. 369-381.

APPENDICES

Appendix A	**SUMMARY TABLES**
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APPENDIX A SUMMARY TABLES

Table 3 CPT summary

Location ID	Stroke number	Final depth (m)	Cone ID	Piezocone test	Pre-drilled (m)	Pre-drilling details	Rig	Primary refusal factor	Applied zero values: qc, fs, u2	Tip zero drift (kPa)	Sleeve zero drift (subtraction) (kPa)	Piezo zero drift (kPa)	Nr dissipation tests	Raw File Name	Easting (m)	Northing (m)	Elevation (m)	Date	Remarks
SCPT-101	1	13.74	S15-CFIPTT.1993	YES			UK20	Tip load	pre, pre, pre	2.00	0.90	-1.20		108298-V1-260423-UK20-LP81.L04				26/04/2023	
SCPT-102	1	12.56	S15-CFIPTT.1993	YES			UK20	Tip load	pre, pre, pre	-15.00	-1.60	-2.60		108298-V1-260423-UK20-LP81.L05				27/04/2023	
SCPT-103	1	13.82	S15-CFIPTT.1993	YES			UK20	Tip load	pre, pre, pre	-0.20	-0.30	-0.90		108298-V1-260423-UK20-LP81.L03				26/04/2023	
SCPT-104	1	1.44	S15-CFIPTT.1993	YES			UK20	Tip load	pre, pre, pre	-44.20	0.40	-1.00		108298-V1-260423-UK20-LP81.L01				26/04/2023	
SCPT-104	2	11.80	S15-CFIPTT.1993	YES			UK20	Tip load	post, post, post	15.40	1.10	0.60		108298-V1-260423-UK20-LP81.L02				26/04/2023	

CPT test plots are presented in Appendix C.

Table 4 Seismic interpretation summary

Location ID	Interval top (mBGL)	Interval bottom (mBGL)	Vs (m/s)	LR Vs (m/s)	Mass density (Mg/m^3)	LR Mass density (Mg/m^3)	Shear modulus G0 (MPa)	LR Shear modulus G0 (MPa)	Comments
SCPT-101	1.50	2.50	187.70		1.88		66.20		*L+R, *VP
SCPT-101	2.50	3.50	110.20	126.00	1.65	1.70	20.00	27.00	*L+R, *VP
SCPT-101	3.50	4.50	114.60	120.00	1.65	1.66	21.70	23.90	*L+R, *VP
SCPT-101	4.50	5.50	141.40	124.00	1.71	1.66	34.20	25.50	*L+R, *VP
SCPT-101	5.50	6.50	114.80	127.00	1.62	1.66	21.40	26.80	*L+R, *VP
SCPT-101	6.50	7.50	133.60	125.00	1.66	1.64	29.60	25.60	*L+R, *VP
SCPT-101	7.50	8.50	124.60	136.00	1.63	1.66	25.30	30.70	*L+R, *VP
SCPT-101	8.50	9.50	157.40	134.00	1.71	1.65	42.40	29.60	*L+R, *VP
SCPT-101	9.50	10.50	120.20	116.00	1.60	1.59	23.10	21.40	*L+R, *VP
SCPT-101	10.50	11.50	92.00	109.00	1.49	1.56	12.60	18.50	*L+R, *VP
SCPT-101	11.50	12.50	131.20	119.00	1.62	1.58	27.90	22.40	*L+R, *VP
SCPT-101	12.50	13.50	150.20		1.66		37.40		*L+R, *VP
SCPT-102	1.50	2.50	206.90		1.91		81.80		*L+R, *VP
SCPT-102	2.50	3.50	99.20	129.00	1.61	1.71	15.80	28.50	*L+R, *VP
SCPT-102	3.50	4.50	141.40	118.00	1.73	1.66	34.60	23.10	*L+R, *VP
SCPT-102	4.50	5.50	117.10	126.00	1.64	1.67	22.50	26.50	*L+R, *VP
SCPT-102	5.50	6.50	125.90	123.00	1.65	1.64	26.20	24.80	*L+R, *VP
SCPT-102	6.50	7.50	124.10	130.00	1.64	1.65	25.30	27.90	*L+R, *VP
SCPT-102	7.50	8.50	143.00	140.00	1.68	1.67	34.40	32.70	*L+R, *VP
SCPT-102	8.50	9.50	159.20	148.00	1.71	1.68	43.30	36.80	*L+R, *VP
SCPT-102	9.50	10.50	140.30	156.00	1.66	1.70	32.70	41.40	*L+R, *VP
SCPT-102	10.50	11.50	178.50	157.00	1.74	1.69	55.40	41.70	*L+R, *VP
SCPT-102	11.50	12.50	150.70		1.67		37.90		*L+R, *VP
SCPT-103	1.50	2.50	198.80		1.90		75.10		*L+R, *VP
SCPT-103	2.50	3.50	139.10	155.00	1.74	1.78	33.70	42.80	*L+R, *VP
SCPT-103	3.50	4.50	146.70	146.00	1.74	1.74	37.40	37.10	*L+R, *VP
SCPT-103	4.50	5.50	152.70	154.00	1.74	1.74	40.60	41.30	*L+R, *VP
SCPT-103	5.50	6.50	163.50	159.00	1.75	1.74	46.80	44.00	*L+R, *VP
SCPT-103	6.50	7.50	158.90	155.00	1.73	1.72	43.70	41.30	*L+R, *VP
SCPT-103	7.50	8.50	142.90	149.00	1.68	1.69	34.30	37.50	*L+R, *VP
SCPT-103	8.50	9.50	149.10	132.00	1.69	1.64	37.60	28.60	*L+R, *VP
SCPT-103	9.50	10.50	109.80	111.00	1.57	1.57	18.90	19.30	*L+R, *VP
SCPT-103	10.50	11.50	91.60	100.00	1.49	1.53	12.50	15.30	*L+R, *VP
SCPT-103	11.50	12.50	103.40		1.53		16.40		*L+R, *VP
SCPT-103	12.50	13.50	-	-	-	-	-	-	*N/A, *See note
SCPT-104	1.50	2.50	255.20		1.99		129.60		*L+R, *VP, *See note
SCPT-104	2.50	3.50	168.40	198.00	1.81	1.87	51.30	73.30	*L+R, *VP, *See note
SCPT-104	3.50	4.50	204.30	186.00	1.86	1.83	77.60	63.30	*L+R, *VP, *See note
SCPT-104	4.50	5.50	184.60	140.00	1.81	1.71	61.70	33.50	*L+R, *VP, *See note
SCPT-104	5.50	6.50	93.00	116.00	1.54	1.62	13.30	21.80	*L+R, *VP, *See note
SCPT-104	6.50	7.50	116.90	104.00	1.62	1.57	22.10	17.00	*L+R, *VP, *See note
SCPT-104	7.50	8.50	101.20	101.00	1.55	1.55	15.90	15.80	*L+R, *VP, *See note
SCPT-104	8.50	9.50	88.90	92.00	1.50	1.51	11.90	12.80	*L+R, *VP, *See note
SCPT-104	9.50	10.50	87.60	75.00	1.48	1.43	11.40	8.00	*L+R, *VP, *See note
SCPT-104	10.50	11.50	56.90		1.32		4.30		*L+R, *VP, *See note

Note: SCPT-103. Final interval of left polarisation traces indicates close to infinite wave velocity, possibly caused by reflection or triggering error. The velocity for this interval has low confidence.
Note: SCPT-104. Seismic data quality/repeatability was generally low due to poor coupling between the source and loose surface soils. The results should be treated as indicative.

Abbreviations

LR	3 interval linear regression	Vs	Shear wave velocity
**	Assumed erroneous data, associated with testing at shallower depths – see report notes (section 4.4.5)	L / R	Left / Right source wave polarisation. Where both are listed, values are calculated based on the average of these signals.
VP	Visual pick	I	X+Y channel sensor full waveform
N/A	No interpretation available	CCF	Cross-correlation function
FMDSM	Forward modelling downhill simplex method		

Seismic interpretation data are presented in Appendix G

APPENDIX B GENERAL INFORMATION

LIST OF FIGURES

Cone calibration certificate: S15-CFIIP.1993

Seismic accelerometer calibration certificate

Data sheet: 17.9-tonne track-truck mounted CPT unit (UK20)

CERTIFICATE OF CALIBRATION

Certificate Number: 1496

Cone Serial Number: S15-CFIIPTT.1993

Instrument:	**Digital-Geopoint-S15-150kN-5MPa**	**Location:**	**Lankelma Calibration Laboratory**
Serial number:	**S15-CFIIPTT.1993**	**Temperature (°C):**	**15.6**
Manufacturer:	**Geopoint**	**Temperature change (°C):**	**0.09**
Calibration standard:	**Conforms to ISO 376:2011 & ISO 22476-1:2012**	**Calibration engineer:**	**P Metcalf**
ISO 22476-1:2012 application class:	**Class 1**	**Date of calibration:**	**14/04/2023**
		Calibration expiry:	**14/10/2023**

This calibration certificate is valid for 6 months.

Calibration signed and dated by:	**Calibration checked and dated by:**	**Calibration verification signed and dated by:**
P Metcalf	A Harman	

REFERENCE INSTRUMENTS	SERIAL NUMBER	UNCERTAINTY OF RECORDED VALUE	CALIBRATION DATE
AM DSCCHA-100kN Load Cell	66914	0.02%	29/04/2021
AM DSCCHA-5kN Load Cell	61065	0.05%	29/04/2021
Omega MMG750V	502273	0.01%	01/09/2022
Keithley 3706A Multimeter	4067652	10ppm	11/08/2022
LD Solar2-45	168558	0.04°	01/08/2022
ETI Ref Thermometer	D20345255	0.01°C	08/09/2022

The calibration tests were made in the Lankelma force standards machine. The applied forces of which are within an uncertainty of:
± 0.050 % of nominal value from 0.5kN up to 10kN, then 0.02% of nominal from 10kN up to 100kN.

MEASUREMENTS
1. The forces applied, and the resulting deflections are given in Tables 1. No corrections for temperature have been applied to these results.
2. The cone was loaded to full range 3 times for no less than 1 minute before calibration and after each rotation.
3. The cone was calibrated in low and high range using two reference load cells. The low range calibration consisted of a maximum load of 5kN with 4 sets of increasing forces and 2 sets of decreasing forces. The high range calibration consisted of a maximum load of 100kN with 3 sets of increasing forces and 2 sets of decreasing forces.
4. The difference in deflection for each applied force with rotation is the relative reproducibility error b, shown as a percentage of the recorded value and in units of pressure MPa. The uncertainty relating to the difference in deflection for increasing forces against degreasing forces is the reversibility uncertainty U_rev, shown as a percentage of the recorded value and in units of pressure MPa.
5. For each application of force, the coefficients of a linear and third order equation relating the estimate of the mean deflection as a function of the applied calibration force were calculated. Table 2.
6. The combined expanded uncertainty of deflection U for each force is shown as a percentage of the recorded value and in units of pressure MPa.
7. The coefficients of a third order equation relating a given applied force to the estimate of the mean deflection were also calculated. The coefficients are given in Table 3.
8. In use the forces acting on the sleeve load cell element are a combination of tip resistance and sleeve friction, with the tip resistance from the tip load cell element being subtracted to give the sleeve friction value. The resultant error values for differing tip and sleeve values are shown in Table 4.
* The combined expanded uncertainties shown are to k=2 with a 95% coverage factor.

The calibration uncertainty is the uncertainty in the force value calculated from the interpolation equation at any deflection.

At each calibration point a combined standard uncertainty *uc* is calculated from the readings obtained during the calibration.

$$uc = \sqrt{\sum_{i=1}^{8} ui^2}$$

and

$$U = k \times uc$$

where

u1 is the standard uncertainty associated with the applied calibration force.
u2 is the standard uncertainty associated with the reproducibility of the calibration results.
u3 is the standard uncertainty associated with the repeatability of the calibration results.
u4 is the standard uncertainty associated with the resolution and noise of the system.
u5 is the standard uncertainty associated with the creep of the instrument.
u6 is the standard uncertainty associated with the drift in zero output.
u7 is the standard uncertainty associated with temperature of the instrument.
u8 is the standard uncertainty associated with interpolation best fit of the linear or 3rd order polynomial equation.

Symbols and their designations

Symbol	Designation
Ref LC	Reference load cell with calibration force in kN
cts	Counts. Base digital cone units.
0.1N	Interpolated digital cone units from counts
b	Relative reproducibility error
U_rev	Reversibility uncertainty
Uc	Combined standard uncertainty
Uc_sub	Combined standard uncertainty including sleeve subtraction
U	Combined expanded uncertainty
k=2	95% uncertainty coverage factor

Cone tempreture effect profile:

This section deals with the apparent pressure readings obtained from sensors due to static and transient temperature change. The parameters for post-processing temperature correction are established and the apparent pressures after correction are presented. Depending on the design or temperature performance, correction of the friction sleeve and/or piezometer readings may not be warranted

LANKELMA

CERTIFICATE OF CALIBRATION

Certificate Number: 1496

Cone Serial Number: S15-CFIIPTT.1993

CONE END RESISTANCE CALIBRATION

Table 1-a.

Low range calibration									High range calibration							
	Tip change In output (cts)				Reproducibility error *b*		Reversibility error *U_rev*			Tip change in output (cts)			Reproducibility error *b*		Reversibility error *U_rev*	
Ref LC	1	2	3	4					Ref LC	1	2	3				
(kN)	0°	120°	240°	240°	MPa	%	MPa	%	(kN)	0°	120°	240°	MPa	%	MPa	%
0.100	1.122E+05	1.129E+05	1.119E+05	1.119E+05	0.000	0.26			5.000	5.530E+06	5.532E+06	5.533E+06	0.000	0.01		
0.500	5.535E+05	5.514E+05	5.529E+05	5.516E+05	0.000	0.11			10.000	1.105E+07	1.106E+07	1.106E+07	0.001	0.01		
1.000	1.105E+06	1.103E+06	1.102E+06	1.099E+06	0.001	0.08			15.000	1.657E+07	1.658E+07	1.658E+07	0.000	0.00		
1.500	1.658E+06	1.657E+06	1.657E+06	1.656E+06	0.000	0.03			20.000	2.209E+07	2.209E+07	2.209E+07	0.001	0.01		
2.000	2.213E+06	2.211E+06	2.210E+06	2.207E+06	0.001	0.04			30.000	3.311E+07	3.311E+07	3.311E+07	0.001	0.00		
2.500	2.765E+06	2.764E+06	2.765E+06	2.765E+06	0.000	0.01			40.000	4.411E+07	4.411E+07	4.412E+07	0.001	0.00		
3.000	3.320E+06	3.317E+06	3.320E+06	3.317E+06	0.001	0.03			50.000	5.511E+07	5.511E+07	5.511E+07	0.001	0.00		
3.500	3.873E+06	3.870E+06	3.872E+06	3.869E+06	0.001	0.02			60.000	6.609E+07	6.609E+07	6.610E+07	0.001	0.00		
4.000	4.425E+06	4.423E+06	4.425E+06	4.423E+06	0.000	0.02			80.000	8.802E+07	8.803E+07	8.803E+07	0.001	0.00		
5.000	5.531E+06	5.531E+06	5.529E+06	5.528E+06	0.000	0.01			100.000	1.099E+08	1.099E+08	1.099E+08	0.001	0.00		
4.000	4.434E+06	4.432E+06			0.000	0.02	-0.003	-0.11	80.000	8.803E+07	8.803E+07		0.000	0.00	-0.003	-0.01
3.500	3.878E+06	3.879E+06			0.000	0.01	-0.002	-0.10	60.000	6.611E+07	6.612E+07		0.000	0.00	-0.007	-0.02
3.000	3.323E+06	3.323E+06			0.000	0.00	-0.002	-0.08	50.000	5.513E+07	5.513E+07		0.000	0.00	-0.009	-0.03
2.500	2.768E+06	2.767E+06			0.000	0.01	-0.001	-0.06	40.000	4.414E+07	4.414E+07		0.000	0.00	-0.010	-0.04
2.000	2.213E+06	2.214E+06			0.000	0.03	0.000	-0.04	30.000	3.314E+07	3.313E+07		0.001	0.00	-0.009	-0.05
1.500	1.658E+06	1.660E+06			0.001	0.06	0.000	-0.05	20.000	2.211E+07	2.211E+07		0.000	0.00	-0.009	-0.06
1.000	1.106E+06	1.104E+06			0.000	0.05	0.000	-0.07	15.000	1.660E+07	1.660E+07		0.000	0.00	-0.008	-0.08
0.500	5.528E+05	5.526E+05			0.000	0.01	0.000	-0.03	10.000	1.107E+07	1.107E+07		0.000	0.00	-0.006	-0.09
0.100	1.112E+05	1.111E+05			0.000	0.04	0.000	0.72	5.000	5.542E+06	5.541E+06		0.000	0.01	-0.004	-0.11

Table 2-a.

Low range calibration							
Reference output		Linear equation			3rd order equation		
Ref Load Cell Nom. (MPa)	Ref Load Cell (0.1N)	Cone output (0.1N)	Expanded uncertainty *U** MPa	%	Equation output (0.1N)	Expanded uncertainty *U** MPa	%
0.067	1000	1021	0.003	4.29	1005	0.001	1.36
0.333	5000	5022	0.003	0.82	4983	0.003	0.78
0.667	10000	10025	0.003	0.46	9958	0.006	0.91
1.000	15000	15061	0.008	0.77	14966	0.005	0.49
1.333	20000	20094	0.012	0.87	19971	0.005	0.35
1.667	25000	25123	0.017	1.00	24974	0.004	0.26
2.000	30000	30159	0.021	1.05	29982	0.004	0.22
2.333	35000	35183	0.024	1.03	34980	0.005	0.21
2.667	40000	40204	0.027	1.02	39976	0.006	0.22
3.333	50000	50254	0.034	1.01	49975	0.007	0.22
2.667	40000	40279	0.038	1.41	40051	0.008	0.30
2.333	35000	35241	0.032	1.39	35038	0.006	0.27
2.000	30000	30198	0.027	1.34	30022	0.004	0.21
1.667	25000	25152	0.021	1.23	25002	0.002	0.15
1.333	20000	20113	0.015	1.15	19990	0.002	0.18
1.000	15000	15076	0.010	1.03	14981	0.003	0.32
0.667	10000	10041	0.006	0.84	9974	0.004	0.55
0.333	5000	5023	0.003	0.92	4984	0.002	0.66
0.067	1000	1010	0.001	2.20	995	0.001	1.25

High range calibration							
Reference output		Linear equation			3rd order equation		
Ref Load Cell Nom. (MPa)	Ref Load Cell (0.1N)	Cone output (0.1N)	Expanded uncertainty *U** MPa	%	Equation output (0.1N)	Expanded uncertainty *U** MPa	%
3.333	50000	50266	0.037	1.10	49987	0.007	0.20
6.667	100000	100474	0.065	0.97	99970	0.011	0.16
10.000	150000	150627	0.086	0.86	149940	0.017	0.17
13.333	200000	200735	0.101	0.75	199905	0.023	0.18
20.000	300000	300868	0.120	0.60	299869	0.034	0.17
26.667	400000	400884	0.124	0.47	399860	0.041	0.16
33.333	500000	500797	0.116	0.35	499879	0.049	0.15
40.000	600000	600609	0.098	0.25	599918	0.056	0.14
53.333	800000	799900	0.074	0.14	799975	0.073	0.14
66.667	1000000	998772	0.188	0.28	999955	0.091	0.14
53.333	800000	799973	0.072	0.14	800049	0.072	0.14
40.000	600000	600795	0.119	0.30	600103	0.056	0.14
33.333	500000	501014	0.143	0.43	500096	0.047	0.14
26.667	400000	401128	0.155	0.58	400103	0.039	0.15
20.000	300000	301101	0.150	0.75	300102	0.030	0.15
13.333	200000	200953	0.130	0.97	200123	0.025	0.18
10.000	150000	150828	0.113	1.13	150140	0.023	0.23
6.667	100000	100622	0.085	1.28	100118	0.019	0.28
3.333	50000	50358	0.050	1.49	50079	0.012	0.36

Table 3-a. Third order equation

For a given cone indicated output of D (0.1N units), the corrected applied force

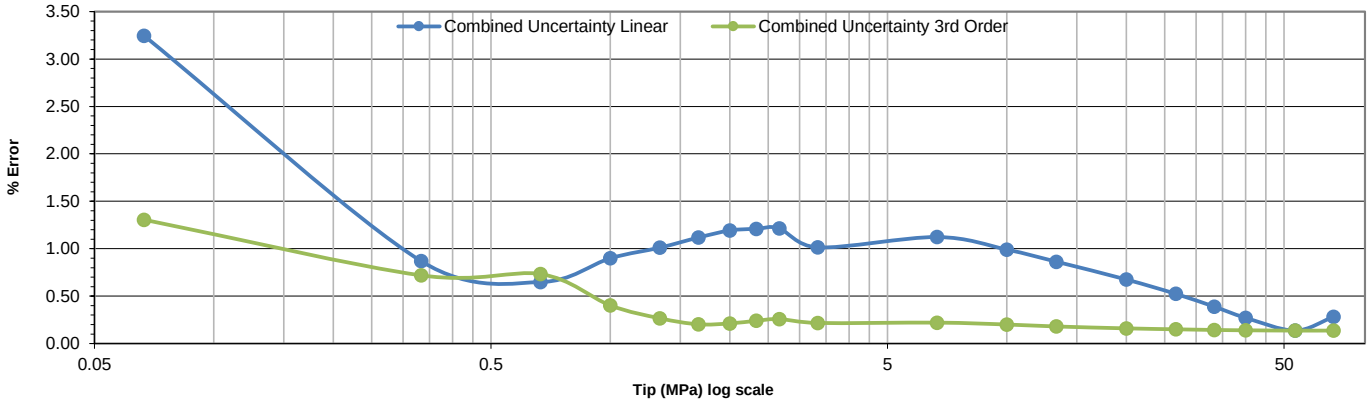
F (in 0.1N units) is calculated from :

$F = (a3 \times D^3) + (a2 \times D^2) + (a1 \times D) + a0$

a0	=	-9.75255
a1	=	0.99421
a2	=	8.90386E-09
a3	=	-1.90981E-15

Maximum tip zero drift during the calibration (MPa) =	0.001
Maximum load cell zero drift during the calibration (MPa) =	0.000
Factor used to convert from counts to 0.1N units =	0.0090871
Maximum tip full scale reading (MPa) =	100.00
Tip resolution (Pa) =	66.7
Tip area (cm^2) =	15
Tip area ratio factor =	0.806

COMBINED EXPANDED UNCERTAINTY TIP



* The combined expanded uncertainties shown are to k=2 with a 95% coverage factor.

LANKELMA

CERTIFICATE OF CALIBRATION

Certificate Number: 1496

Cone Serial Number: S15-CFIIPTT.1993

SLEEVE FRICTION CALIBRATION

Table1-b.

Low range calibration									High range calibration							
	Sleeve change In output (cts)				Reproducibility error *b*		Reversibility error *U_rev*			Sleeve change in output (cts)			Reproducibility error *b*		Reversibility error *U_rev*	
Ref LC	1	2	3	4					Ref LC	1	2	3				
(kN)	0°	120°	240°	240°	kPa	%	kPa	%	(kN)	0°	120°	240°	kPa	%	kPa	%
0.100	1.197E+05	1.149E+05	1.133E+05	1.133E+05	0.073	1.65			5.000	5.710E+06	5.711E+06	5.709E+06	0.023	0.01		
0.500	5.752E+05	5.718E+05	5.726E+05	5.722E+05	0.039	0.18			10.000	1.141E+07	1.141E+07	1.141E+07	0.033	0.01		
1.000	1.143E+06	1.145E+06	1.142E+06	1.142E+06	0.033	0.08			15.000	1.710E+07	1.710E+07	1.710E+07	0.015	0.00		
1.500	1.719E+06	1.714E+06	1.715E+06	1.713E+06	0.052	0.08			20.000	2.279E+07	2.279E+07	2.279E+07	0.030	0.00		
2.000	2.287E+06	2.284E+06	2.287E+06	2.287E+06	0.040	0.05			30.000	3.416E+07	3.416E+07	3.416E+07	0.032	0.00		
2.500	2.857E+06	2.856E+06	2.856E+06	2.856E+06	0.019	0.02			40.000	4.551E+07	4.551E+07	4.552E+07	0.022	0.00		
3.000	3.430E+06	3.428E+06	3.426E+06	3.424E+06	0.041	0.03			50.000	5.686E+07	5.686E+07	5.686E+07	0.035	0.00		
3.500	3.999E+06	3.996E+06	3.999E+06	3.996E+06	0.046	0.03			60.000	6.819E+07	6.819E+07	6.819E+07	0.022	0.00		
4.000	4.570E+06	4.567E+06	4.568E+06	4.566E+06	0.035	0.02			80.000	9.082E+07	9.082E+07	9.082E+07	0.026	0.00		
5.000	5.708E+06	5.707E+06	5.706E+06	5.706E+06	0.019	0.01			100.000	1.134E+08	1.134E+08	1.134E+08	0.051	0.00		
4.000	4.575E+06	4.578E+06			0.048	0.03	-0.166	-0.09	80.000	9.083E+07	9.082E+07		0.056	0.00	-0.105	0.00
3.500	4.005E+06	4.007E+06			0.028	0.02	-0.186	-0.12	60.000	6.820E+07	6.820E+07		0.057	0.00	-0.295	-0.01
3.000	3.432E+06	3.436E+06			0.057	0.04	-0.112	-0.08	50.000	5.687E+07	5.687E+07		0.062	0.00	-0.326	-0.01
2.500	2.860E+06	2.860E+06			0.011	0.01	-0.076	-0.07	40.000	4.553E+07	4.553E+07		0.054	0.00	-0.392	-0.02
2.000	2.289E+06	2.292E+06			0.040	0.05	-0.114	-0.13	30.000	3.418E+07	3.417E+07		0.084	0.01	-0.404	-0.03
1.500	1.714E+06	1.717E+06			0.035	0.05	0.017	0.03	20.000	2.281E+07	2.281E+07		0.034	0.00	-0.330	-0.04
1.000	1.143E+06	1.146E+06			0.038	0.09	-0.012	-0.03	15.000	1.712E+07	1.711E+07		0.058	0.01	-0.303	-0.05
0.500	5.680E+05	5.717E+05			0.049	0.22	0.081	0.37	10.000	1.142E+07	1.142E+07		0.060	0.01	-0.153	-0.03
0.100	1.106E+05	1.141E+05			0.048	1.08	0.104	2.37	5.000	5.713E+06	5.711E+06		0.029	0.01	-0.036	-0.02

Table 2-b.

Low range calibration							
Reference output		Linear factor output			3rd order equation		
Ref Load Cell Nom. (kPa)	Ref Load Cell (0.1N)	Cone output (0.1N)	Expanded uncertainty *U** kPa	%	Equation output (0.1N)	Expanded uncertainty *U** kPa	%
4	1000	1021	0.248	5.63	1016	0.213	4.84
22	5000	5049	0.441	2.00	5020	0.201	0.91
44	10000	10072	0.643	1.46	10014	0.156	0.35
66	15000	15113	1.006	1.52	15026	0.278	0.42
88	20000	20134	1.194	1.35	20019	0.239	0.27
110	25000	25159	1.407	1.28	25016	0.221	0.20
132	30000	30194	1.729	1.31	30025	0.323	0.24
154	35000	35215	1.913	1.24	35019	0.338	0.22
176	40000	40241	2.142	1.22	40019	0.337	0.19
220	50000	50269	2.409	1.09	49997	0.421	0.19
176	40000	40308	2.728	1.55	40086	0.806	0.46
154	35000	35283	2.503	1.62	35086	0.802	0.52
132	30000	30247	2.192	1.66	30078	0.722	0.55
110	25000	25191	1.689	1.53	25048	0.455	0.41
88	20000	20176	1.558	1.77	20061	0.561	0.64
66	15000	15112	0.990	1.50	15025	0.247	0.37
44	10000	10082	0.729	1.66	10024	0.233	0.53
22	5000	5019	0.206	0.93	4990	0.147	0.67
4	1000	990	0.150	3.41	984	0.183	4.15

High range calibration							
Reference output		Linear factor output			3rd order equation		
Ref Load Cell Nom. (kPa)	Ref Load Cell (0.1N)	Cone output (0.1N)	Expanded uncertainty *U** kPa	%	Equation output (0.1N)	Expanded uncertainty *U** kPa	%
220	50000	50293	2.616	1.19	50021	0.445	0.20
441	100000	100494	4.404	1.00	99996	0.655	0.07
661	150000	150644	5.756	0.87	149966	1.000	0.08
881	200000	200742	6.660	0.76	199926	1.431	0.08
1322	300000	300873	7.916	0.60	299903	2.044	0.08
1762	400000	400884	8.145	0.46	399903	2.540	0.07
2203	500000	500790	7.568	0.34	499926	3.037	0.07
2643	600000	600597	6.344	0.24	599958	3.571	0.07
3524	800000	799948	4.756	0.13	800017	4.736	0.07
4405	1000000	998952	10.948	0.25	999957	5.900	0.07
3524	800000	799983	4.655	0.13	800052	4.676	0.07
2643	600000	600708	7.148	0.27	600069	3.545	0.07
2203	500000	500917	8.589	0.39	500053	2.960	0.07
1762	400000	401033	9.400	0.53	400053	2.384	0.07
1322	300000	301027	9.217	0.70	300056	1.837	0.07
881	200000	200876	7.809	0.89	200060	1.301	0.07
661	150000	150761	6.769	1.02	150083	1.167	0.09
441	100000	100562	4.994	1.13	100064	0.852	0.10
220	50000	50313	2.781	1.26	50040	0.521	0.12

Table 3-b. Third order equation

For a given cone indicated output of D (0.1N units), the corrected applied force

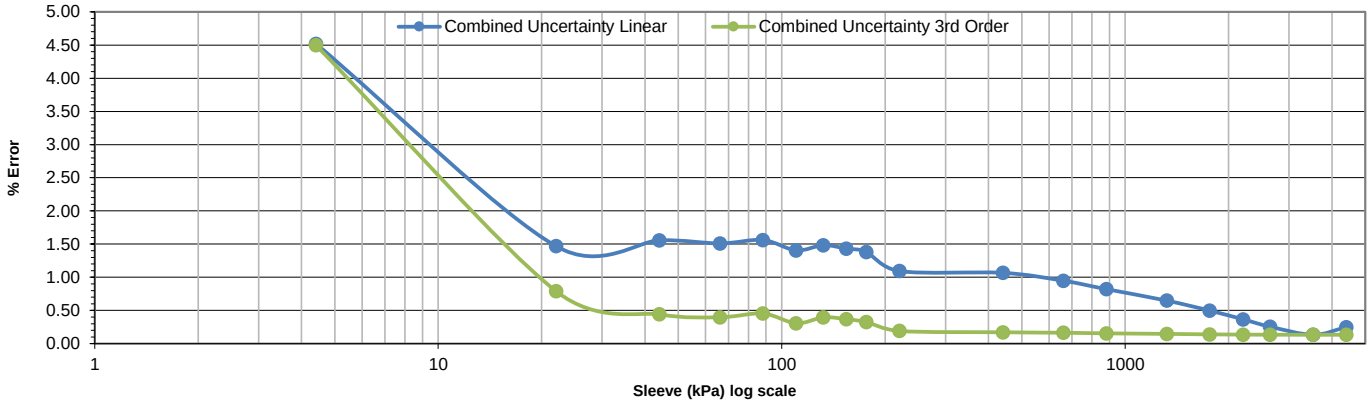
F (in 0.1N units) is calculated from :

$F = (a3 \times D^3) + (a2 \times D^2) + (a1 \times D) + a0$

a0	=	0.48207
a1	=	0.99408
a2	=	9.82039E-09
a3	=	-2.89167E-15

Maximum sleeve zero drift during the calibration (kPa) =	0.056
Maximum load cell zero drift during the calibration (kPa) =	0.027
Factor used to convert from counts to 0.1N units =	0.0088078
Physical strength limited maximum sleeve reading (MPa) =	1.333
Sleeve resolution (Pa) =	4.4
Sleeve area (cm^2) =	227
Sleeve area ratio factor =	-0.002

COMBINED EXPANDED UNCERTAINTY SLEEVE



* The combined expanded uncertainties shown are to k=2 with a 95% coverage factor.

LANKELMA

CERTIFICATE OF CALIBRATION

Certificate Number: 1496

Cone Serial Number: S15-CFIIPTT.1993

Table 4-b Sleeve friction - tip subtraction combined standard uncertainty Uc_sub

Tip MPa	Sleeve linear equation subtraction error (%) Sleeve kPa → 4	22	44	66	110	154	220	661
0.07	6.1	1.5	1.2	1.0	0.9	0.8	0.6	0.5
0.33	8.1	1.9	1.4	1.1	0.9	0.9	0.8	0.5
0.67	13.3	2.9	1.9	1.5	1.1	1.0	0.8	0.5
1.00	20.3	4.3	2.6	2.0	1.4	1.2	0.9	0.5
1.67	33.8	7.0	3.9	2.9	2.0	1.6	1.2	0.6
2.33	48.5	10.0	5.4	3.8	2.6	2.0	1.5	0.6
3.33	54.9	11.3	6.0	4.3	2.8	2.2	1.6	0.7
10.00	147.6	29.8	15.3	10.4	6.5	4.9	3.5	1.1
13.33	170.7	34.4	17.6	14.0	7.4	5.5	4.5	1.4

Tip MPa	Sleeve 3rd order equation subtraction error (%) Sleeve kPa → 4	22	44	66	110	154	220	661
0.07	5.1	1.0	0.5	0.4	0.3	0.3	0.2	0.1
0.33	6.0	1.1	0.6	0.5	0.3	0.3	0.2	0.1
0.67	8.1	1.6	0.8	0.6	0.4	0.4	0.2	0.1
1.00	8.2	1.6	0.8	0.6	0.4	0.4	0.2	0.1
1.67	8.6	1.7	0.9	0.6	0.4	0.4	0.2	0.1
2.33	12.9	2.5	1.3	0.9	0.6	0.5	0.3	0.2
3.33	12.5	2.4	1.2	0.9	0.6	0.5	0.3	0.2
10.00	29.6	5.9	3.0	2.0	1.2	1.0	0.6	0.3
13.33	35.8	7.1	3.6	3.3	1.5	1.1	0.8	0.3

PORE PRESSURE CALIBRATION

Table1-c.

Ref PR (kPa)	PWP change in output (cts) 1 0°	2 120°	3 240°	Reproducibility error *b* kPa	%	Reversibility error *U_rev* kPa	%
100	1.950E+07	1.948E+07	1.956E+07	0.1	0.13		
200	3.902E+07	3.905E+07	3.909E+07	0.1	0.05		
400	7.810E+07	7.814E+07	7.816E+07	0.1	0.02		
600	1.171E+08	1.171E+08	1.171E+08	0.1	0.02		
800	1.558E+08	1.559E+08	1.559E+08	0.1	0.02		
1000	1.945E+08	1.945E+08	1.946E+08	0.2	0.02		
1500	2.911E+08	2.912E+08	2.912E+08	0.2	0.01		
2000	3.876E+08	3.877E+08	3.877E+08	0.2	0.01		
2500	4.841E+08	4.842E+08	4.843E+08	0.3	0.01		
3000	5.807E+08	5.807E+08	5.809E+08	0.3	0.01		
2500	4.835E+08	4.837E+08		0.2	0.01	1.8	0.07
2000	3.863E+08	3.864E+08		0.1	0.01	4.0	0.20
1500	2.893E+08	2.894E+08		0.2	0.01	5.3	0.36
1000	1.927E+08	1.927E+08		0.0	0.00	5.3	0.53
800	1.542E+08	1.542E+08		0.0	0.00	5.0	0.62
600	1.157E+08	1.157E+08		0.1	0.01	4.1	0.69
400	7.722E+07	7.722E+07		0.0	0.00	2.6	0.66
200	3.871E+07	3.874E+07		0.0	0.02	0.9	0.46
100	1.943E+07	1.941E+07		0.0	0.04	0.2	0.19

Table 2-c.

Reference output: Ref Pressure (kPa)	Ref Pressure (0.1Pa)	Linear factor output: Cone output (0.1Pa)	Expanded uncertainty *U** kPa	%	3rd order equation: Equation output (0.1N)	Expanded uncertainty *U** kPa	%
100	1000000	1008615	1.751	1.75	1002287	0.559	0.56
200	2000000	2018601	3.796	1.90	2007987	1.745	0.87
400	4000000	4038481	7.960	1.99	4021513	4.681	1.17
600	6000000	6052199	10.872	1.81	6031473	6.918	1.15
800	8000000	8055560	11.700	1.46	8033216	7.499	0.94
1000	10000000	10055504	11.783	1.18	10033230	7.627	0.76
1500	15000000	15048450	10.541	0.70	15030897	7.371	0.49
2000	20000000	20038851	8.624	0.43	20027202	6.539	0.33
2500	25000000	25028702	6.667	0.27	25017518	4.831	0.19
3000	30000000	30017949	5.414	0.18	29995169	4.144	0.14
2500	25000000	24995345	3.452	0.14	24984190	4.586	0.18
2000	20000000	19968407	7.325	0.37	19956697	9.387	0.47
1500	15000000	14954504	10.013	0.67	14936830	13.255	0.88
1000	10000000	9961917	8.543	0.85	9939609	12.640	1.26
800	8000000	7967955	7.337	0.92	7945645	11.410	1.43
600	6000000	5978619	5.184	0.86	5957989	8.877	1.48
400	4000000	3991416	2.525	0.63	3974565	5.408	1.35
200	2000000	2001555	0.744	0.37	1991008	1.921	0.96
100	1000000	1004019	0.850	0.85	997713	0.505	0.51

Table 3-c. Third order equation

For a given cone indicated output of D (0.1N units), the corrected applied force

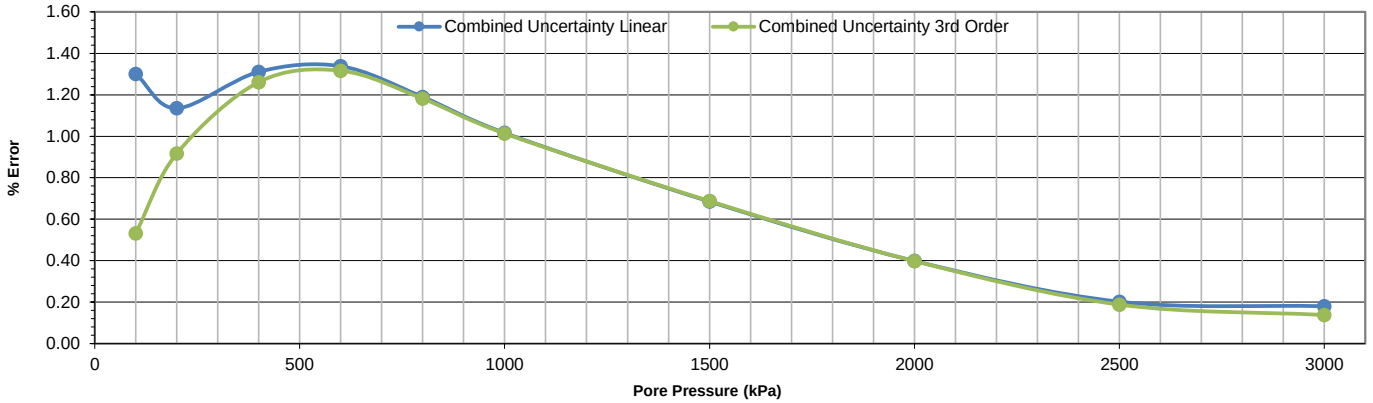
F (in 0.1N units) is calculated from :

$F = (a3 \times D^3) + (a2 \times D^2) + (a1 \times D) + a0$

a0	=	-1237.19219
a1	=	0.99453
a2	=	4.24904E-10
a3	=	-8.88506E-18

Maximum PWP zero drift during the calibration (kPa) =	0.28
Maximum reference zero drift during the calibration (kPa) =	0.144
Factor used to convert from counts to 0.1Pa units =	0.0516874
Maximum PWP full scale reading (kPa) =	5000
PWP resolution (Pa) =	0.1

COMBINED EXPANDED UNCERTAINTY PORE PRESSURE



* The combined expanded uncertainties shown are to k=2 with a 95% coverage factor.

LANKELMA

CERTIFICATE OF CALIBRATION

Certificate Number: 1496

Cone Serial Number: S15-CFIIPTT.1993

INCLINATION CALIBRATION

Ref Inclination (°C)	Cone inclination output X Inc (cts)	Y Inc (cts)
-25	-27464	-25901
0	-1994	-398
25	23180	24919

Ref Inclination (°)	Cone inclination output X Inc (°)	Y Inc (°)
-25	-25.1	-25.1
0	0.0	0.0
25	24.9	24.9

	X inc	Y inc
Factor used to convert from counts to 0.1m° units =	9.87272543	9.83860227
Inclination error (°) =	0.1	0.1

TEMPERATURE CALIBRATION

Recorded temp (°C)	Cone output 1 FS (cts)	Cone output 2 QC (cts)
7.89	3042552	3060624
10.26	3083243	3101349
15.18	3168433	3186829
20.04	3253804	3272292
24.94	3340998	3359695

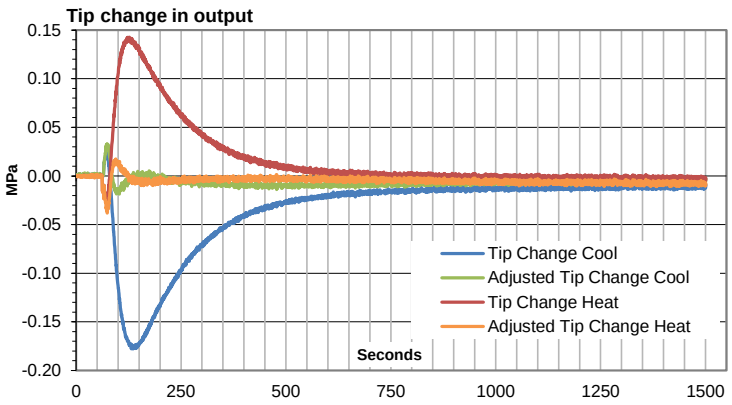
Recorded temp (°C)	Cone output 1 FS (°C)	Cone output 2 QC (°C)
7.89	7.93	7.93
10.26	10.26	10.25
15.18	15.13	15.13
20.04	20.01	20.01
24.94	24.99	24.99

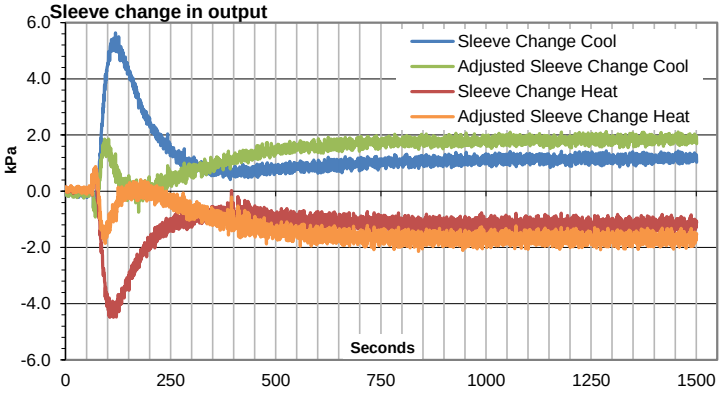
Factor used to convert from counts to 0.00001°C units =	0.57162306	0.570406521
Temperature error (°C) =	0.05	0.05

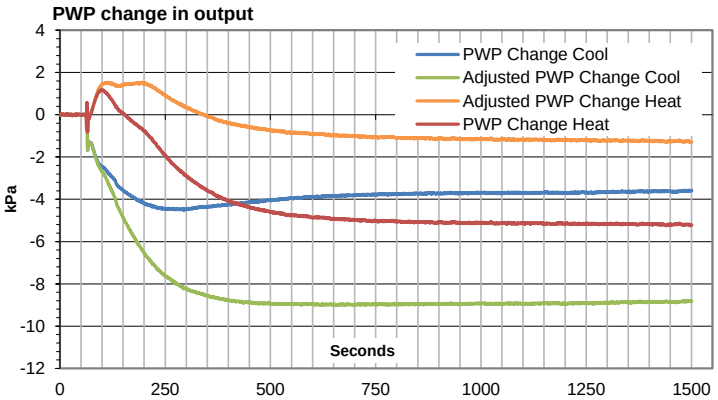
CONE TEMERATURE RESPONSE AND CORRECTION

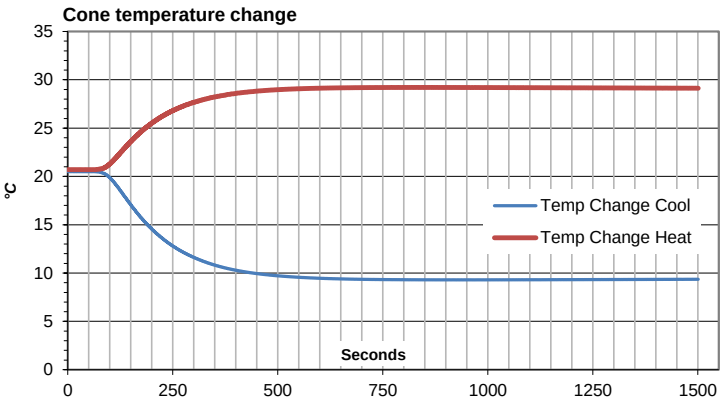
	Cooling	Heating
Start temperature =	20.50	20.70
End temperature =	9.30	29.21
Temperature change =	-11.20	8.51

	Cooling	Heating
Tip maximum rate of change (MPa/(°C/min)) =	0.049	0.048
Tip end change (MPa/°C) =	-0.001	0.000
Adjusted tip end change (MPa/°C) =	0.000	0.001
Sleeve maximum rate of change (kPa/(°C/min)) =	2.36	2.25
Sleeve end change (kPa/°C) =	0.09	-0.14
Adjusted sleeve end change (kPa/°C) =	0.15	-0.19
PWP end change (kPa/°C) =	-0.32	-0.61
Adjusted PWP end change (kPa/°C) =	0.79	-0.15









~ Calibration Certificate ~

Per ISO 16063-21

Model Number: 356A15

Serial Number: LW193179 (Z axis)

Description: ICP® Triaxial Accelerometer

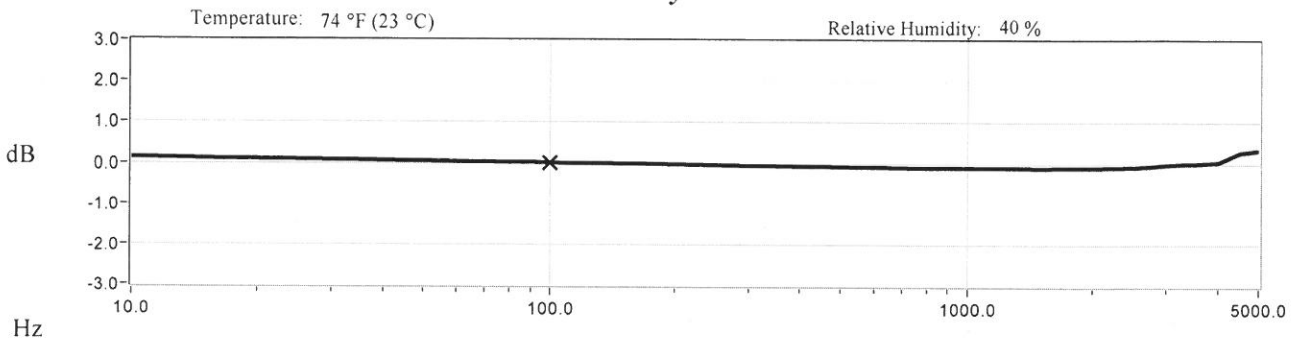
Manufacturer: PCB

Method: Back-to-Back Comparison AT401-3

Calibration Data

Sensitivity @ 100 Hz	**94.0 mV/g**	Output Bias	10.9 VDC
	(9.59 mV/m/s²)	Transverse Sensitivity	1.2 %
Discharge Time Constant	0.3 seconds		

Sensitivity Plot



Data Points

Frequency (Hz)	Dev. (%)	Frequency (Hz)	Dev. (%)
10	1.4	300	-0.7
15	1.2	500	-1.0
30	0.8	1000	-1.3
50	0.5	3000	-0.3
REF. FREQ.	0.0	5000	3.8

Mounting Surface: Beryllium Fastener: Adhesive Fixture Orientation: Inverted Vertical
Acceleration Level (pk)[1]: 10.0 g (98.1 m/s²)
[1]The acceleration level may be limited by shaker displacement at low frequencies. If the listed level cannot be obtained, the calibration system uses the following formula to set the vibration amplitude; Acceleration Level (g) = 0.008 x (freq)². [2]The gravitational constant used for calculations by the calibration system is; 1 g = 9.80665 m/s².

Condition of Unit

As Found: n/a

As Left: New Unit, In Tolerance

Notes

1. Calibration is NIST Traceable thru Project 683/287323 and PTB Traceable thru Project 17014.
2. This certificate shall not be reproduced, except in full, without written approval from PCB Piezotronics, Inc.
3. Calibration is performed in compliance with ISO 9001, ISO 10012-1, ANSI Z540.3 and ISO 17025.
4. See Manufacturer's Specification Sheet for a detailed listing of performance specifications.
5. Measurement uncertainty (95% confidence level with coverage factor of 2) for frequency ranges tested during calibration are as follows: 5-9 Hz; +/- 2.0%, 10-99 Hz; +/- 1.5%, 100-1999 Hz; +/- 1.0%, 2-10 kHz; +/- 2.5%.

Technician: Joseph Rogerson

Date: 10/27/2015

ACCREDITED
CALIBRATION CERT #1862.02

PCB PIEZOTRONICS
VIBRATION DIVISION
Headquarters: 3425 Walden Avenue, Depew, NY 14043
Calibration Performed at: 10869 Highway 903, Halifax, NC 27839
TEL: 888-684-0013 · FAX: 716-685-3886 · www.pcb.com

CAL2-3528789451.399+0

ACS-1T

~ Calibration Certificate ~

Per ISO 16063-21

Model Number: 356A15

Serial Number: LW193179 (y axis)

Description: ICP® Triaxial Accelerometer

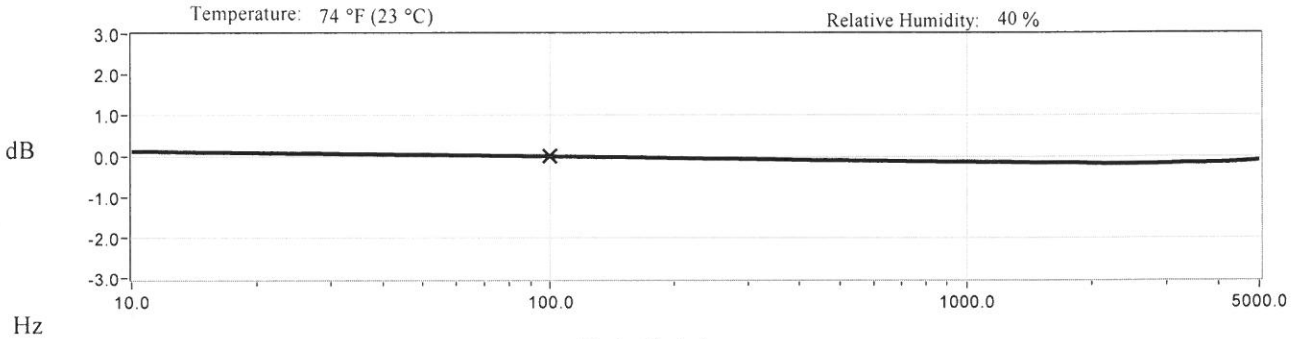
Manufacturer: PCB

Method: Back-to-Back Comparison AT401-3

Calibration Data

Sensitivity @ 100 Hz	**93.5 mV/g**	Output Bias	11.0 VDC
	(9.54 mV/m/s²)	Transverse Sensitivity	1.6 %
Discharge Time Constant	0.4 seconds		

Sensitivity Plot



Data Points

Frequency (Hz)	Dev. (%)	Frequency (Hz)	Dev. (%)
10	1.3	300	-0.9
15	1.0	500	-1.3
30	0.7	1000	-1.7
50	0.3	3000	-2.1
REF. FREQ.	0.0	5000	-1.3

Mounting Surface: Beryllium Fastener: Adhesive Fixture Orientation: Vertical
Acceleration Level (pk)[1]: 10.0 g (98.1 m/s²)
[1]The acceleration level may be limited by shaker displacement at low frequencies. If the listed level cannot be obtained, the calibration system uses the following formula to set the vibration amplitude; Acceleration Level (g) = 0.008 x (freq)². [2]The gravitational constant used for calculations by the calibration system is; 1 g = 9.80665 m/s².

Condition of Unit

As Found: n/a

As Left: New Unit, In Tolerance

Notes

1. Calibration is NIST Traceable thru Project 683/287323 and PTB Traceable thru Project 17014.
2. This certificate shall not be reproduced, except in full, without written approval from PCB Piezotronics, Inc.
3. Calibration is performed in compliance with ISO 9001, ISO 10012-1, ANSI Z540.3 and ISO 17025.
4. See Manufacturer's Specification Sheet for a detailed listing of performance specifications.
5. Measurement uncertainty (95% confidence level with coverage factor of 2) for frequency ranges tested during calibration are as follows: 5-9 Hz; +/- 2.0%, 10-99 Hz; +/- 1.5%, 100-1999 Hz; +/- 1.0%, 2-10 kHz; +/- 2.5%.

Technician: Joseph Rogerson JR Date: 10/27/2015

ACCREDITED
CALIBRATION CERT #1862.02

PCB PIEZOTRONICS
VIBRATION DIVISION
Headquarters: 3425 Walden Avenue, Depew, NY 14043
Calibration Performed at: 10869 Highway 903, Halifax, NC 27839
TEL: 888-684-0013 · FAX: 716-685-3886 · www.pcb.com

CAL2-3528789665.911+0

ACS-1T

~ Calibration Certificate ~

Per ISO 16063-21

Model Number: 356A15

Serial Number: LW193179 (X axis)

Description: ICP® Triaxial Accelerometer

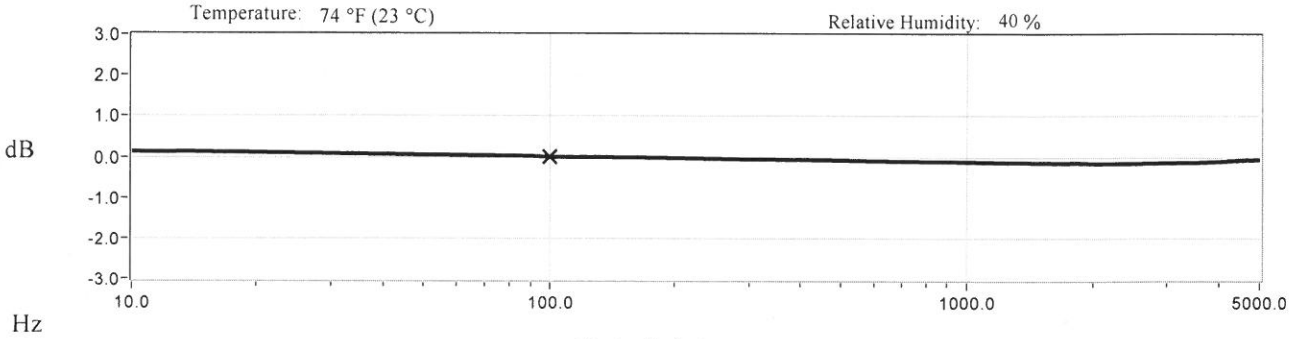
Manufacturer: PCB

Method: Back-to-Back Comparison AT401-3

Calibration Data

Sensitivity @ 100 Hz	**94.5 mV/g**	Output Bias	11.0 VDC
	(9.63 mV/m/s²)	Transverse Sensitivity	1.1 %
Discharge Time Constant	0.3 seconds		

Sensitivity Plot



Data Points

Frequency (Hz)	Dev. (%)	Frequency (Hz)	Dev. (%)
10	1.4	300	-0.7
15	1.4	500	-1.0
30	0.9	1000	-1.4
50	0.6	3000	-1.7
REF. FREQ.	0.0	5000	-0.8

Mounting Surface: Beryllium w/Silicone Grease Fastener: 10-32 Female Fixture Orientation: Vertical
Acceleration Level (pk)[1]: 10.0 g (98.1 m/s²)
[1]The acceleration level may be limited by shaker displacement at low frequencies. If the listed level cannot be obtained, the calibration system uses the following formula to set the vibration amplitude; Acceleration Level (g) = 0.008 x (freq)². [2]The gravitational constant used for calculations by the calibration system is; 1 g = 9.80665 m/s².

Condition of Unit

As Found: n/a

As Left: New Unit, In Tolerance

Notes

1. Calibration is NIST Traceable thru Project 683/287323 and PTB Traceable thru Project 17014.
2. This certificate shall not be reproduced, except in full, without written approval from PCB Piezotronics, Inc.
3. Calibration is performed in compliance with ISO 9001, ISO 10012-1, ANSI Z540.3 and ISO 17025.
4. See Manufacturer's Specification Sheet for a detailed listing of performance specifications.
5. Measurement uncertainty (95% confidence level with coverage factor of 2) for frequency ranges tested during calibration are as follows: 5-9 Hz; +/- 2.0%, 10-99 Hz; +/- 1.5%, 100-1999 Hz; +/- 1.0%, 2-10 kHz; +/- 2.5%.

Technician: Joseph Rogerson

Date: 10/27/2015

ACCREDITED
CALIBRATION CERT #1862.02

PCB PIEZOTRONICS
VIBRATION DIVISION
Headquarters: 3425 Walden Avenue, Depew, NY 14043
Calibration Performed at: 10869 Highway 903, Halifax, NC 27839
TEL: 888-684-0013 · FAX: 716-685-3886 · www.pcb.com

CAL2-3528791617.264+0

ACS-1T

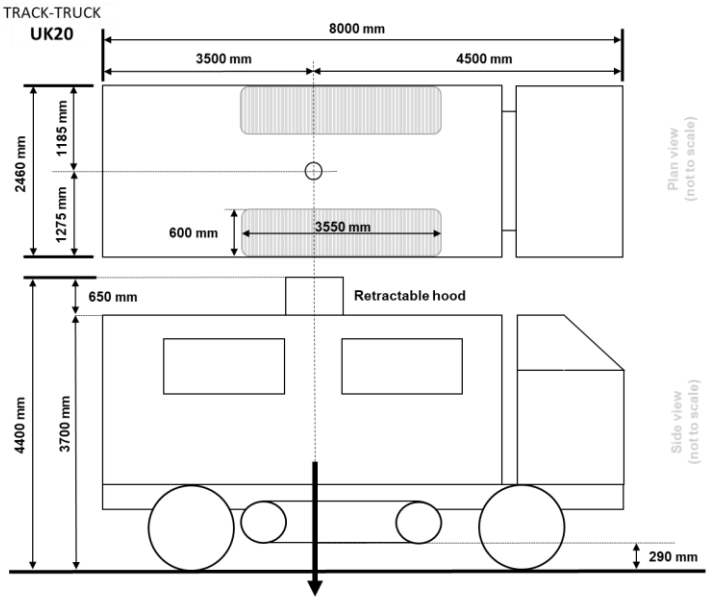
UK20
Track-truck

LANKELMA
01797 280050 – www.lankelma.com

The versatile track-truck is suitable for most geotechnical sites. The rig is driven to site as a self-contained HGV with tracks that can be deployed to cope with soft or uneven terrain.

Remote-controlled tracking to assist with manoeuvring onto location.

Complies with Euro 6 emission standards for use in London's low emissions zones (LEZ).



Rig weight	17.9 T
Max. operating ram capacity	17.5 T
Max. travelling speed	86 km/h
Track material	Steel
Track length	3550 mm
Track width	600 mm
Jack plate dimensions	Tracks act as jacks
Jack arrangements	1nr. on each side
Max. ground clearance on jacks	290 mm
Max. ground bearing pressure	Wheels – 300 kPa Tracks – 48 kPa
Max. testing gradient	10 degrees
Max. traversing gradient	20 degrees (operator assessed)
Noise output at 2 m	Testing - 69.5 dBA Driving – 78.7 dBA
Clamp arrangement	Hydraulic catching – semi automatic
Ram stroke	1.2 m
Max. casing size	55 mm
Typical production	100 m+ of standard CPTu testing per day (depending on conditions and access)

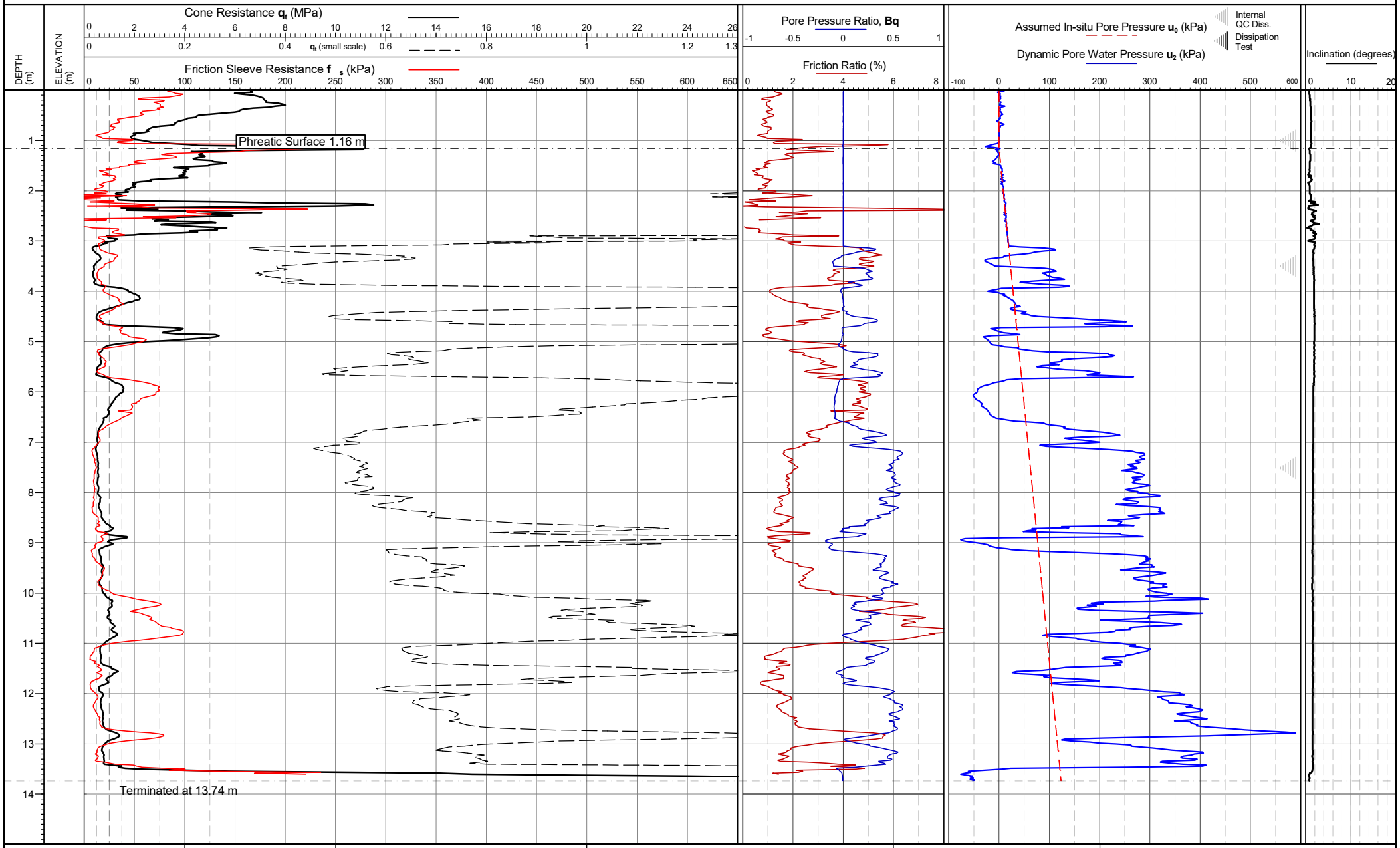
APPENDIX C CONE PENETRATION TEST RESULTS

Measured CPT parameters

intermediate parameters R_f and B_q

Project: PORT TALBOT

Client: TEC

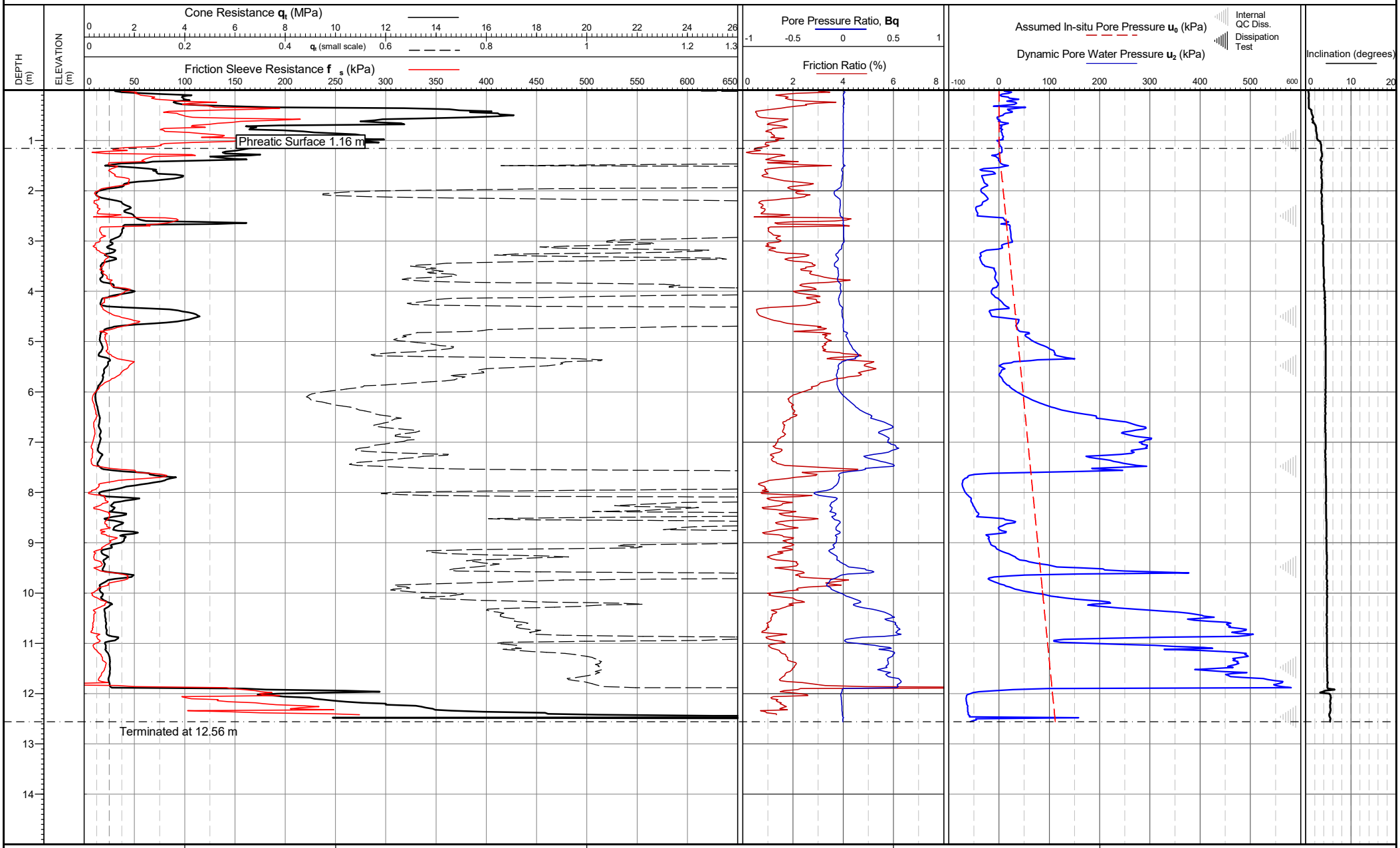


Cone area (mm2): Cone ID: S15-CFIPTT.1993 Operator: Rob Bennett Rig Used: UK20 Date of test: 26/04/2023 14:09:59	Zero drift (Pre/post test) q_c (kPa): 2.0 f_s (kPa): 0.9 ($f_{s\,drift}$ - $q_{c\,drift}$) u_2 (kPa): -1.2	Location: Swansea, UK Coordinates: , Elevation: Coordinate system:	Remarks: *Phreatic surface origin: Average measured piezometric depth from other location(s) Termination Remark: Tip load	Date of plot: 28-04-23 Checked by: Chris Player	Lankelma Project Ref: P-108298-10

TEST ID: SCPT-101

Project: PORT TALBOT

Client: TEC

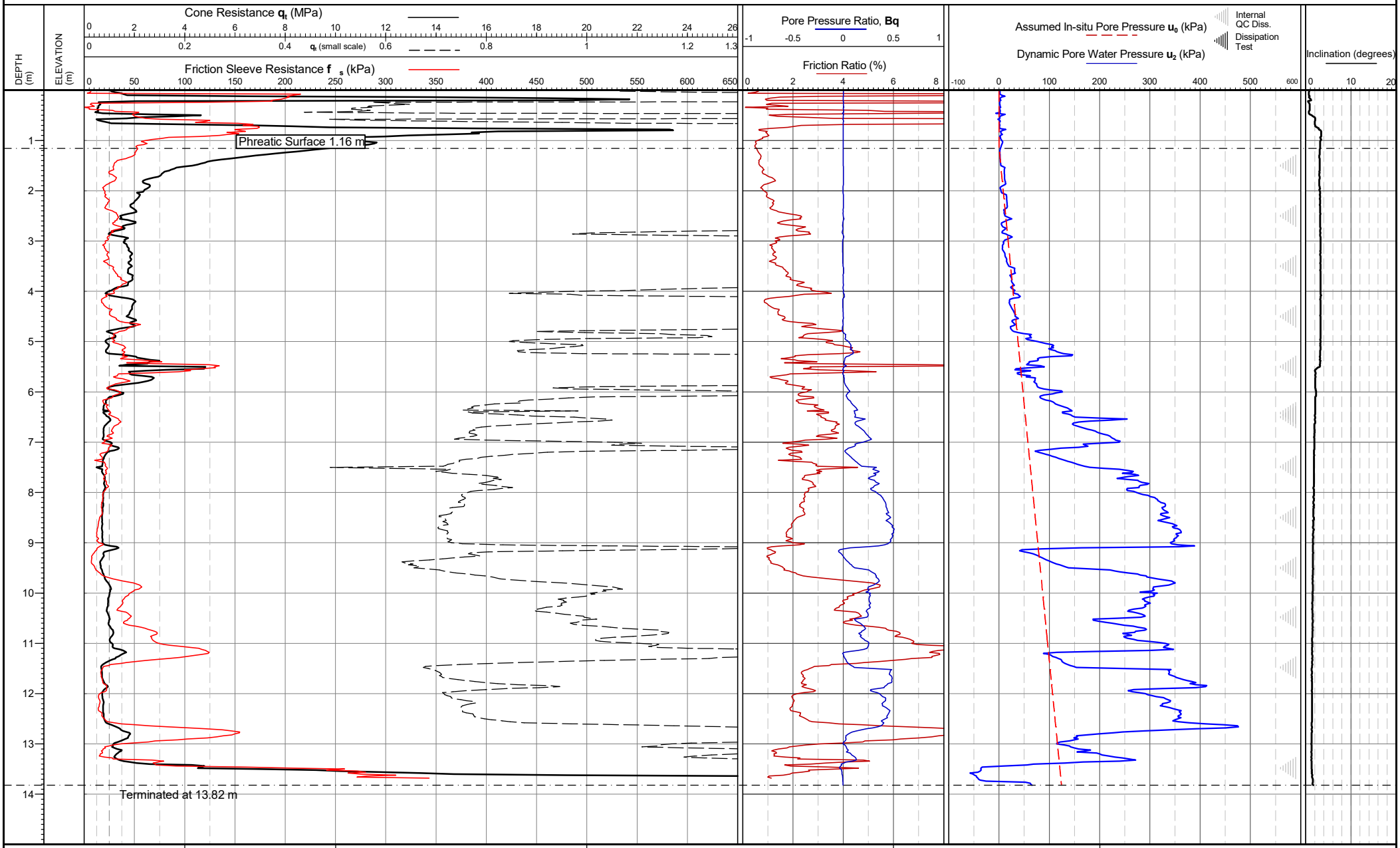


Cone area (mm2): Cone ID: S15-CFIPTT.1993 Operator: Rob Bennett Rig Used: UK20 Date of test: 27/04/2023 07:39:51	Zero drift (Pre/post test) q_c (kPa): -15.0 f_s (kPa): -1.6 ($f_{s\ drift}$ - $q_{c\ drift}$) u_2 (kPa): -2.6	Location: Swansea, UK Coordinates: , Elevation: Coordinate system:	Remarks: *Phreatic surface origin: Average measured piezometric depth from other location(s) Termination Remark: Tip load	Date of plot: 28-04-23 Checked by: Chris Player	Lankelma Project Ref: P-108298-10

TEST ID: SCPT-102

Project: PORT TALBOT

Client: TEC

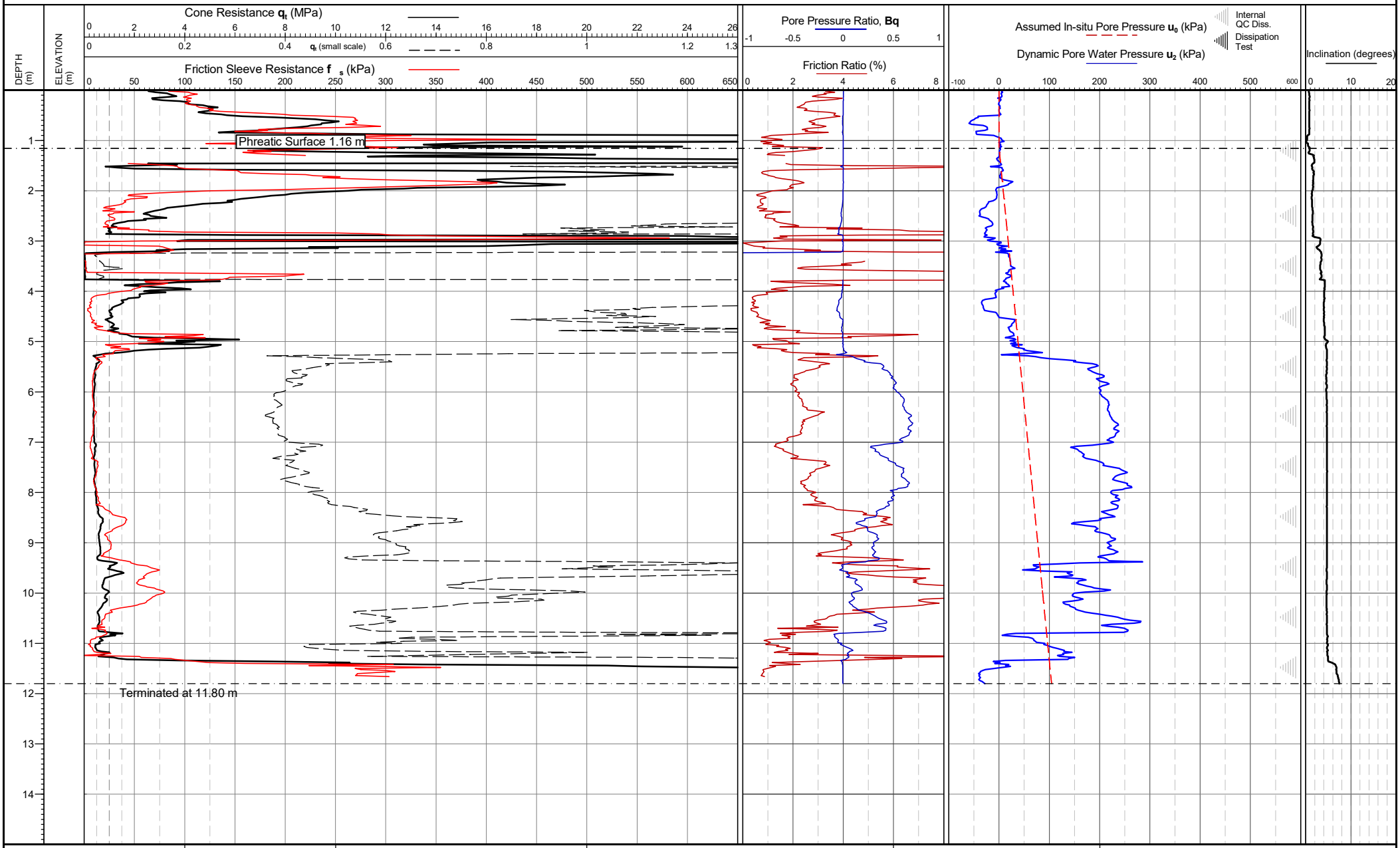


Cone area (mm2): Cone ID: S15-CFIPTT.1993 Operator: Rob Bennett Rig Used: UK20 Date of test: 26/04/2023 12:28:19	Zero drift (Pre/post test) q_c (kPa): -0.2 f_s (kPa): -0.3 ($f_{s\,drift}$ - $q_{c\,drift}$) u_2 (kPa): -0.9	Location: Swansea, UK Coordinates: , Elevation: Coordinate system:	Remarks: *Phreatic surface origin: Average measured piezometric depth from other location(s) Termination Remark: Tip load	Date of plot: 28-04-23 Checked by: Chris Player	Lankelma Project Ref: P-108298-10

TEST ID: SCPT-103

Project: PORT TALBOT

Client: TEC



Cone area (mm2): Cone ID: S15-CFIPTT.1993 Operator: Rob Bennett Rig Used: UK20 Date of test: 26/04/2023 09:35:55	Zero drift (Pre/post test) q_c (kPa): -44.2 f_s (kPa): 0.4 ($f_{s\,drift}$ - $q_{c\,drift}$) u_2 (kPa): -1.0	Location: Swansea, UK Coordinates: , Elevation: Coordinate system:	Remarks: *Phreatic surface origin: Average measured piezometric depth at this location, approx. +- 0.3 mbgl Termination Remark: Tip load	Date of plot: 28-04-23 Checked by: Chris Player	Lankelma Project Ref: P-108298-10

TEST ID: SCPT-104

APPENDIX D SOIL BEHAVIOUR TYPE RESULTS

Soil behaviour type (SBT) point data evaluation according to:

Schneider et al (2008)

Robertson (2016)

Robertson (2010) with aggregate layer descriptions

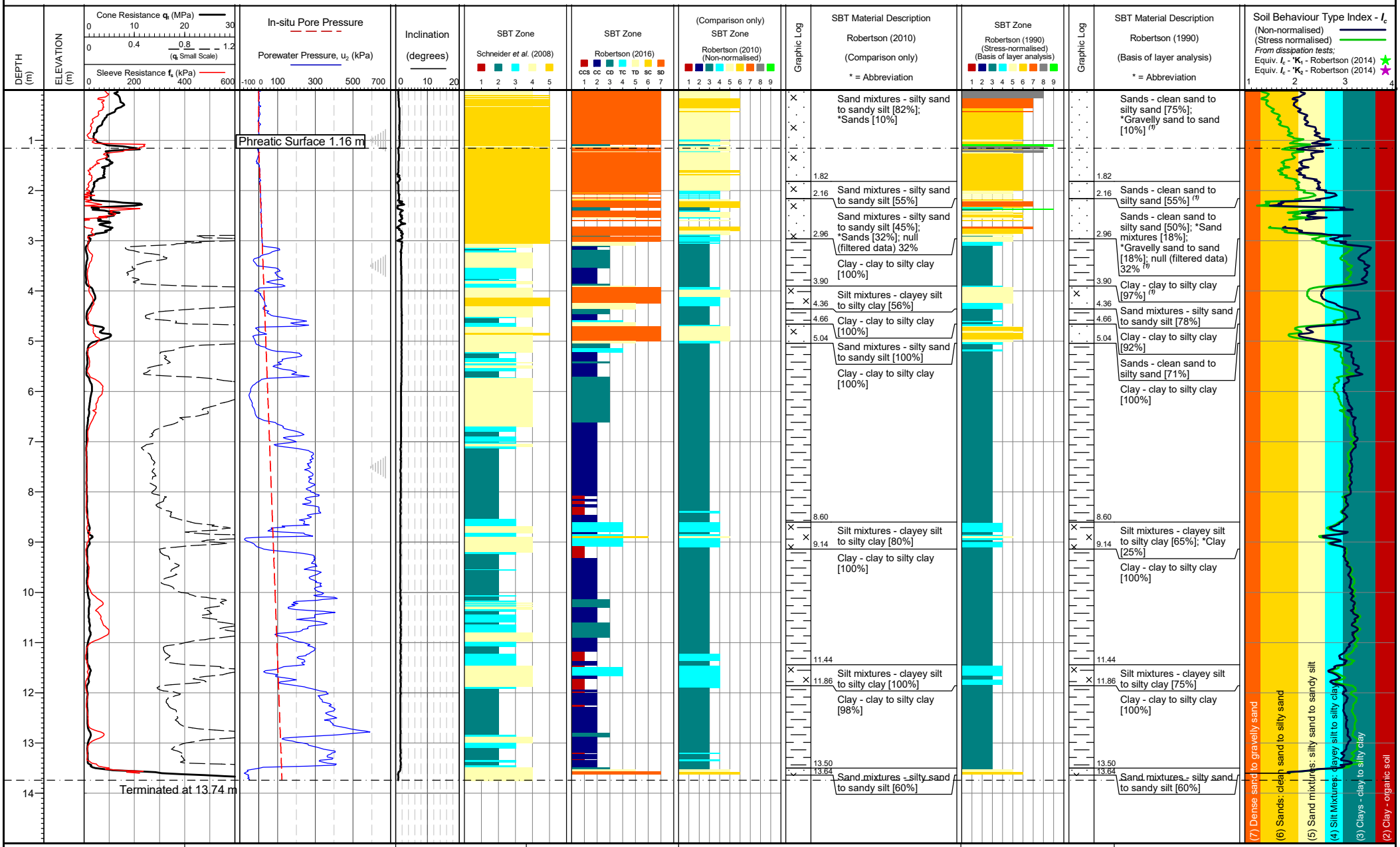
Robertson (1990) with aggregate layer descriptions

LANKELMA

Project: PORT TALBOT

Client: TEC

Lankelma Project Ref: P-108298-10



Cone area (mm2):
ConeID: S15-CFIPTT.1993
Location: Swansea, UK
Rig Used: UK20
Date of test: 26/04/2023 14:09:59

Remarks: *Phreatic surface origin: Average measured piezometric depth from other location(s)

Coordinates: ,
Elevation:

Schneider *et al.* (2008) Material Type
1 - (1c) Sensitive clays
2 - (1b) Clays
3 - (1a) Silts & low I, clays
4 - (3) Transitional soils
5 - (2) Essentially drained sands

Robertson (2016) Material Type
1 - **CCS** - Clay-like - Contractive - Sensitive
2 - **CC** - Clay-like - Contractive
3 - **CD** - Clay-like - Dilative
4 - **TC** - Transitional - Contractive
5 - **TD** - Transitional - Dilative
6 - **SC** - Sand-like - Contractive
7 - **SD** - Sand-like - Dilative

Robertson (1990 & 2010) Material Type
1 - Sensitive fine-grained
2 - Organic soils
3 - Clays - clay to silty clay
4 - Silt mixtures - clayey silt to silty clay
5 - Sand mixtures - silty sand to sandy silt
6 - Sands - clean sand to silty sand
7 - Gravelly sand to sand
8 - Very stiff/dense sand to clayey sand
9 - Very stiff fine grained

(1) 0-3 m: Normalised SBT often artificially coarse/stiff at very low in-situ stresses

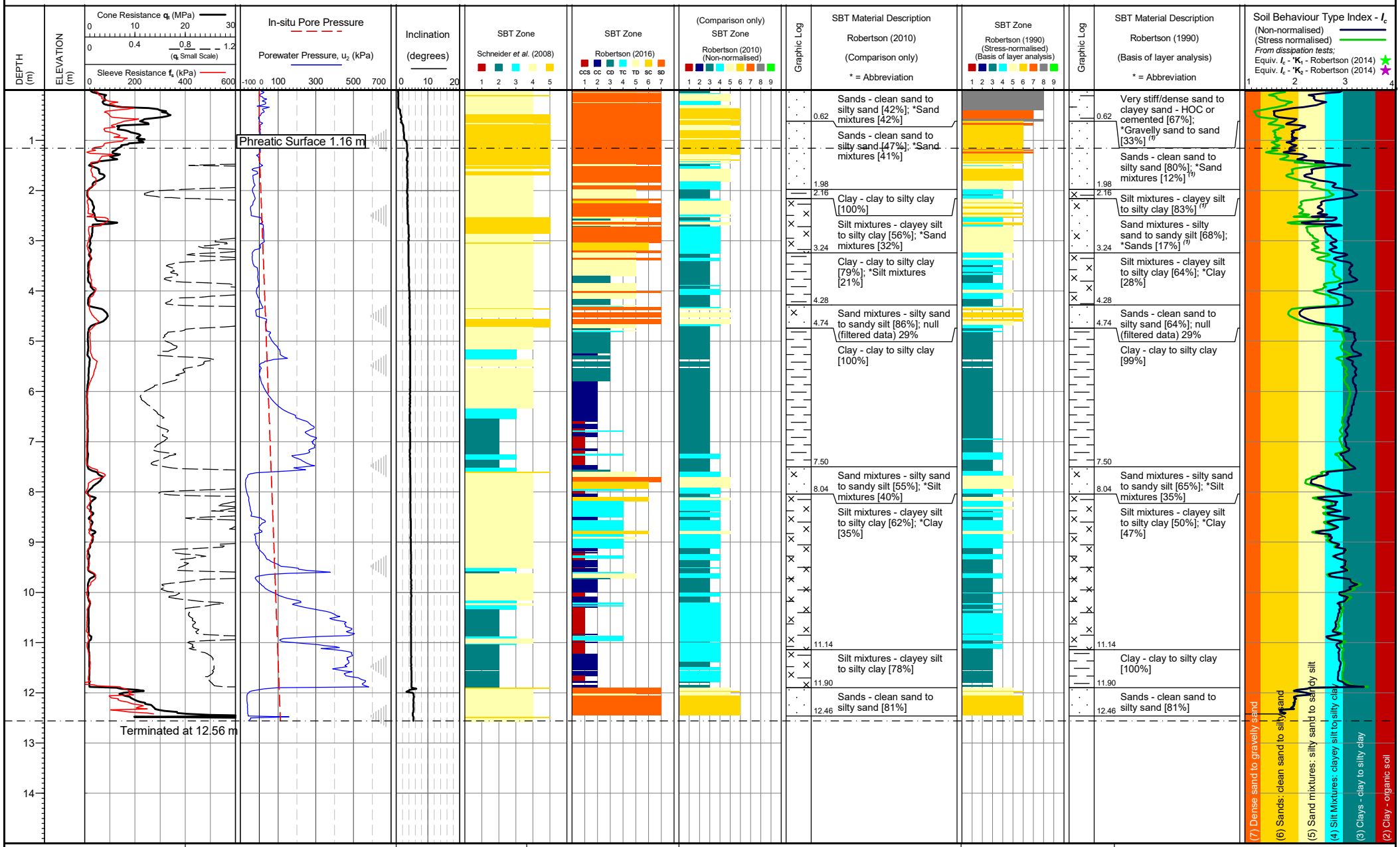
Internal QA Diss.
Dissipation Test

TEST ID: SCPT-101

Project: PORT TALBOT

Client: TEC

Lankelma Project Ref: P-108298-10



Cone area (mm2):
ConeID: S15-CFIPTT.1993
Location: Swansea, UK
Rig Used: UK20
Date of test: 27/04/2023 07:39:51

Remarks: *Phreatic surface origin: Average measured piezometric depth from other location(s)

Coordinates: ,
Elevation:

Schneider *et al.* (2008) Material Type
1 - (1c) Sensitive clays
2 - (1b) Clays
3 - (1a) Silts & low I, clays
4 - (3) Transitional soils
5 - (2) Essentially drained sands

Robertson (2016) Material Type
1 - **CCS** - Clay-like - Contractive - Sensitive
2 - **CC** - Clay-like - Contractive
3 - **CD** - Clay-like - Dilative
4 - **TC** - Transitional - Contractive
5 - **TD** - Transitional - Dilative
6 - **SC** - Sand-like - Contractive
7 - **SD** - Sand-like - Dilative

Robertson (1990 & 2010) Material Type
1 - Sensitive fine-grained
2 - Organic soils
3 - Clays - clay to silty clay
4 - Silt mixtures - clayey silt to silty clay
5 - Sand mixtures - silty sand to sandy silt
6 - Sands - clean sand to silty sand
7 - Gravelly sand to sand
8 - Very stiff/dense sand to clayey sand
9 - Very stiff fine grained

(1) 0-3 m: Normalised SBT often artificially coarse/stiff at very low in-situ stresses

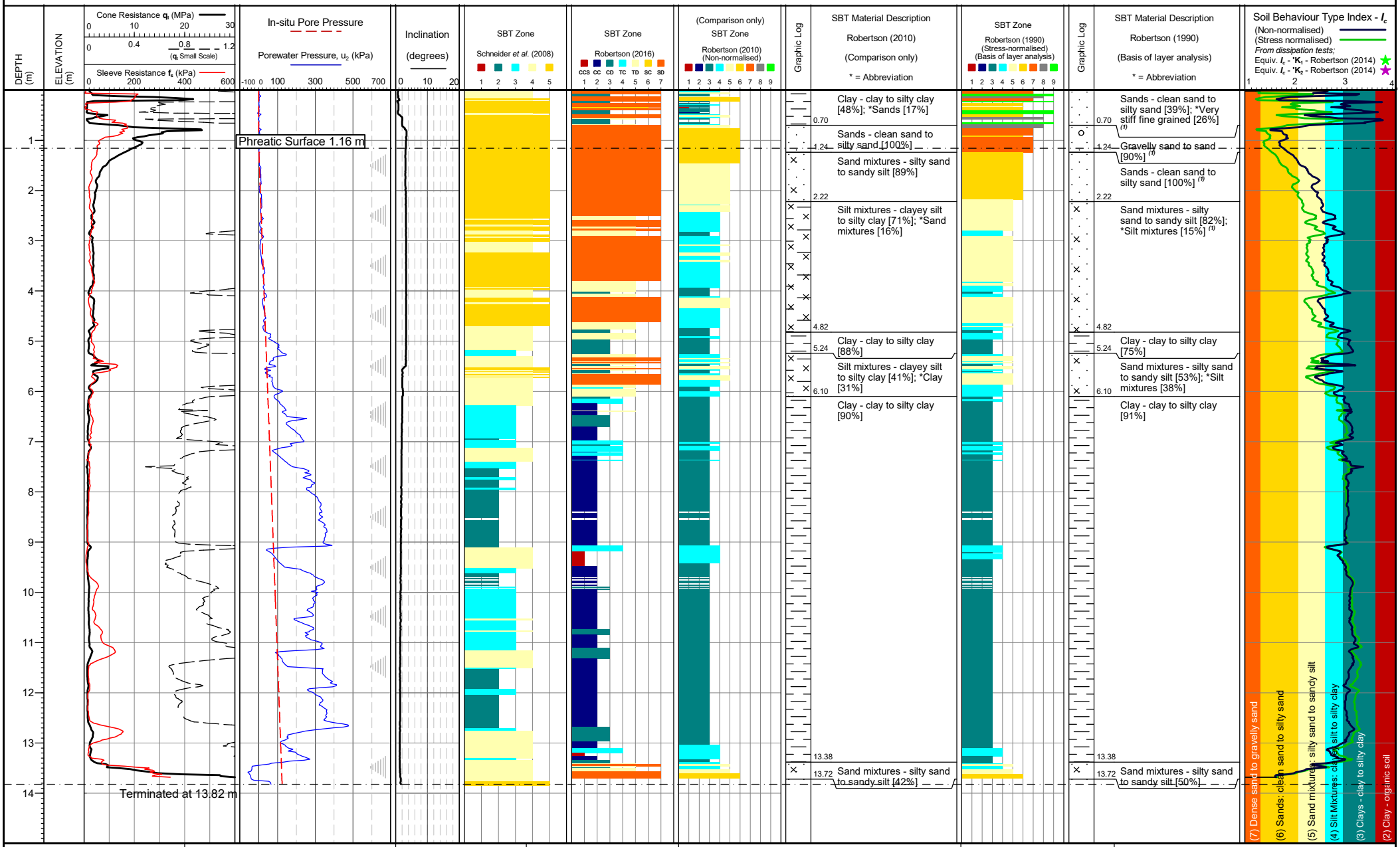
Internal QA Diss.
Dissipation Test

TEST ID: SCPT-102

Project: PORT TALBOT

Client: TEC

Lankelma Project Ref: P-108298-10



Cone area (mm2):
ConeID: S15-CFIPTT.1993
Location: Swansea, UK
Rig Used: UK20
Date of test: 26/04/2023 12:28:19

Remarks: *Phreatic surface origin: Average measured piezometric depth from other location(s)

Coordinates: ,
Elevation:

Schneider *et al.* (2008) Material Type
1 - (1c) Sensitive clays
2 - (1b) Clays
3 - (1a) Silts & low I, clays
4 - (3) Transitional soils
5 - (2) Essentially drained sands

Robertson (2016) Material Type
1 - **CCS** - Clay-like - Contractive - Sensitive
2 - **CC** - Clay-like - Contractive
3 - **CD** - Clay-like - Dilative
4 - **TC** - Transitional - Contractive
5 - **TD** - Transitional - Dilative
6 - **SC** - Sand-like - Contractive
7 - **SD** - Sand-like - Dilative

Robertson (1990 & 2010) Material Type
1 - Sensitive fine-grained
2 - Organic soils
3 - Clays - clay to silty clay
4 - Silt mixtures - clayey silt to silty clay
5 - Sand mixtures - silty sand to sandy silt
6 - Sands - clean sand to silty sand
7 - Gravelly sand to sand
8 - Very stiff/dense sand to clayey sand
9 - Very stiff fine grained

(1) 0-3 m: Normalised SBT often artificially coarse/stiff at very low in-situ stresses

Internal QA Diss.
Dissipation Test

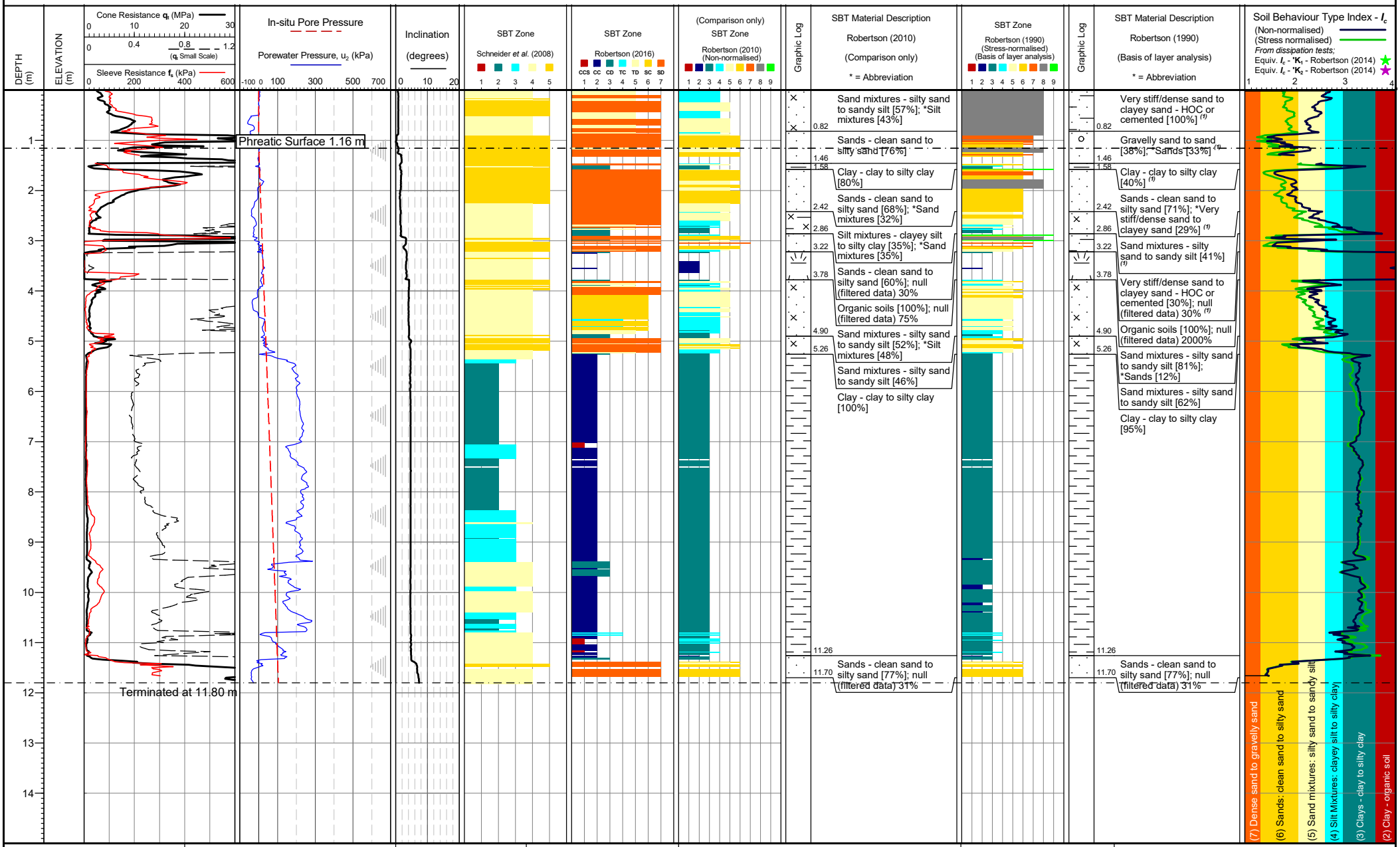
TEST ID: SCPT-103

LANKELMA

Project: PORT TALBOT

Client: TEC

Lankelma Project Ref: P-108298-10



Cone area (mm2):
ConeID: S15-CFIPTT.1993
Location: Swansea, UK
Rig Used: UK20
Date of test: 26/04/2023 09:35:55

Remarks: *Phreatic surface origin: Average measured piezometric depth at this location, approx. +- 0.3 mbgl

Coordinates: ,
Elevation:

Schneider *et al.* (2008) Material Type
1 - (1c) Sensitive clays
2 - (1b) Clays
3 - (1a) Silts & low I, clays
4 - (3) Transitional soils
5 - (2) Essentially drained sands

Robertson (2016) Material Type
1 - **CCS** - Clay-like - Contractive - Sensitive
2 - **CC** - Clay-like - Contractive
3 - **CD** - Clay-like - Dilative
4 - **TC** - Transitional - Contractive
5 - **TD** - Transitional - Dilative
6 - **SC** - Sand-like - Contractive
7 - **SD** - Sand-like - Dilative

Robertson (1990 & 2010) Material Type
1 - Sensitive fine-grained
2 - Organic soils
3 - Clays - clay to silty clay
4 - Silt mixtures - clayey silt to silty clay
5 - Sand mixtures - silty sand to sandy silt
6 - Sands - clean sand to silty sand
7 - Gravelly sand to sand
8 - Very stiff/dense sand to clayey sand
9 - Very stiff fine grained

(7) 0-3 m: Normalised SBT often artificially coarse/stiff at very low in-situ stresses

Internal QA Diss.
Dissipation Test

TEST ID: SCPT-104

APPENDIX E PARAMETER RESULTS 1 – S_U, M_V, OCR, SBT, I_C

Undrained shear strength

Coefficient of volume change

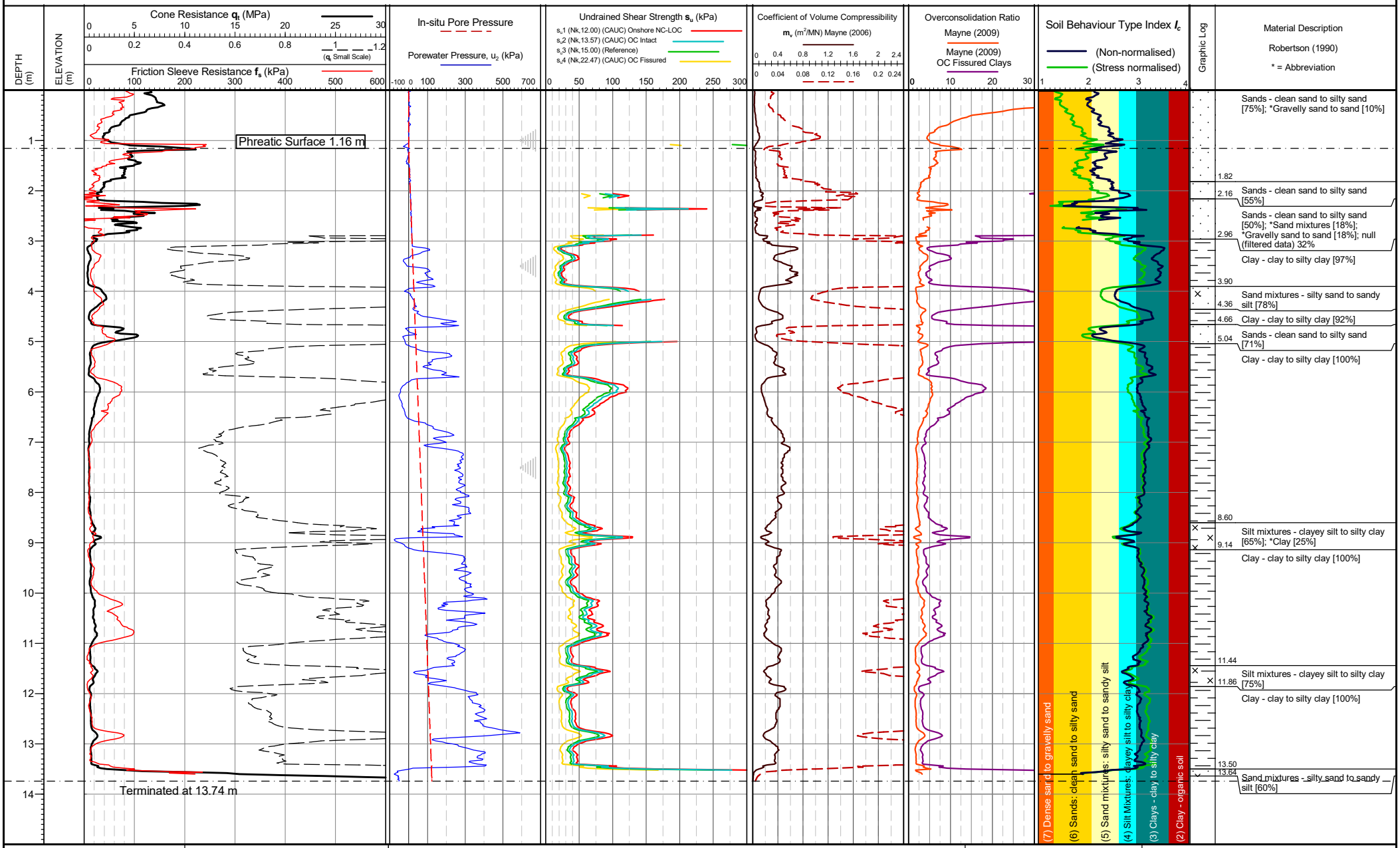
Overconsolidation ratio

Robertson 1990 SBT descriptions & SBT index I_c

LANKELMA

Project: PORT TALBOT

Client: TEC



Cone area (mm2):
ConeID: S15-CFIPTT.1993
Operator: Rob Bennett
Rig Used: UK20
Date of test: 26/04/2023 14:09:59

Location: Swansea, UK
Coordinates: ,
Elevation:
Coordinate system:

Remarks: *Phreatic surface origin: Average measured piezometric depth from other location(s)

Termination Remark:
Tip load

Internal QA Diss.
Dissipation Test
Penetration Pause (<1cm/s)

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.40-2.70. See report text for methods and discussion of parameter evaluation.

Date of plot: 28-04-23

Lankelma Project Ref: P-108298-10

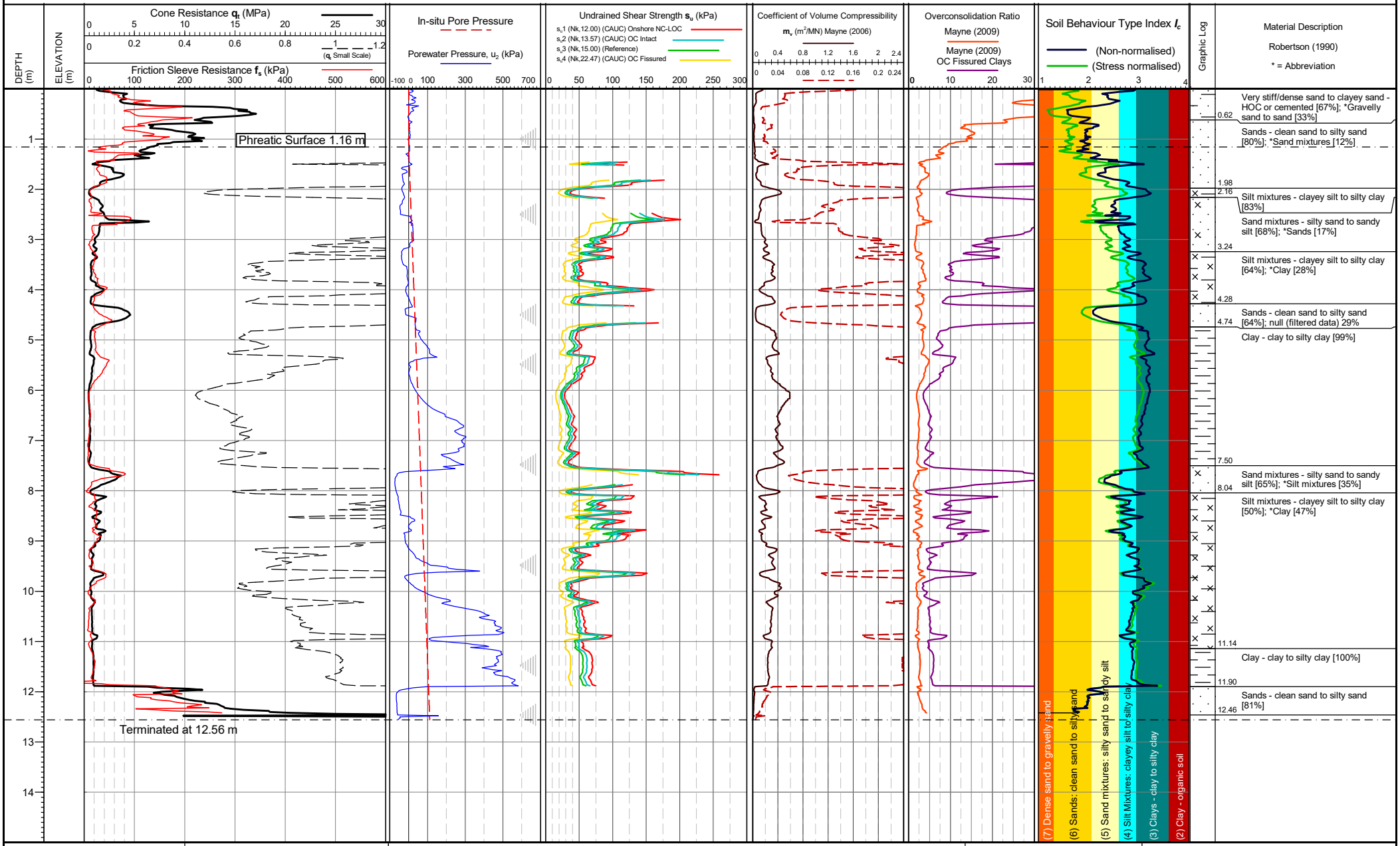
Checked by: Chris Player

TEST ID: SCPT-101

LANKELMA

Project: PORT TALBOT

Client: TEC



Cone area (mm2):
ConeID: S15-CFIPTT.1993
Operator: Rob Bennett
Rig Used: UK20
Date of test: 27/04/2023 07:39:51

Location: Swansea, UK
Coordinates: ,
Elevation:
Coordinate system:

Remarks: *Phreatic surface origin: Average measured piezometric depth from other location(s)

Termination Remark:
Tip load

Internal QA Diss.
Dissipation Test
Penetration Pause (<1cm/s)

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.40-2.70. See report text for methods and discussion of parameter evaluation.

Date of plot: 28-04-23

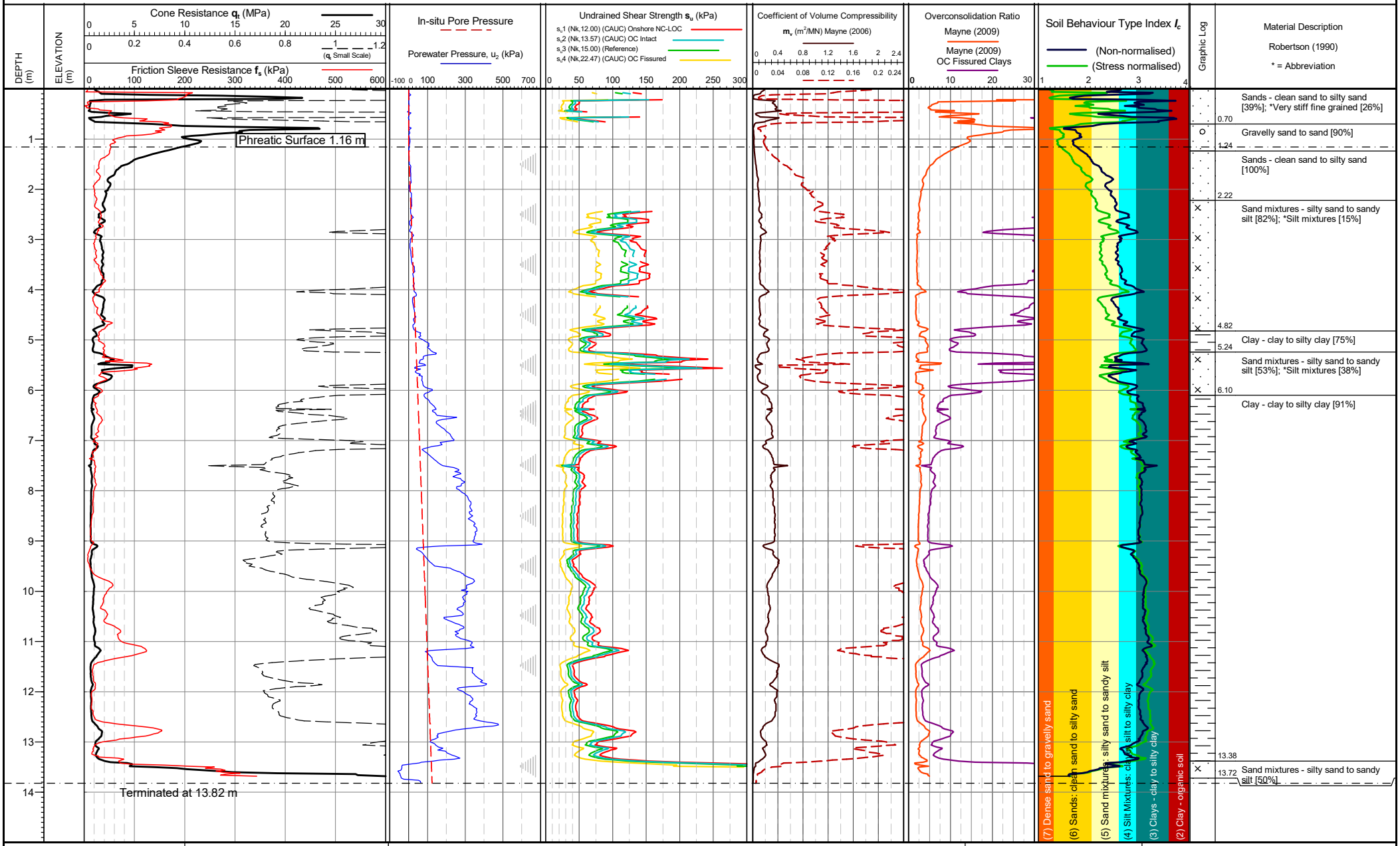
Lankelma Project Ref: P-108298-10

Checked by: Chris Player

TEST ID: SCPT-102

Project: PORT TALBOT

Client: TEC



Cone area (mm2):
ConeID: S15-CFIPTT.1993
Operator: Rob Bennett
Rig Used: UK20
Date of test: 26/04/2023 12:28:19

Location: Swansea, UK
Coordinates: ,
Elevation:
Coordinate system:

Remarks: *Phreatic surface origin: Average measured piezometric depth from other location(s)

Termination Remark:
Tip load

Internal QA Diss.
Dissipation Test
Penetration Pause (<1cm/s)

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.40-2.70. See report text for methods and discussion of parameter evaluation.

Date of plot: 28-04-23

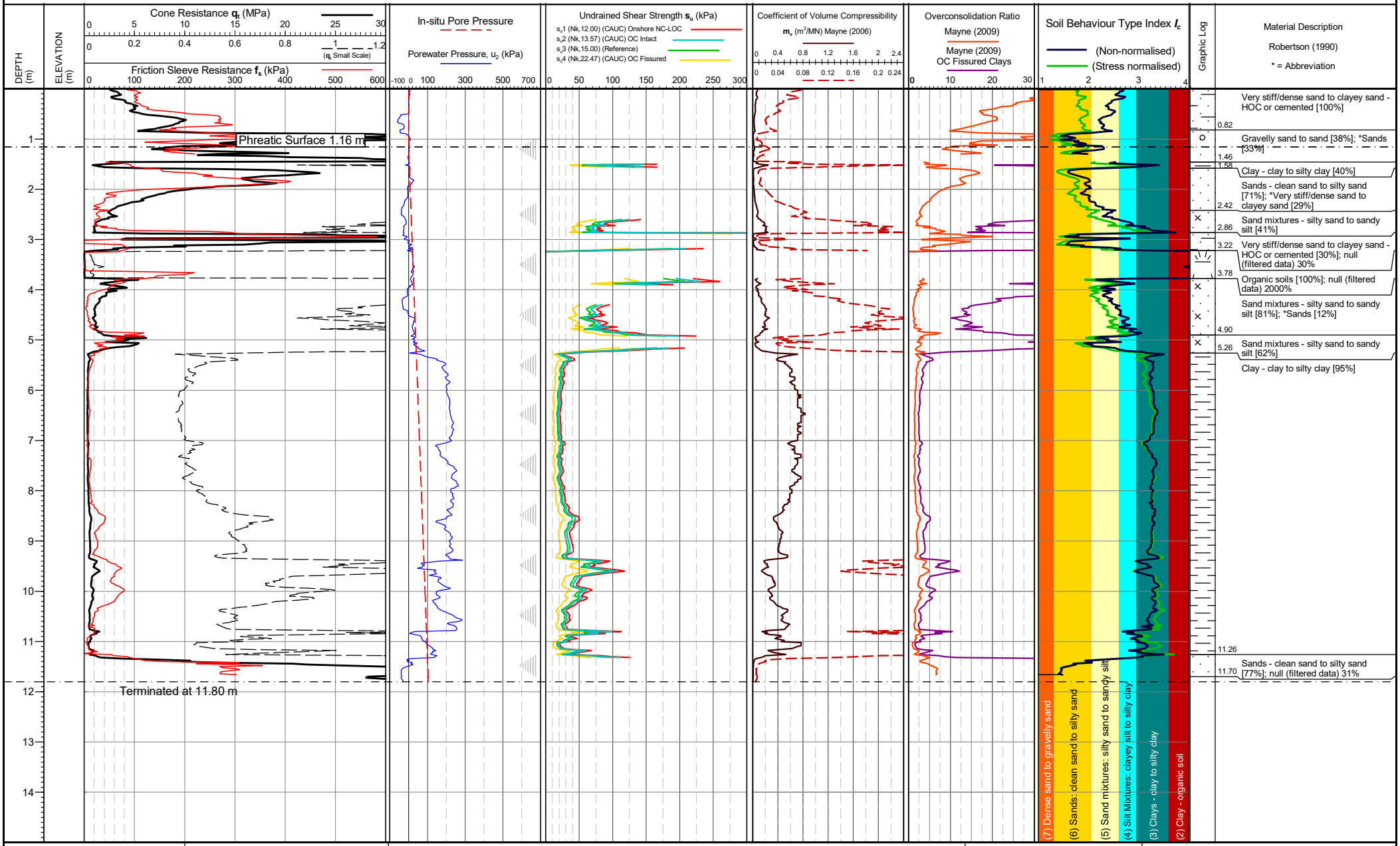
Lankelma Project Ref: P-108298-10

Checked by: Chris Player

TEST ID: SCPT-103

Project: PORT TALBOT

Client: TEC



Cone area (mm2):
ConeID: S15-CFIPTT.1993
Operator: Rob Bennett
Rig Used: UK20
Date of test: 26/04/2023 09:35:55

Location: Swansea, UK
Coordinates: ,
Elevation:
Coordinate system:

Remarks: *Phreatic surface origin: Average measured piezometric depth at this location, approx. +- 0.3 mbgl

Termination Remark:
Tip load

Internal QA Diss.
Dissipation Test
Penetration Pause (<1cm/s)

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.40-2.70. See report text for methods and discussion of parameter evaluation.

Date of plot: 28-04-23

Checked by: Chris Player

Lankelma Project Ref: P-108298-10

TEST ID: SCPT-104

APPENDIX F PARAMETER RESULTS 2 – SPT N60, PHI, D_R, E, I_C

Equivalent SPT N60

Peak friction angle

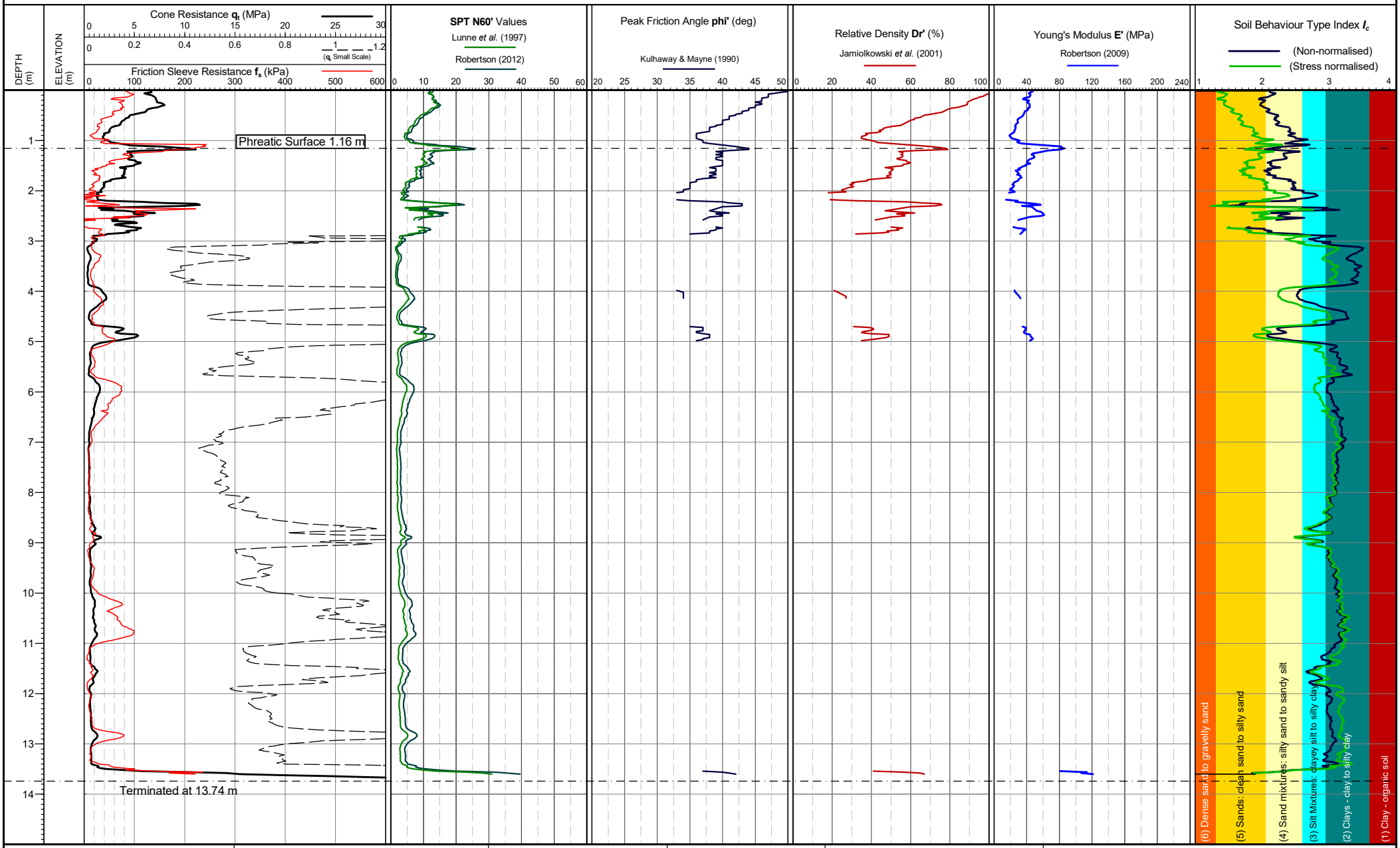
Relative density

Young's modulus

SBT index I_c

Project: PORT TALBOT

Client: TEC



Cone area (mm2):
Cone ID: S15-CFIPTT.1993
Operator: Rob Bennett
Date of test: 26/04/2023 14:09:59

Location: Swansea, UK
Coordinates: ,
Elevation:
Coordinate system:

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.40-2.70. See report text for methods and discussion of parameter evaluation.

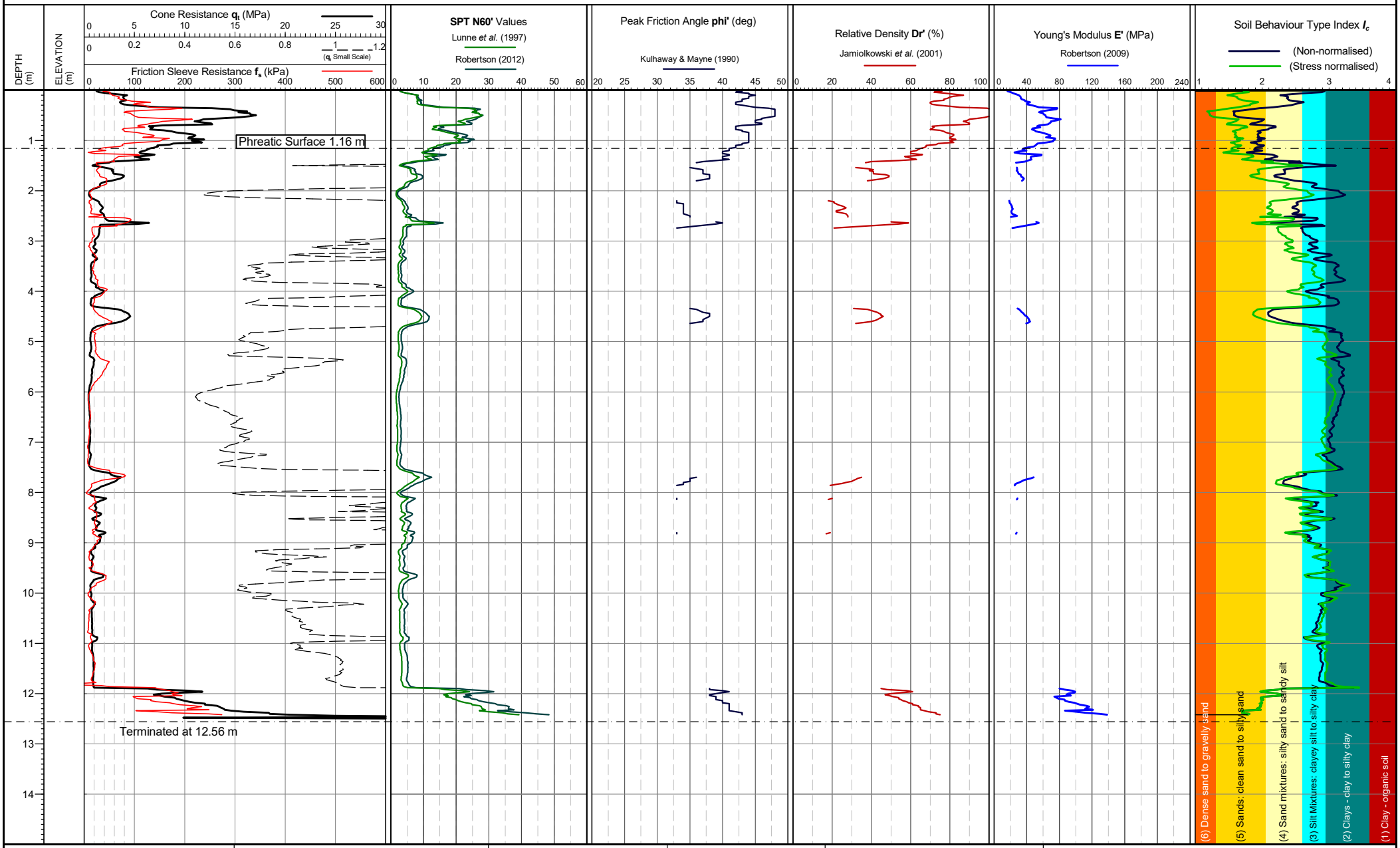
Date of plot: 28-04-23
Checked by: Chris Player

Lankelma Project Ref: P-108298-10

TEST ID: SCPT-101

Project: PORT TALBOT

Client: TEC



Cone area (mm2):
Cone ID: S15-CFIPTT.1993
Operator: Rob Bennett
Date of test: 27/04/2023 07:39:51

Location: Swansea, UK
Coordinates: ,
Elevation:
Coordinate system:

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.40-2.70. See report text for methods and discussion of parameter evaluation.

Date of plot: 28-04-23
Checked by: Chris Player

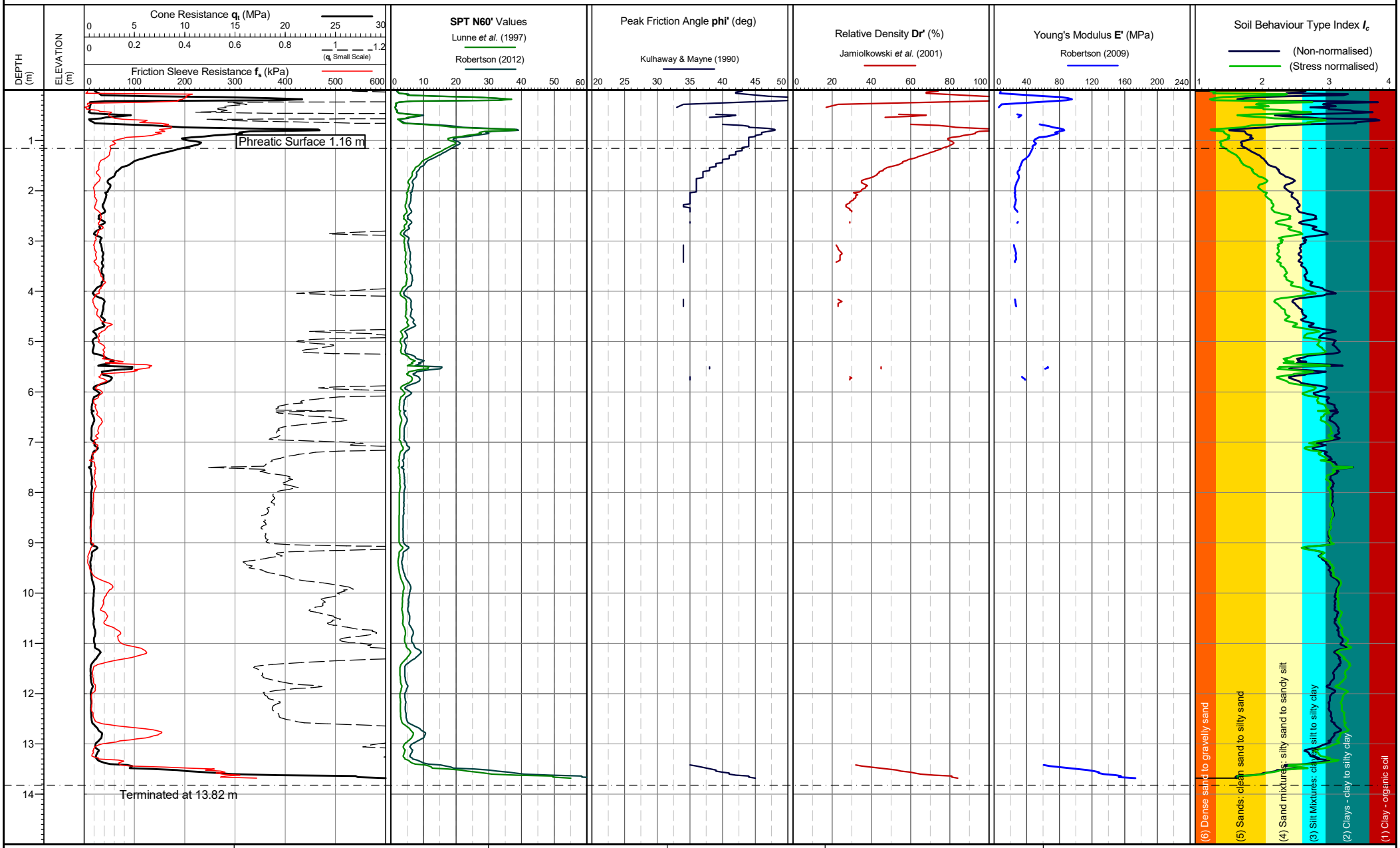
Lankelma Project Ref: P-108298-10

TEST ID: SCPT-102

LANKELMA

Project: PORT TALBOT

Client: TEC



Cone area (mm2):
Cone ID: S15-CFIPTT.1993
Operator: Rob Bennett
Date of test: 26/04/2023 12:28:19

Location: Swansea, UK
Coordinates: ,
Elevation:
Coordinate system:

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.40-2.70. See report text for methods and discussion of parameter evaluation.

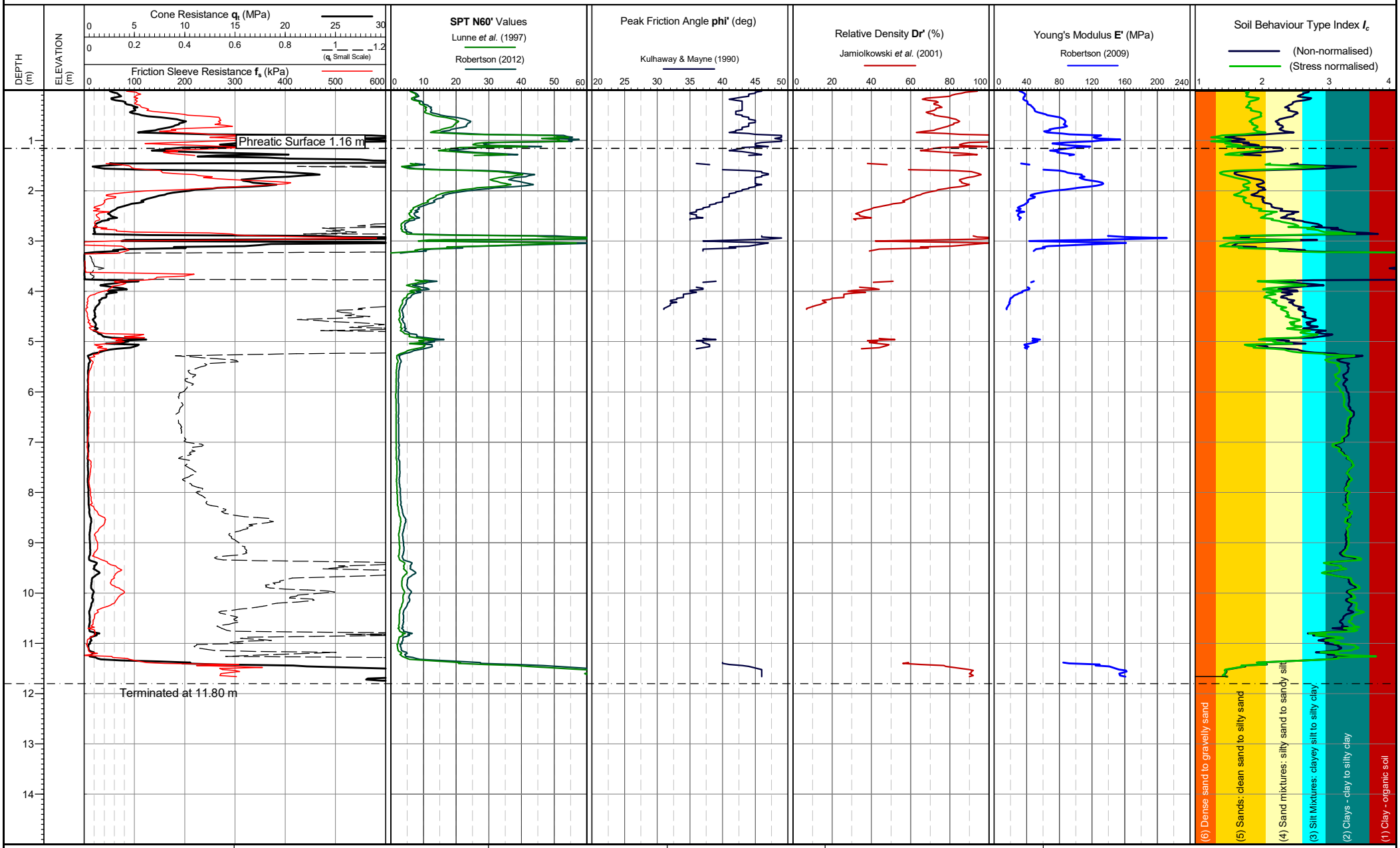
Date of plot: 28-04-23
Checked by: Chris Player

Lankelma Project Ref: P-108298-10

TEST ID: SCPT-103

Project: PORT TALBOT

Client: TEC



Cone area (mm2):
Cone ID: S15-CFIPTT.1993
Operator: Rob Bennett
Date of test: 26/04/2023 09:35:55

Location: Swansea, UK
Coordinates: ,
Elevation:
Coordinate system:

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.40-2.70. See report text for methods and discussion of parameter evaluation.

Date of plot: 28-04-23
Checked by: Chris Player

Lankelma Project Ref: P-108298-10

TEST ID: SCPT-104

APPENDIX G SEISMIC TEST RESULTS

Small strain shear modulus

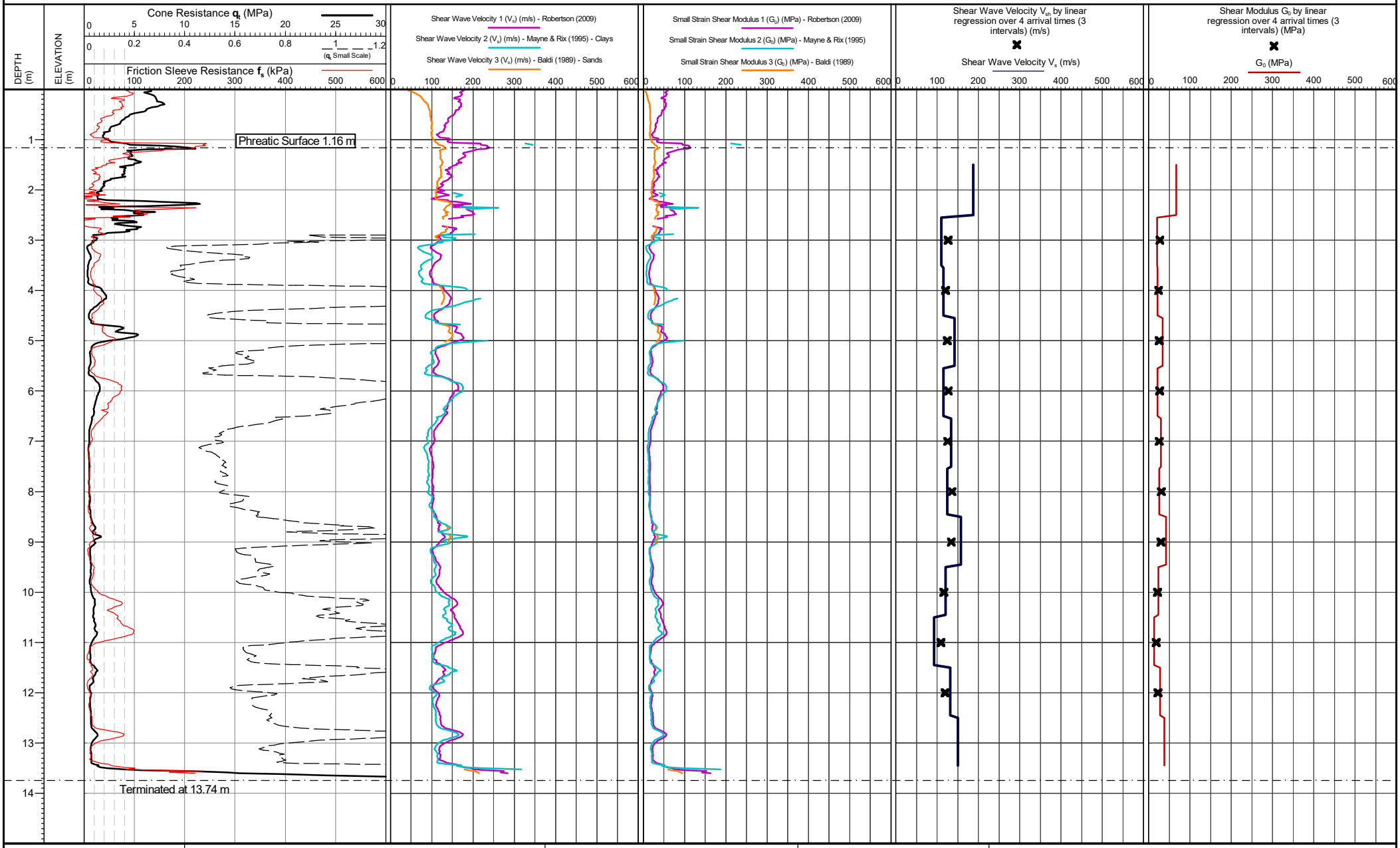
Shear wave velocity

Plots are provided for all seismic locations

LANKELMA

Project: PORT TALBOT

Client: TEC



Cone area (mm2):
Cone ID: S15-CFIPTT.1993
Operator: Rob Bennett
Date of test: 26/04/2023 14:09:59

Location: Swansea, UK
Coordinates: ,
Elevation:
Coordinate system:

Phreatic surface (m):
3

Remarks:

Date of plot:
02-05-23

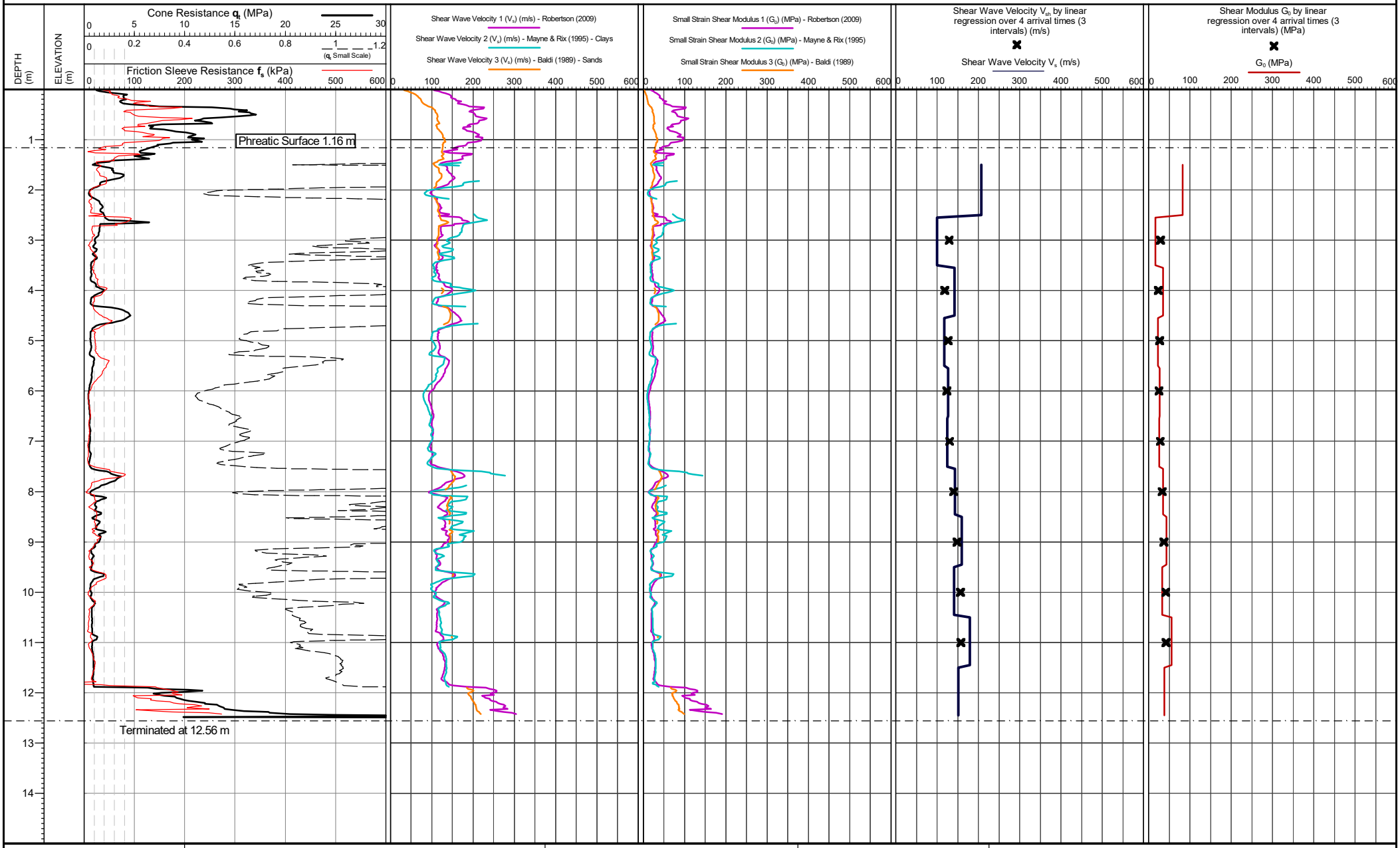
Checked by:
Chris Player

TEST ID: SCPT-101

LANKELMA

Project: PORT TALBOT

Client: TEC



Cone area (mm2):
Cone ID: S15-CFIPTT.1993
Operator: Rob Bennett
Date of test: 27/04/2023 07:39:51

Location: Swansea, UK
Coordinates: ,
Elevation:
Coordinate system:

Phreatic surface (m):
3

Remarks:

Date of plot:
02-05-23

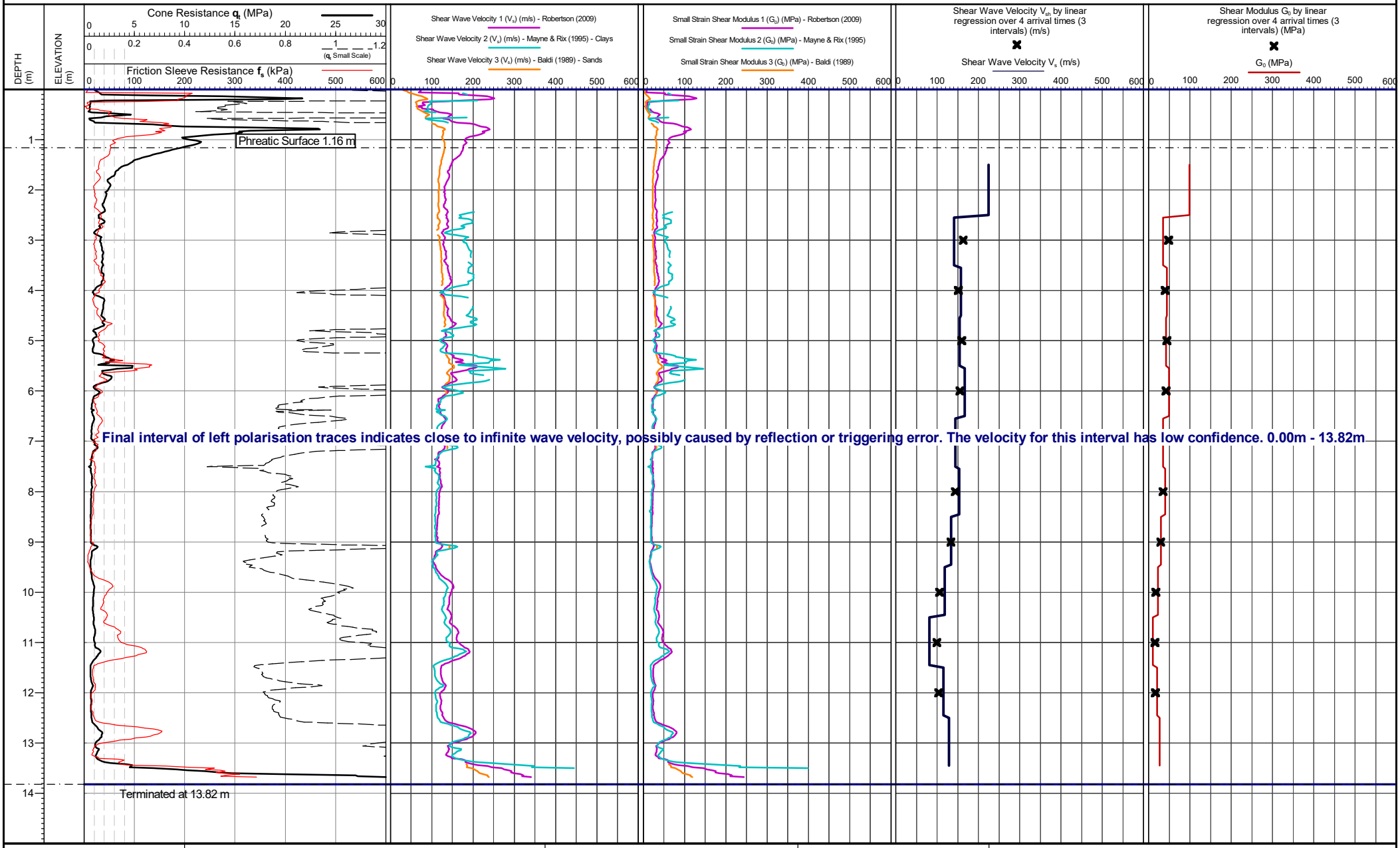
Checked by:
Chris Player

TEST ID: SCPT-102

LANKELMA

Project: PORT TALBOT

Client: TEC

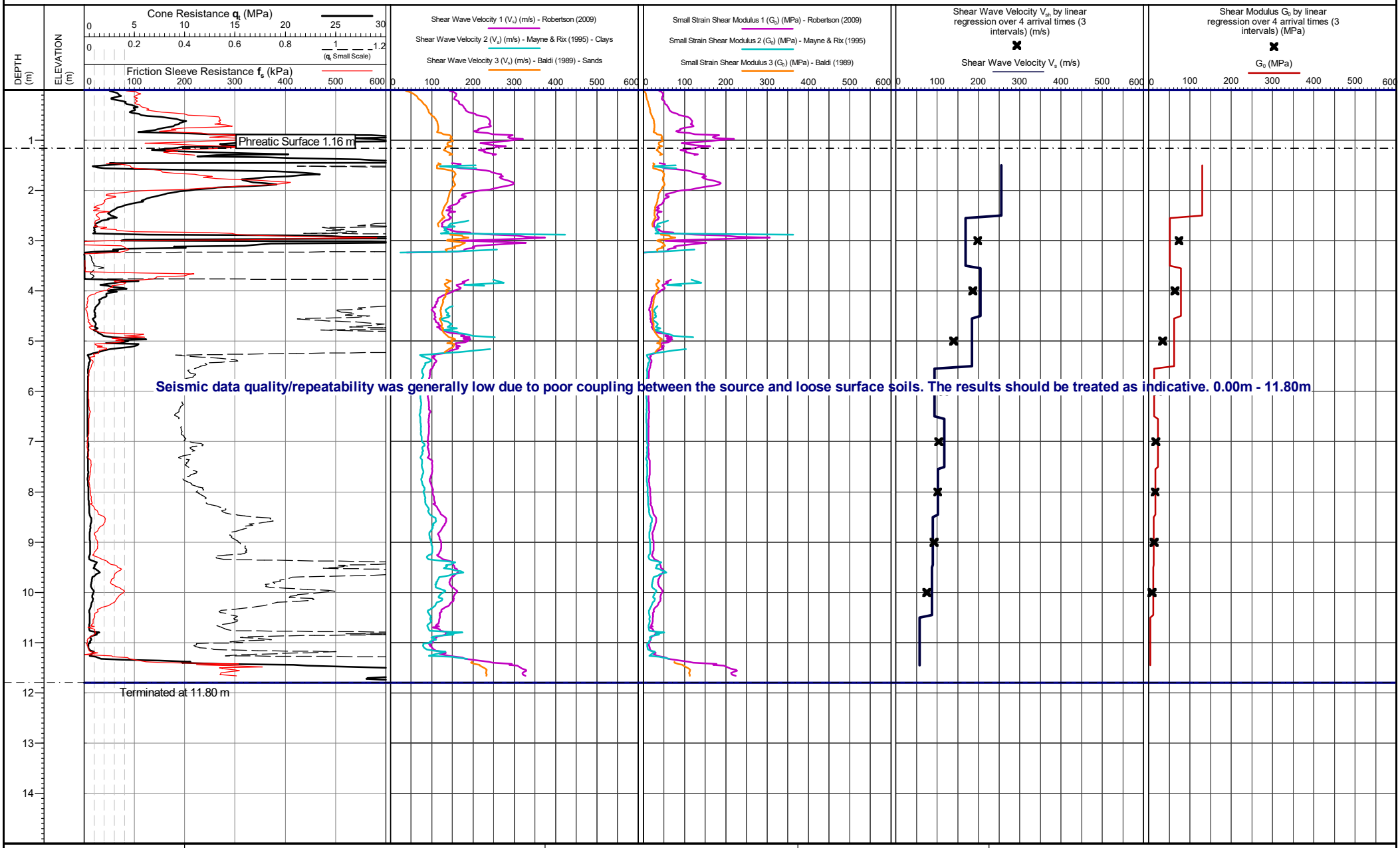


Cone area (mm2):	Location: Swansea, UK	Phreatic surface (m):	Remarks:	Date of plot:	**TEST ID: SCPT-103**
Cone ID: S15-CFIPTT.1993	Coordinates: ,	3		02-05-23	
Operator: Rob Bennett	Elevation:			Checked by:	
Date of test: 26/04/2023 12:28:19	Coordinate system:			Chris Player	Page 1 of 1

LANKELMA

Project: PORT TALBOT

Client: TEC



Cone area (mm2):
Cone ID: S15-CFIPTT.1993
Operator: Rob Bennett
Date of test: 26/04/2023 09:35:55

Location: Swansea, UK
Coordinates: ,
Elevation:
Coordinate system:

Phreatic surface (m):
3

Remarks:

Date of plot:
02-05-23

Checked by:
Chris Player

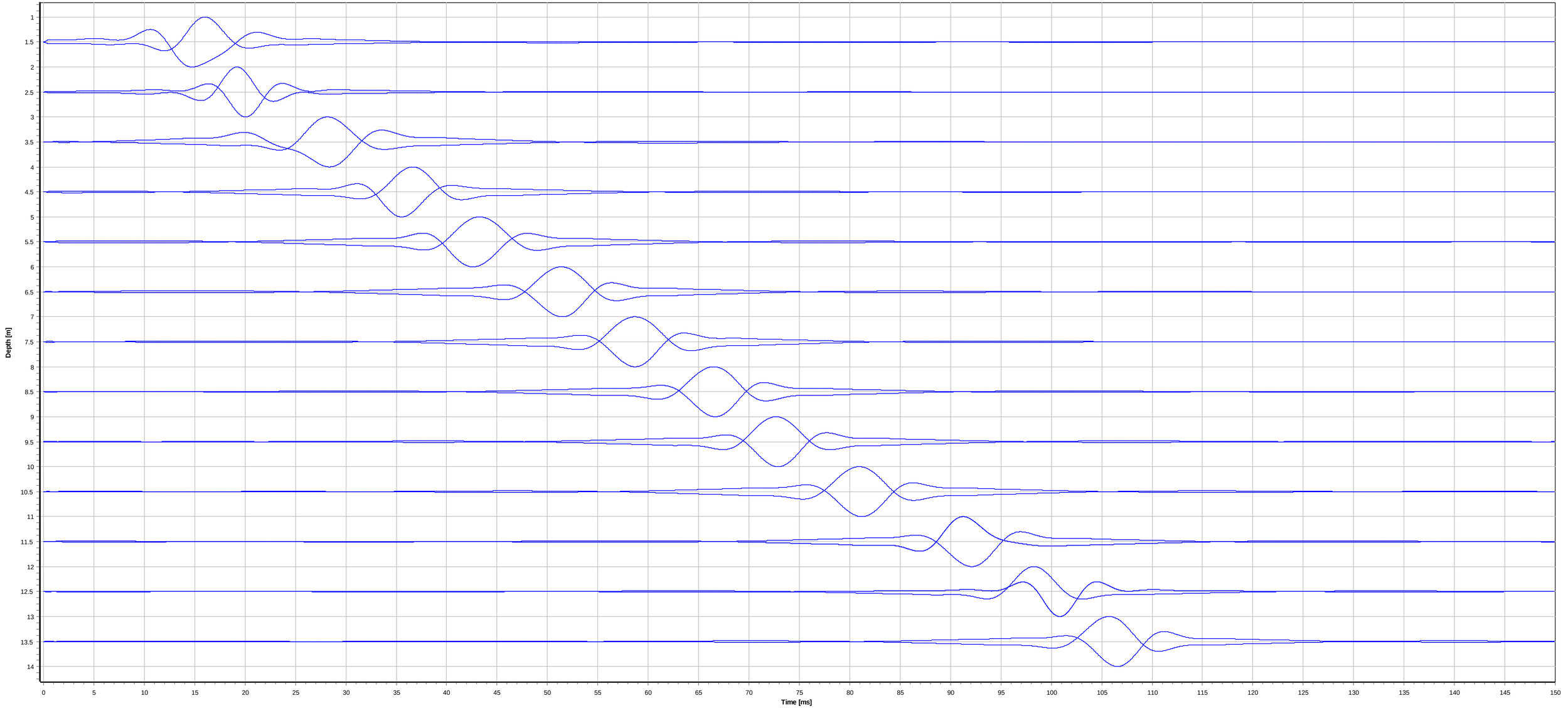
TEST ID: SCPT-104

APPENDIX H SEISMOGRAMS

Plots are provided for all seismic locations

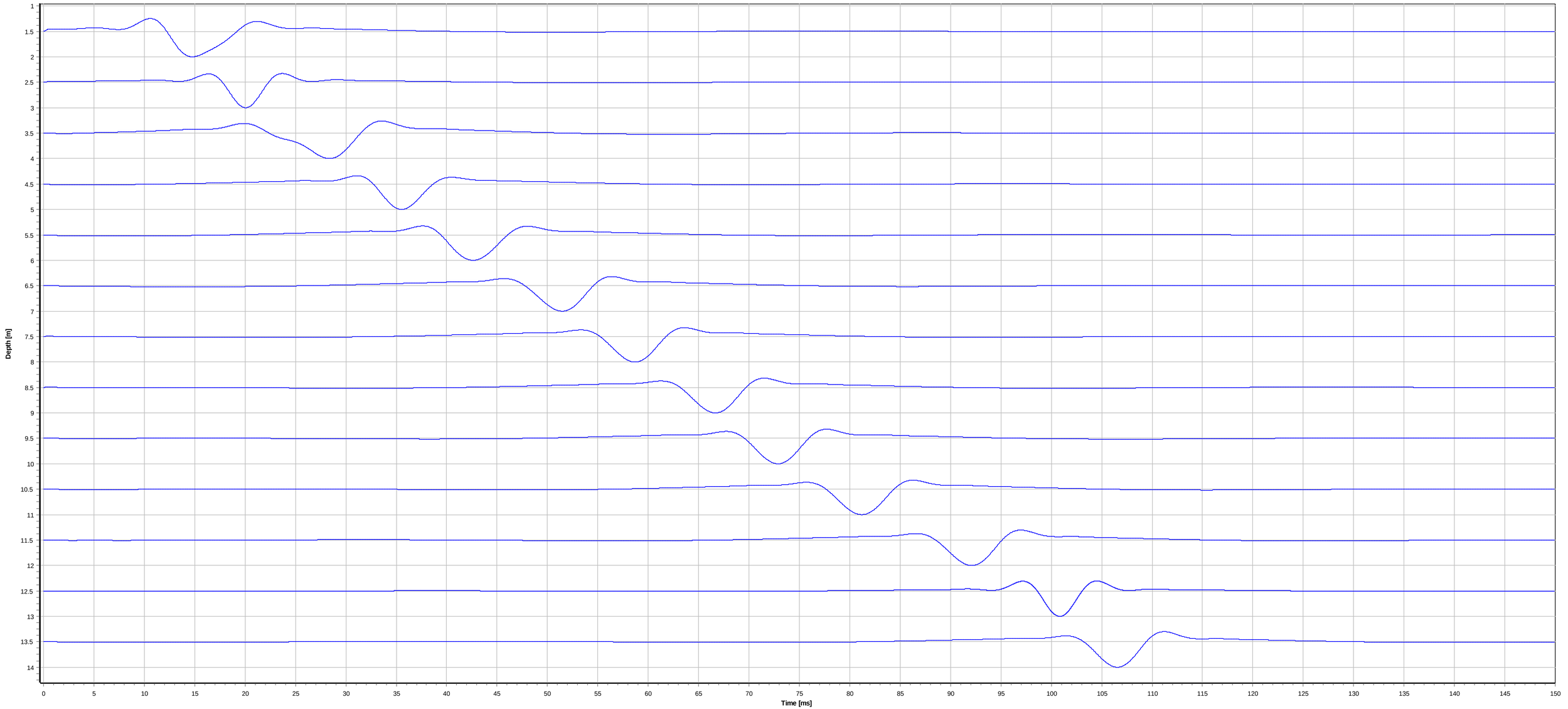
PROJECT: PORT TALBOT
CLIENT: TEC

SCPT-101 SEISMIC SHEAR WAVE (Svh) TRACES, BOTH POLARISATIONS, Y-AXIS, SIGNAL DECAY APPLIED



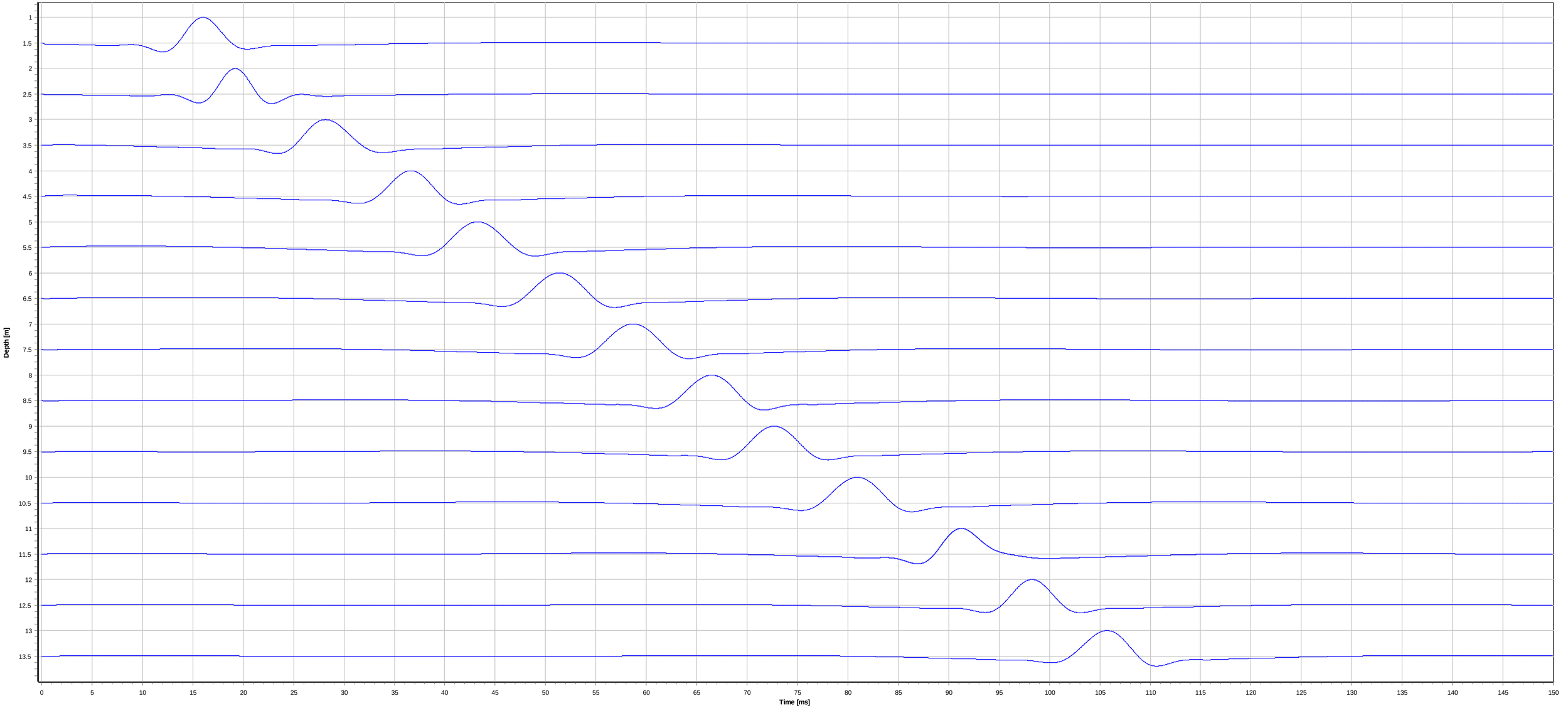
PROJECT: PORT TALBOT
CLIENT: TEC

SCPT-101 SEISMIC SHEAR WAVE (Svh) TRACES, LEFT POLARISATION, Y-AXIS, SIGNAL DECAY APPLIED



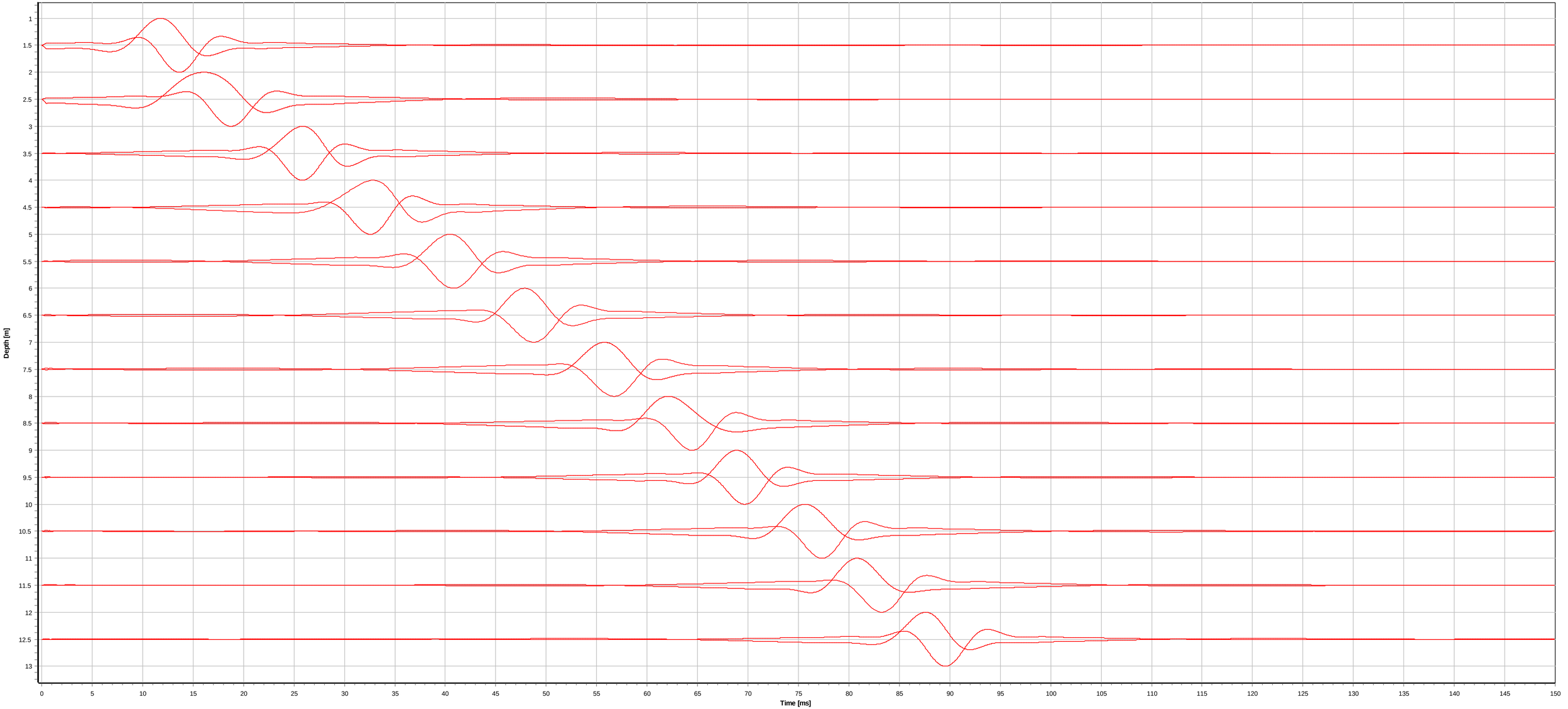
PROJECT: PORT TALBOT
CLIENT: TEC

SCPT-101 SEISMIC SHEAR WAVE (Svh) TRACES, RIGHT POLARISATION, Y-AXIS, SIGNAL DECAY APPLIED



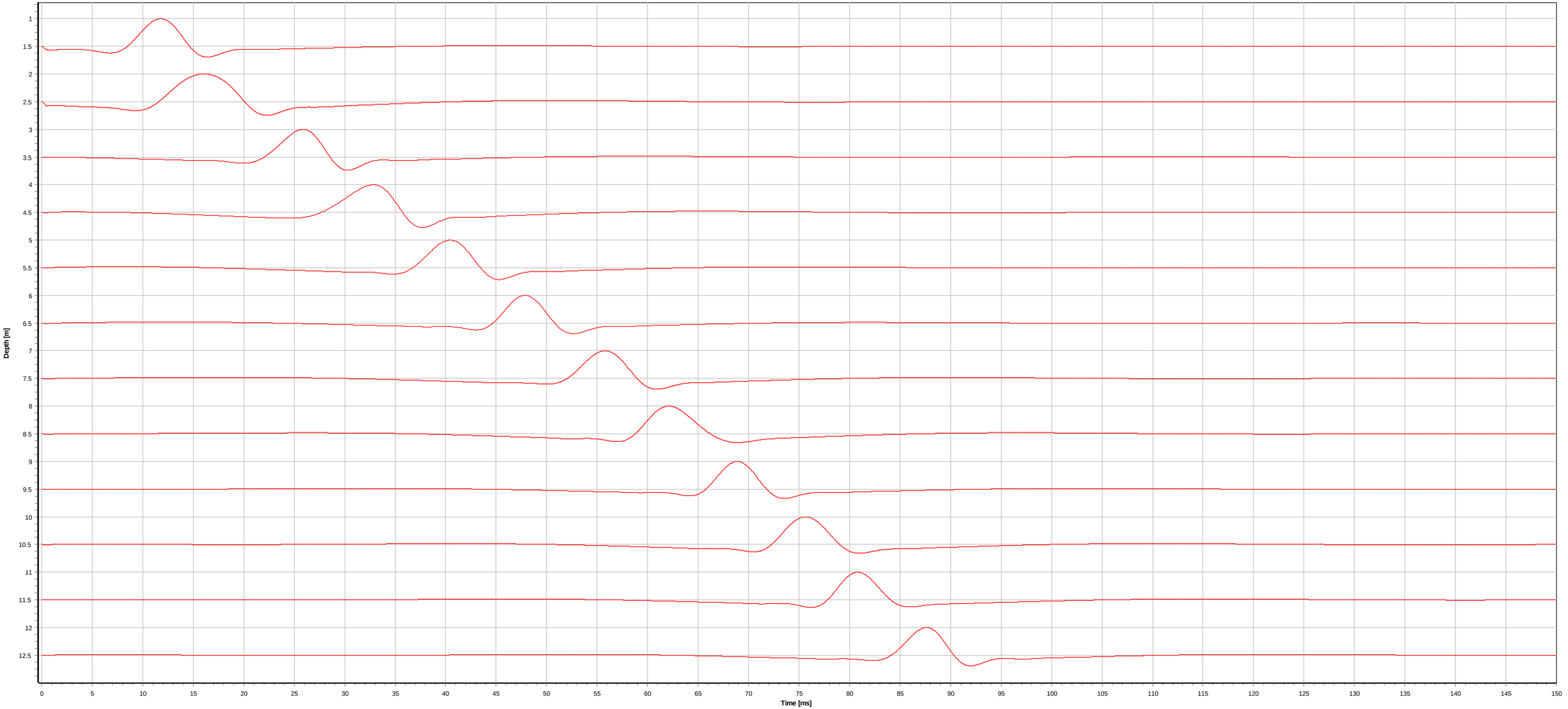
PROJECT: PORT TALBOT
CLIENT: TEC

SCPT-102 SEISMIC SHEAR WAVE (Svh) TRACES, BOTH POLARISATIONS, X-AXIS, SIGNAL DECAY APPLIED



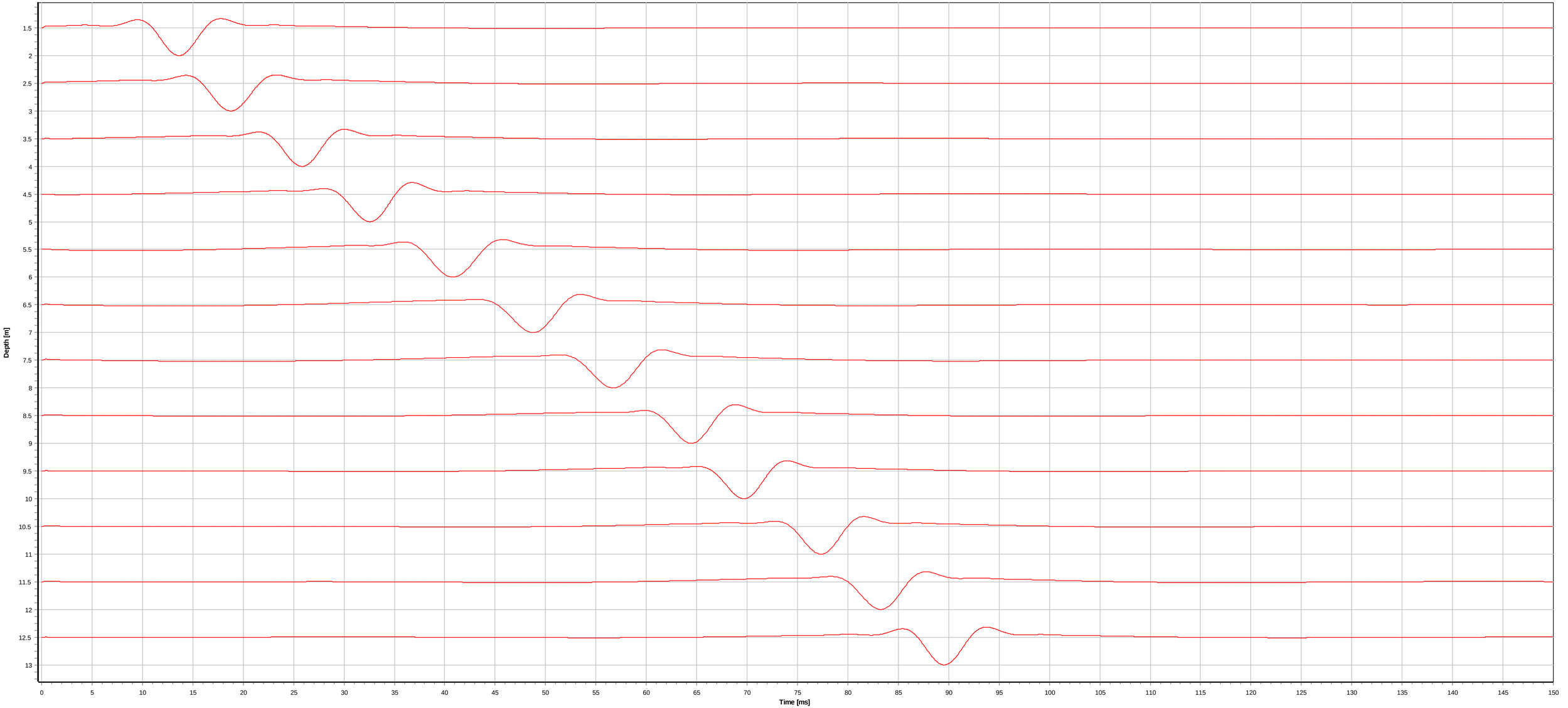
PROJECT: PORT TALBOT
CLIENT: TEC

SCPT-102 SEISMIC SHEAR WAVE (Svh) TRACES, LEFT POLARISATION, X-AXIS, SIGNAL DECAY APPLIED



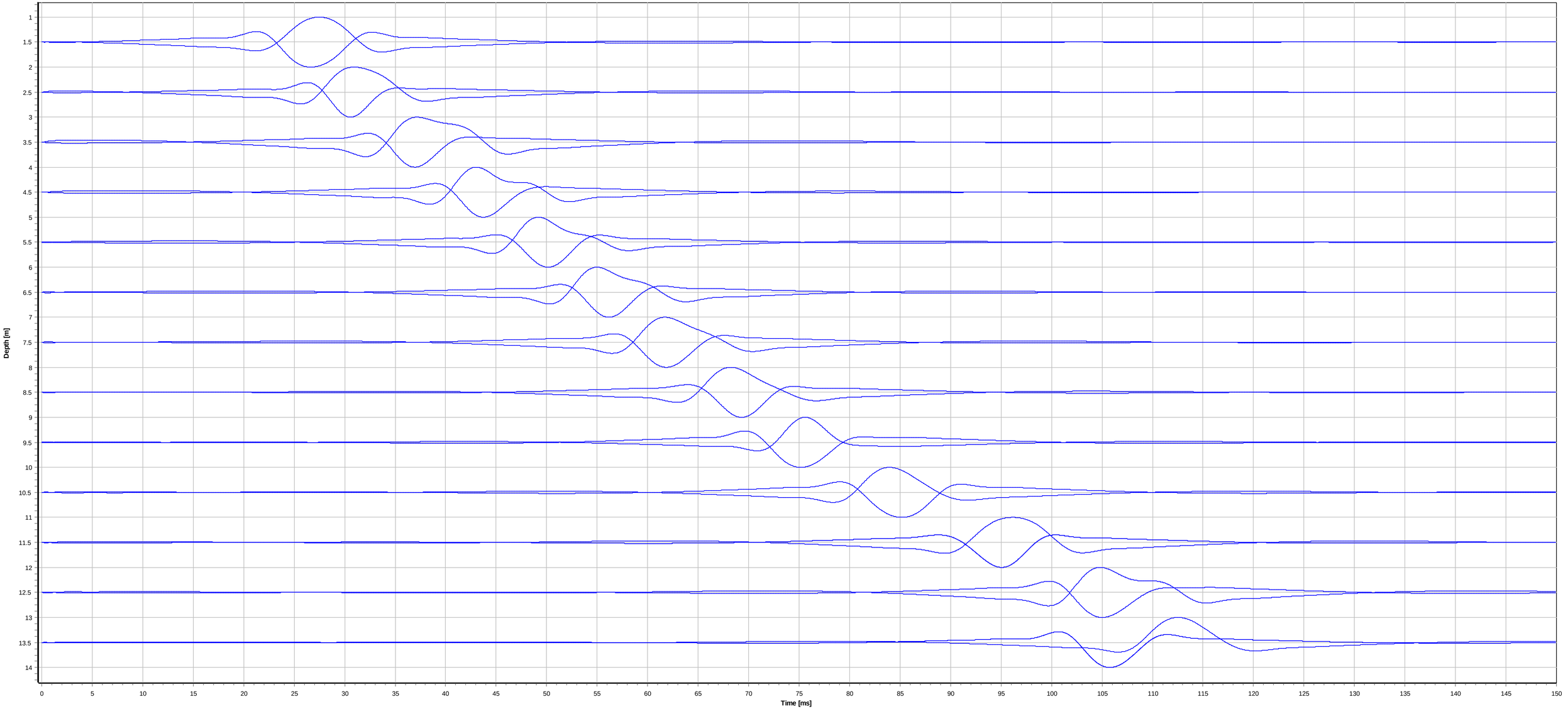
PROJECT: PORT TALBOT
CLIENT: TEC

SCPT-102 SEISMIC SHEAR WAVE (Svh) TRACES, RIGHT POLARISATION, X-AXIS, SIGNAL DECAY APPLIED



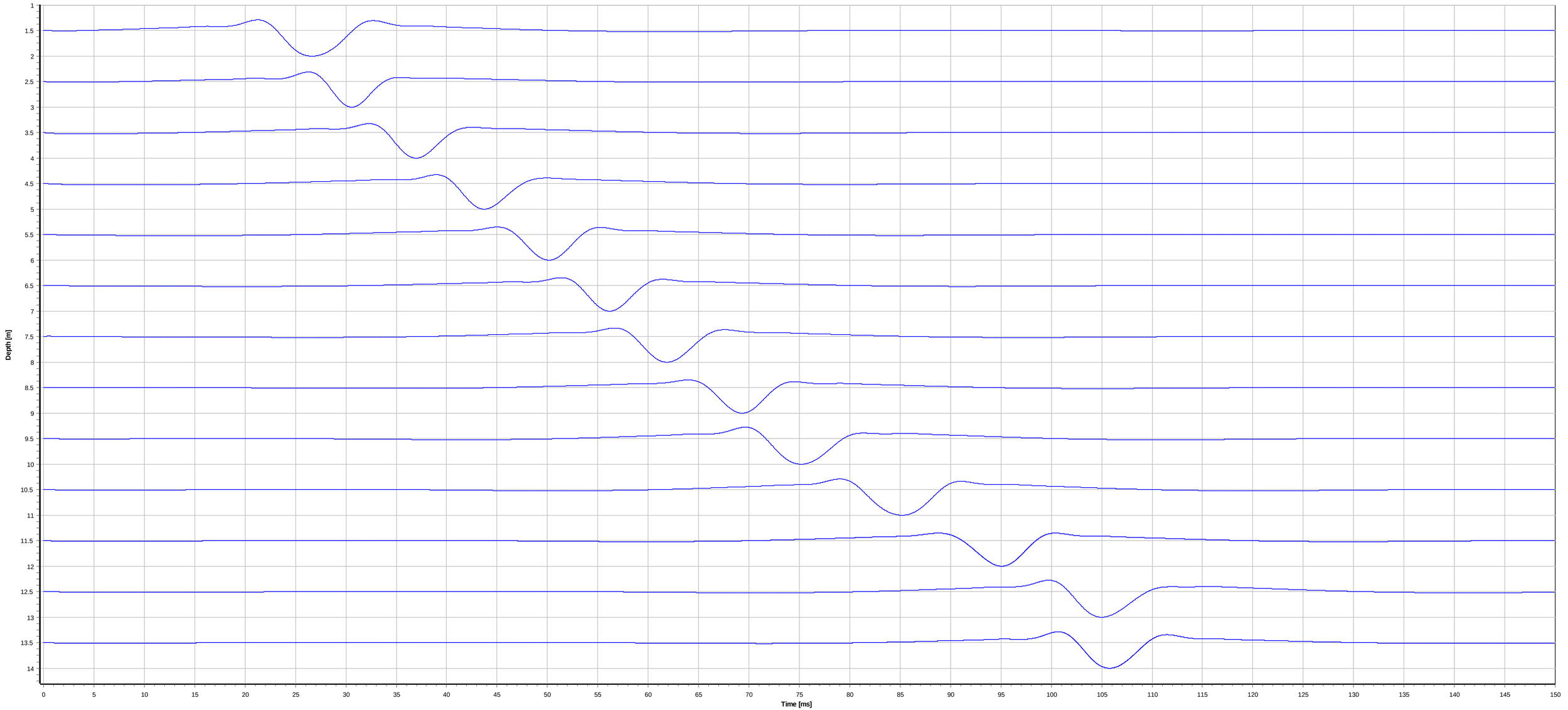
PROJECT: PORT TALBOT
CLIENT: TEC

SCPT-103 SEISMIC SHEAR WAVE (Svh) TRACES, BOTH POLARISATIONS, Y-AXIS, SIGNAL DECAY APPLIED



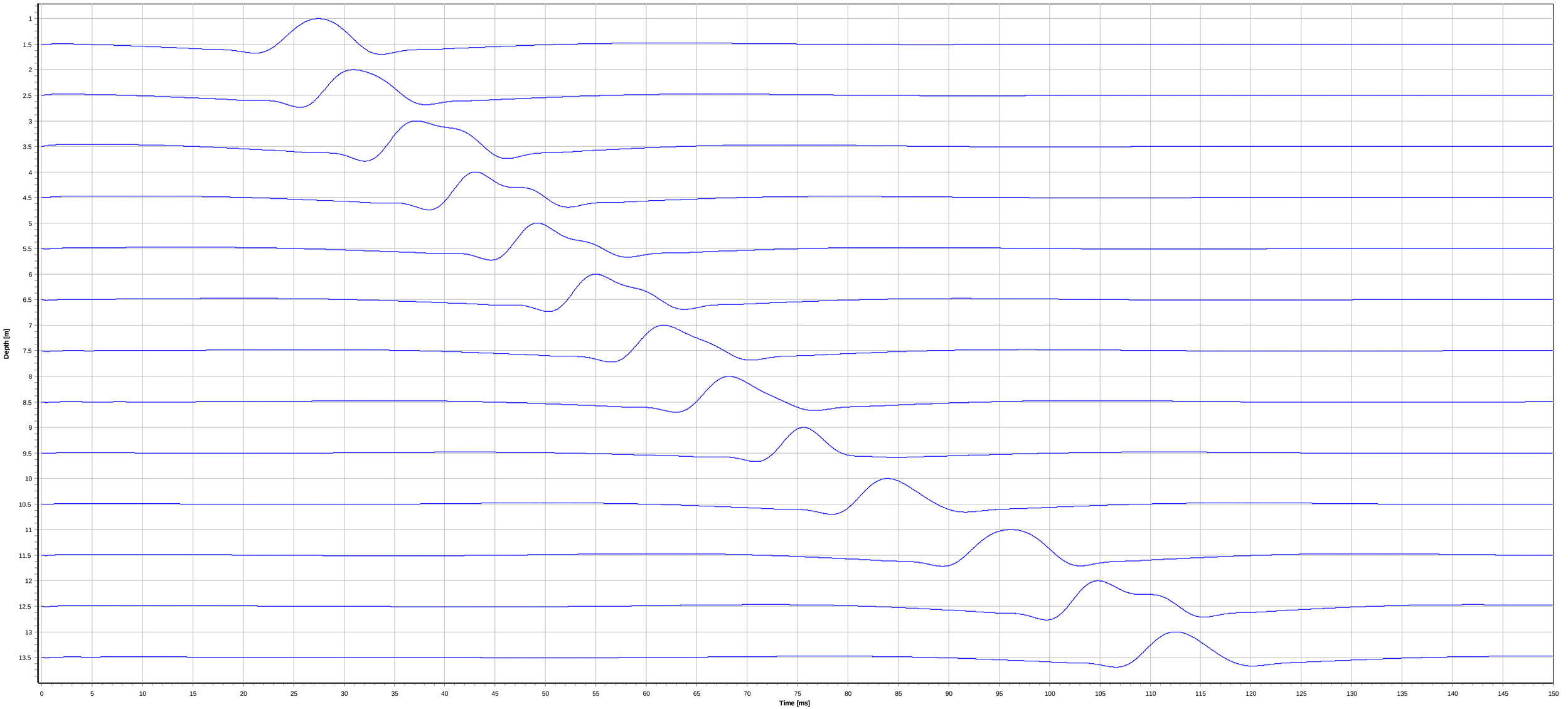
PROJECT: PORT TALBOT
CLIENT: TEC

SCPT-103 SEISMIC SHEAR WAVE (Svh) TRACES, LEFT POLARISATION, Y-AXIS, SIGNAL DECAY APPLIED



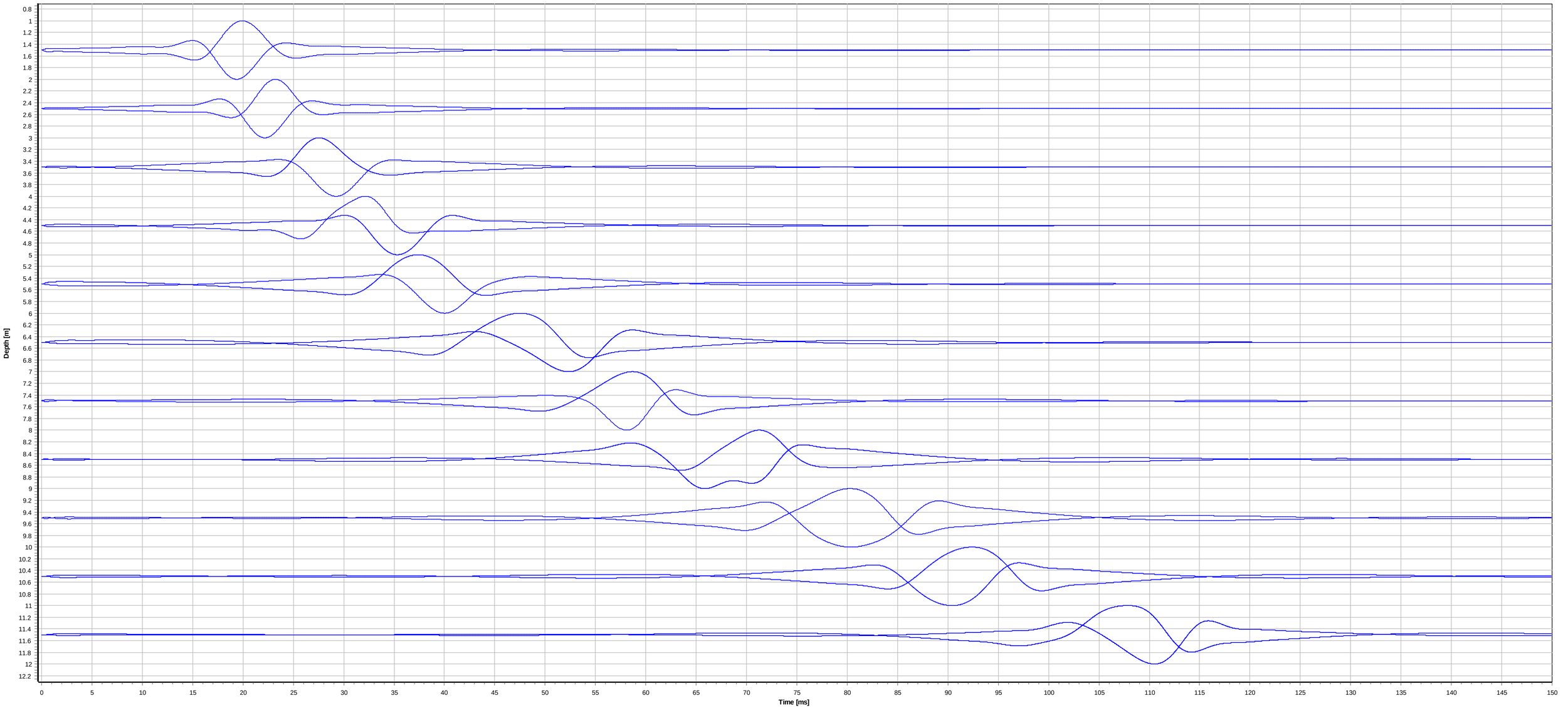
PROJECT: PORT TALBOT
CLIENT: TEC

SCPT-103 SEISMIC SHEAR WAVE (Svh) TRACES, RIGHT POLARISATION, Y-AXIS, SIGNAL DECAY APPLIED



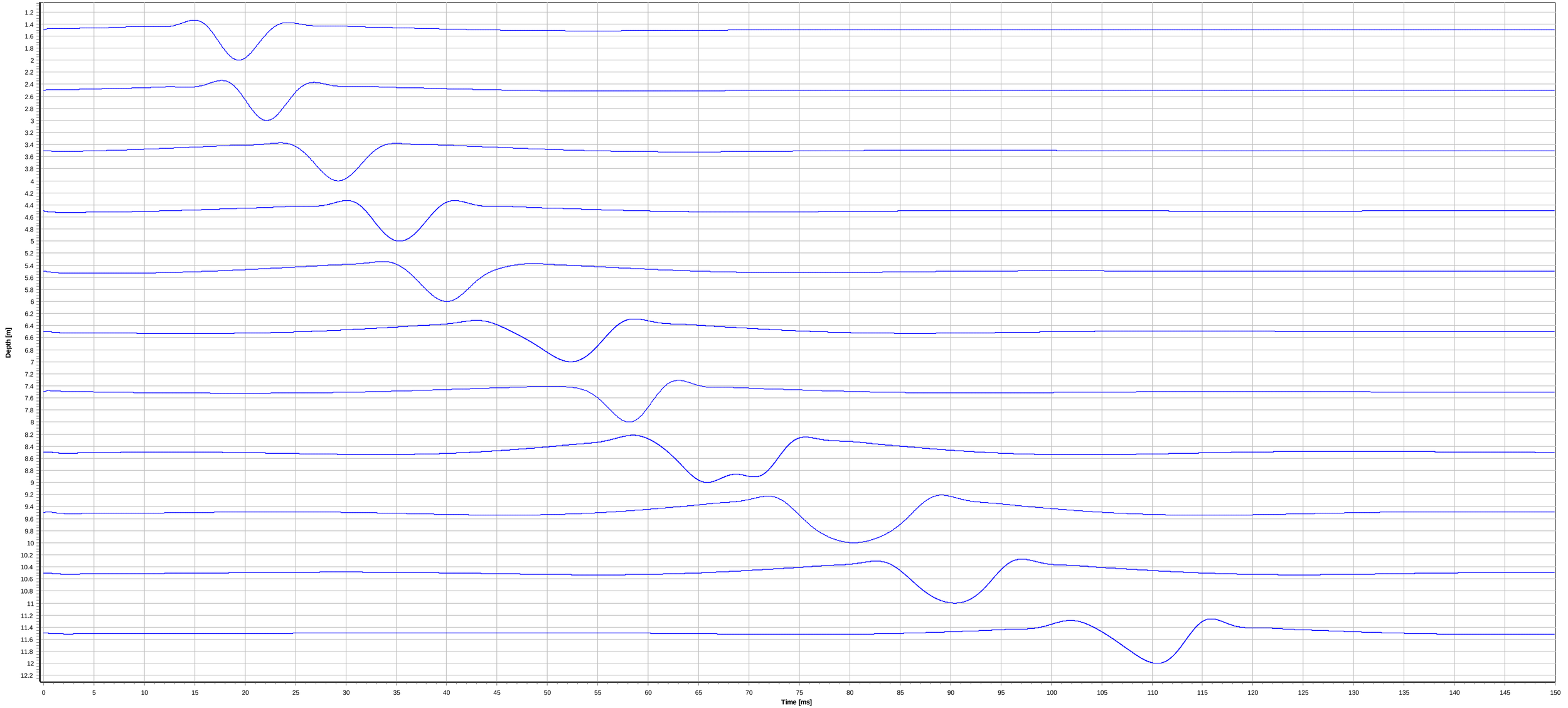
PROJECT: PORT TALBOT
CLIENT: TEC

SCPT-104 SEISMIC SHEAR WAVE (Svh) TRACES, BOTH POLARISATIONS, Y-AXIS, SIGNAL DECAY APPLIED



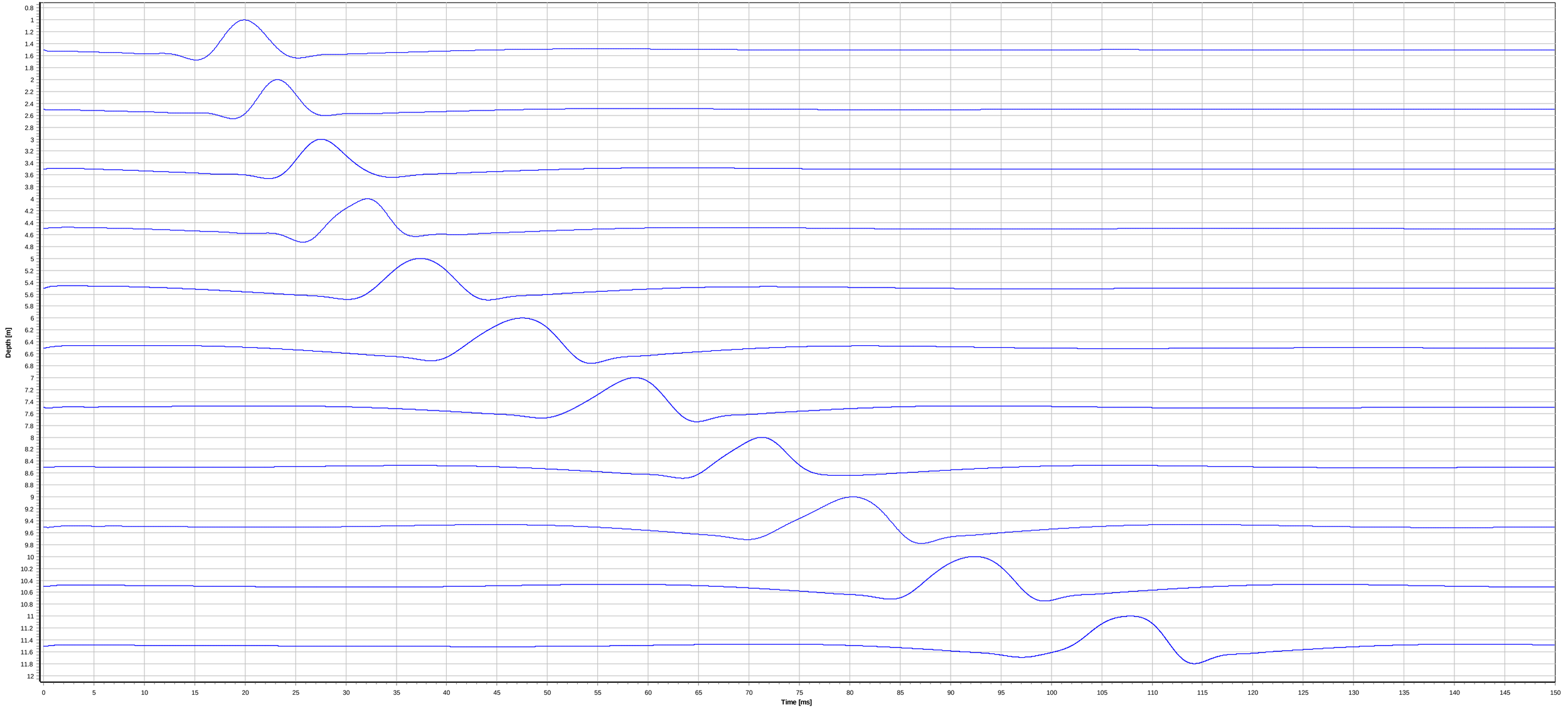
PROJECT: PORT TALBOT
CLIENT: TEC

SCPT-104 SEISMIC SHEAR WAVE (Svh) TRACES, LEFT POLARISATION, Y-AXIS, SIGNAL DECAY APPLIED



PROJECT: PORT TALBOT
CLIENT: TEC

SCPT-104 SEISMIC SHEAR WAVE (Svh) TRACES, RIGHT POLARISATION, Y-AXIS, SIGNAL DECAY APPLIED



APPENDIX I PENETROMETER TEMPERATURE RESULTS

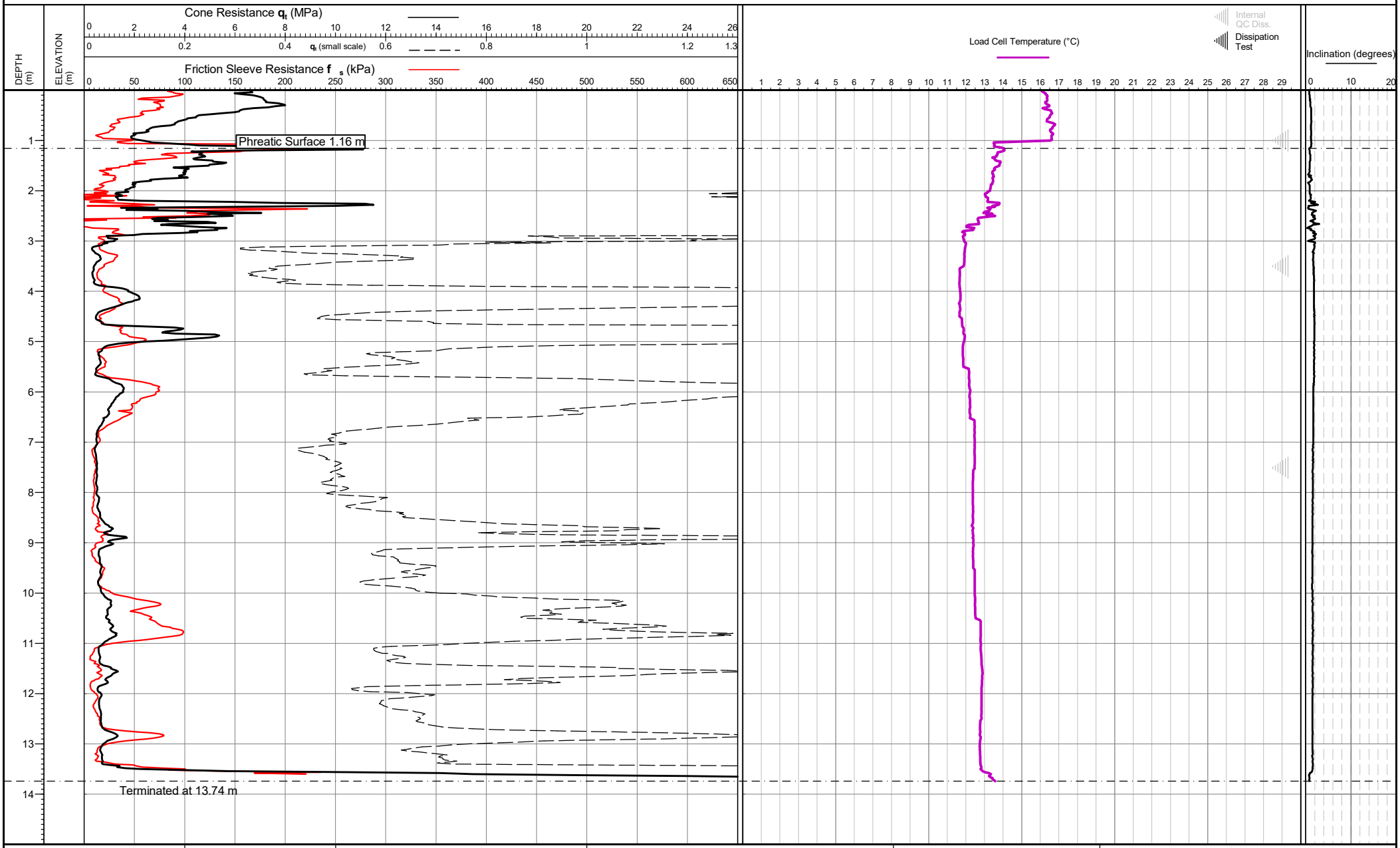
The temperature values in these logs represent the internal load cell temperature of the penetrometer and are used for QC purposes by comparison to the measured temperature response indicated on the calibration certificate. The CPT results have been corrected for transient and static temperature effects during post processing.

Ground temperature is only represented following a penetration pause of > 11 minutes.

Plots are provided for locations performed with a digital penetrometer measuring internal load cell temperature.

Project: PORT TALBOT

Client: TEC

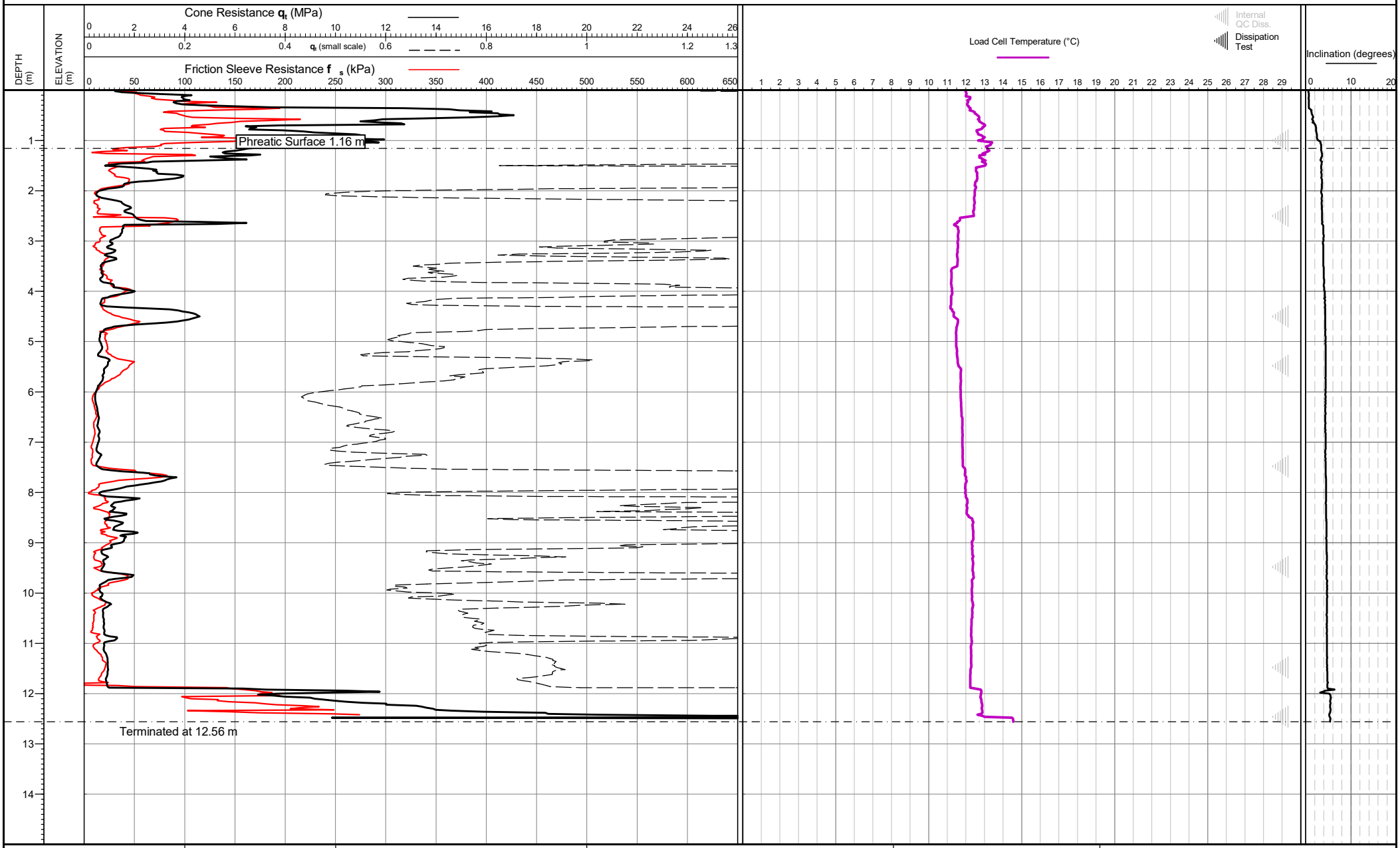


Cone area (mm2): Cone ID: S15-CFIPTT.1993 Operator: Rob Bennett Rig Used: UK20 Date of test: 26/04/2023 14:09:59	Zero drift (Pre/post test) q_c (kPa): 2.0 f_s (kPa): 0.9 ($f_{s\,drift}$ - $q_{c\,drift}$) u_2 (kPa): -1.2	Location: Swansea, UK Coordinates: , Elevation: Coordinate system:	Remarks: *Phreatic surface origin: Average measured piezometric depth from other location(s) Termination Remark: Tip load	Date of plot: 28-04-23 Checked by: Chris Player	Lankelma Project Ref: P-108298-10

TEST ID: SCPT-101

Project: PORT TALBOT

Client: TEC

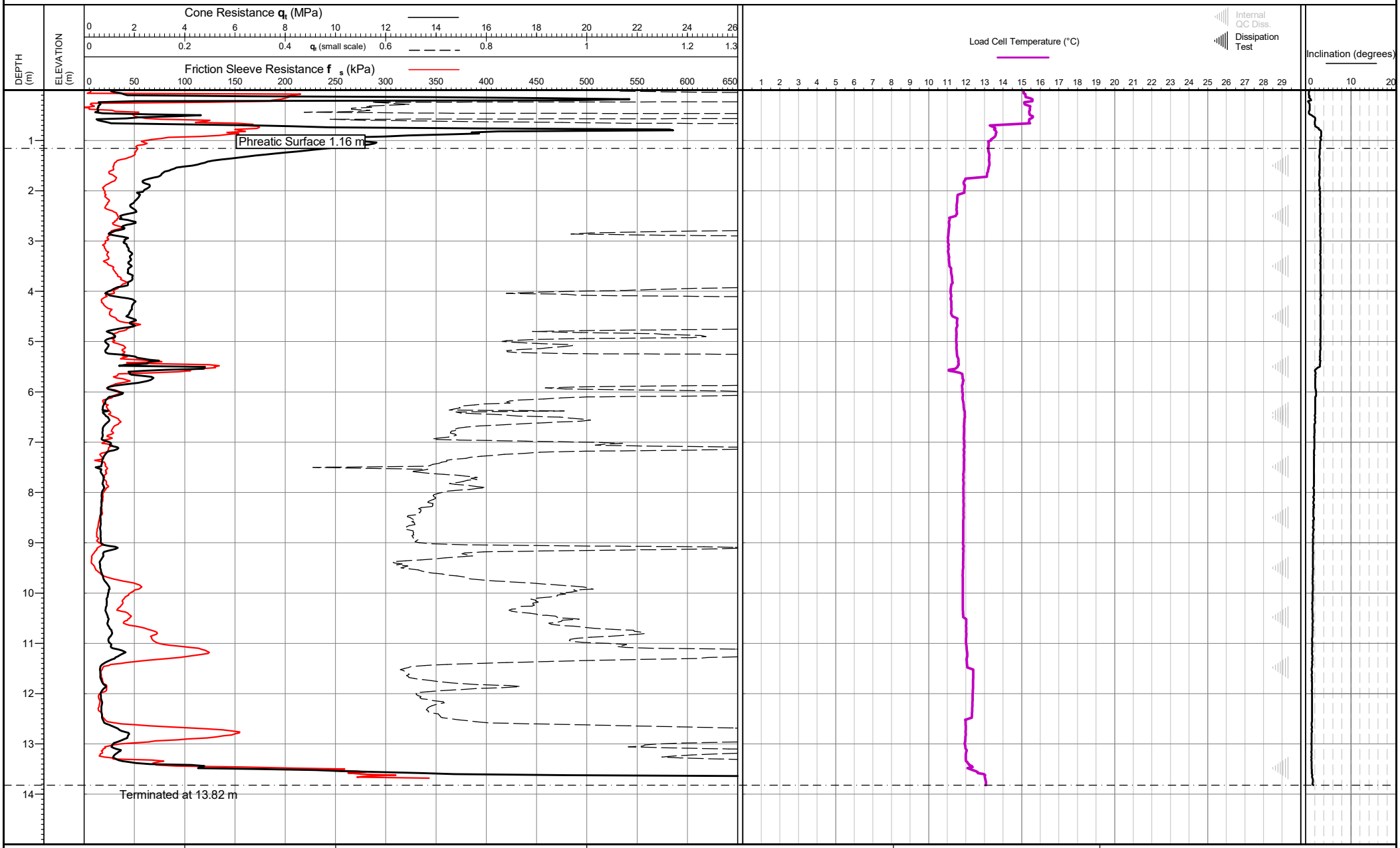


Cone area (mm2): Cone ID: S15-CFIPTT.1993 Operator: Rob Bennett Rig Used: UK20 Date of test: 27/04/2023 07:39:51	Zero drift (Pre/post test) q_c (kPa): -15.0 f_s (kPa): -1.6 ($f_{s\,drift}$ - $q_{c\,drift}$) u_2 (kPa): -2.6	Location: Swansea, UK Coordinates: , Elevation: Coordinate system:	Remarks: *Phreatic surface origin: Average measured piezometric depth from other location(s) Termination Remark: Tip load	Date of plot: 28-04-23 Checked by: Chris Player	Lankelma Project Ref: P-108298-10

TEST ID: SCPT-102

Project: PORT TALBOT

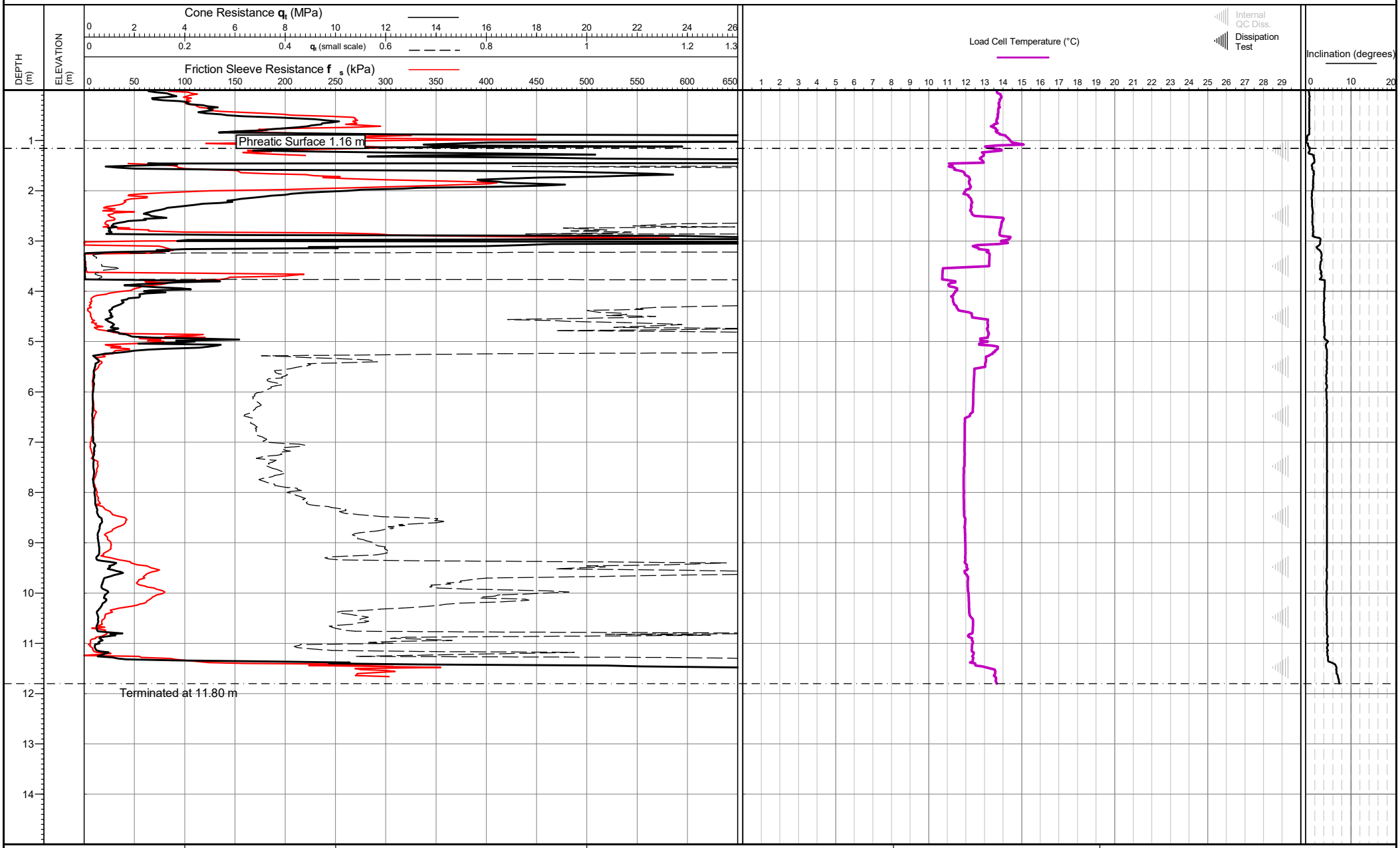
Client: TEC



Cone area (mm2): Cone ID: S15-CFIPTT.1993 Operator: Rob Bennett Rig Used: UK20 Date of test: 26/04/2023 12:28:19	Zero drift (Pre/post test) q_c (kPa): -0.2 f_s (kPa): -0.3 ($f_{s\,drift}$ - $q_{c\,drift}$) u_2 (kPa): -0.9	Location: Swansea, UK Coordinates: , Elevation: Coordinate system:	Remarks: *Phreatic surface origin: Average measured piezometric depth from other location(s) Termination Remark: Tip load	Date of plot: 28-04-23 Checked by: Chris Player	Lankelma Project Ref: P-108298-10	**TEST ID: SCPT-103** Page 1 of 1

Project: PORT TALBOT

Client: TEC

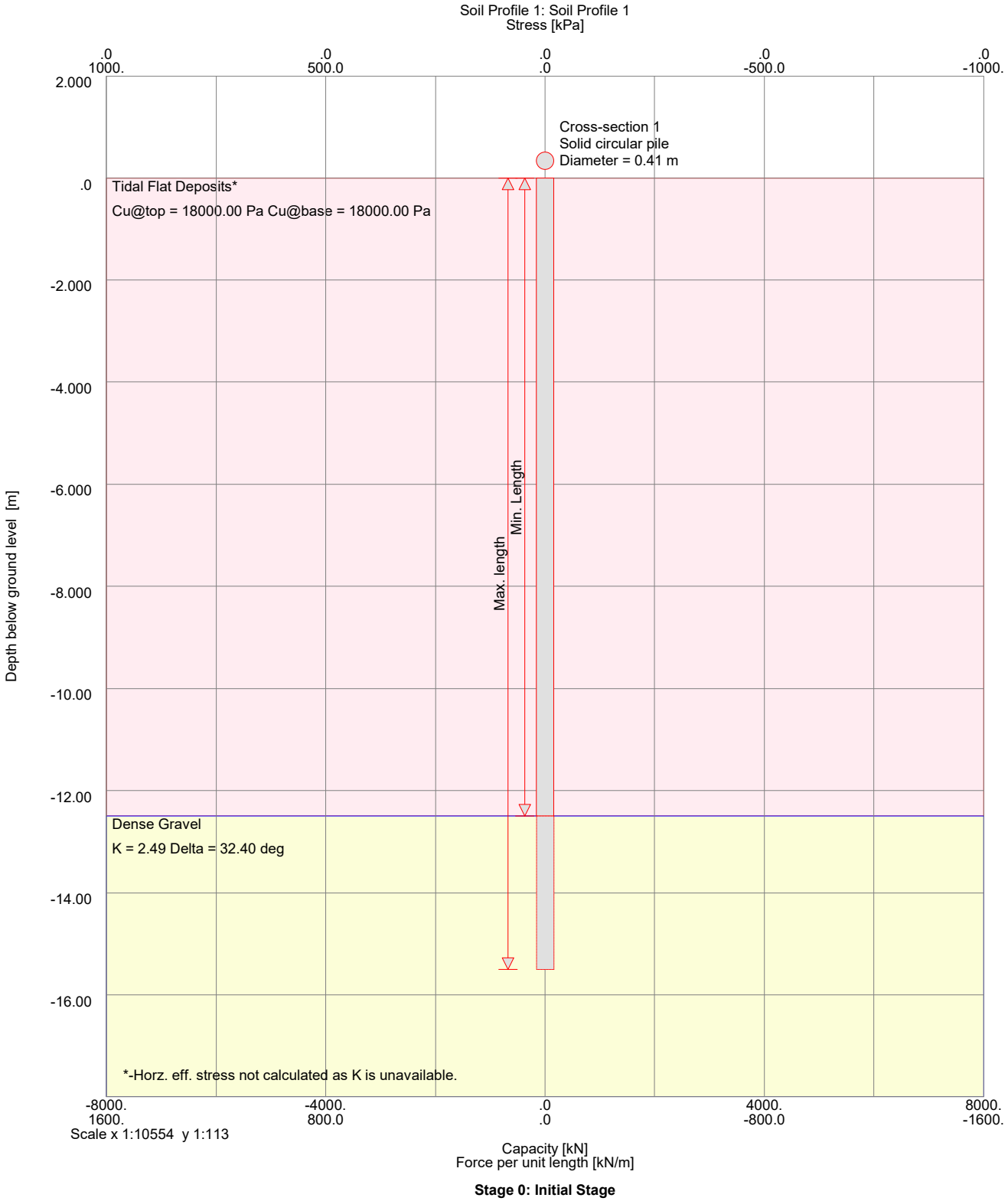


Cone area (mm2): Cone ID: S15-CFIPTT.1993 Operator: Rob Bennett Rig Used: UK20 Date of test: 26/04/2023 09:35:55	Zero drift (Pre/post test) q_c (kPa): -44.2 f_s (kPa): 0.4 ($f_{s\,drift}$ - $q_{c\,drift}$) u_2 (kPa): -1.0	Location: Swansea, UK Coordinates: , Elevation: Coordinate system:	Remarks: *Phreatic surface origin: Average measured piezometric depth at this location, approx. +- 0.3 mbgl Termination Remark: Tip load	Date of plot: 28-04-23 Checked by: Chris Player	Lankelma Project Ref: P-108298-10

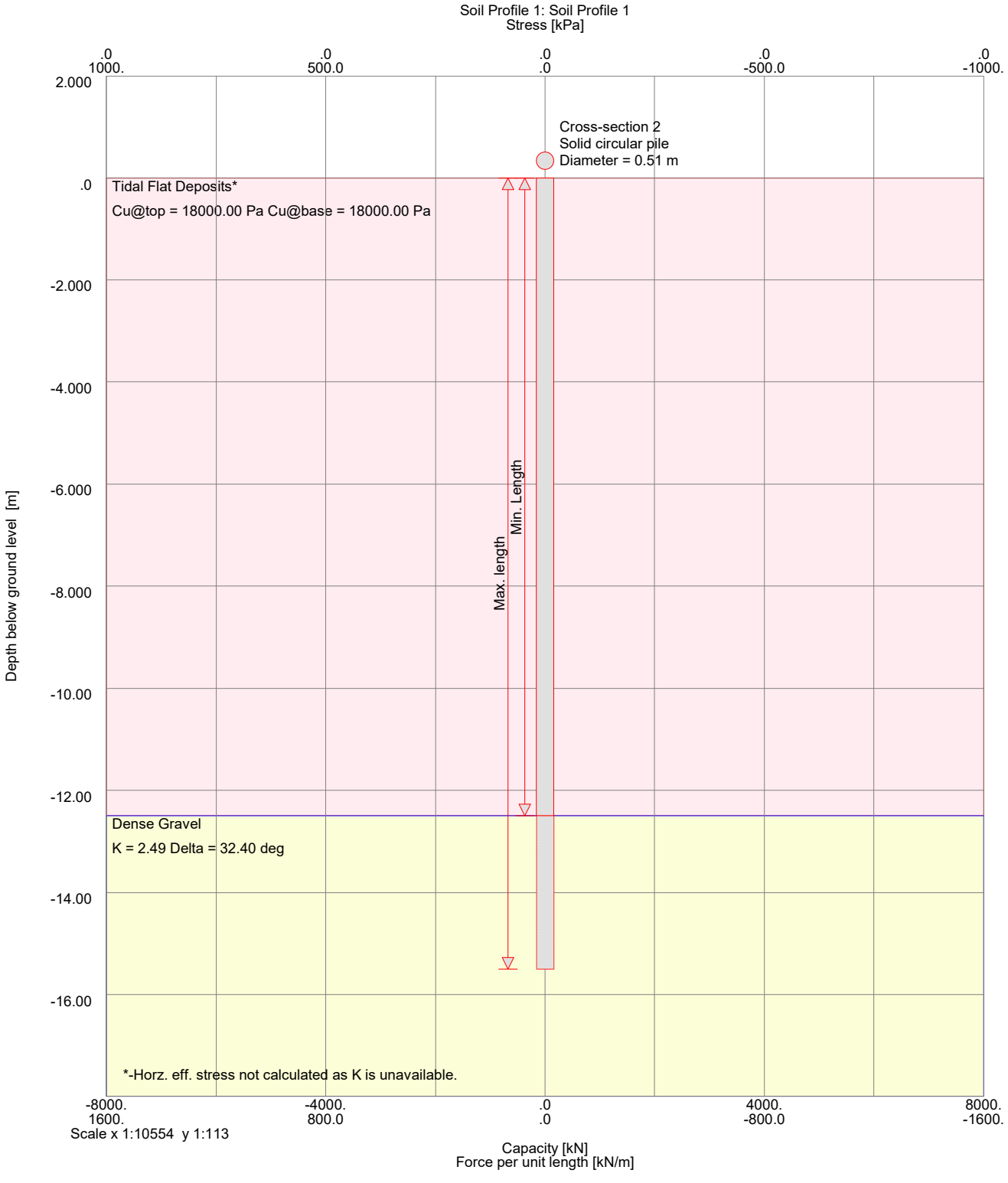
TEST ID: SCPT-104

Appendix J

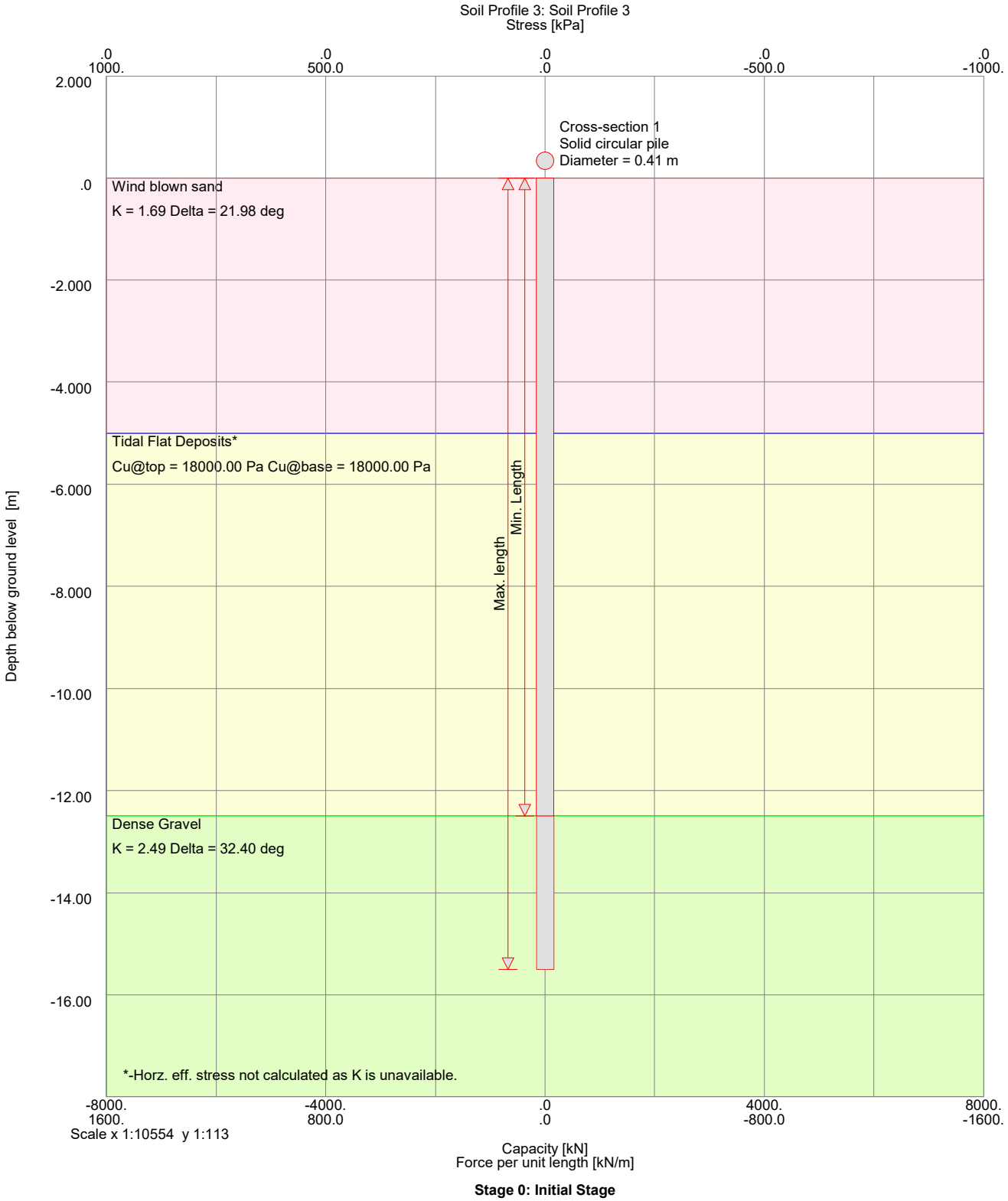
Oasys PILE Outputs



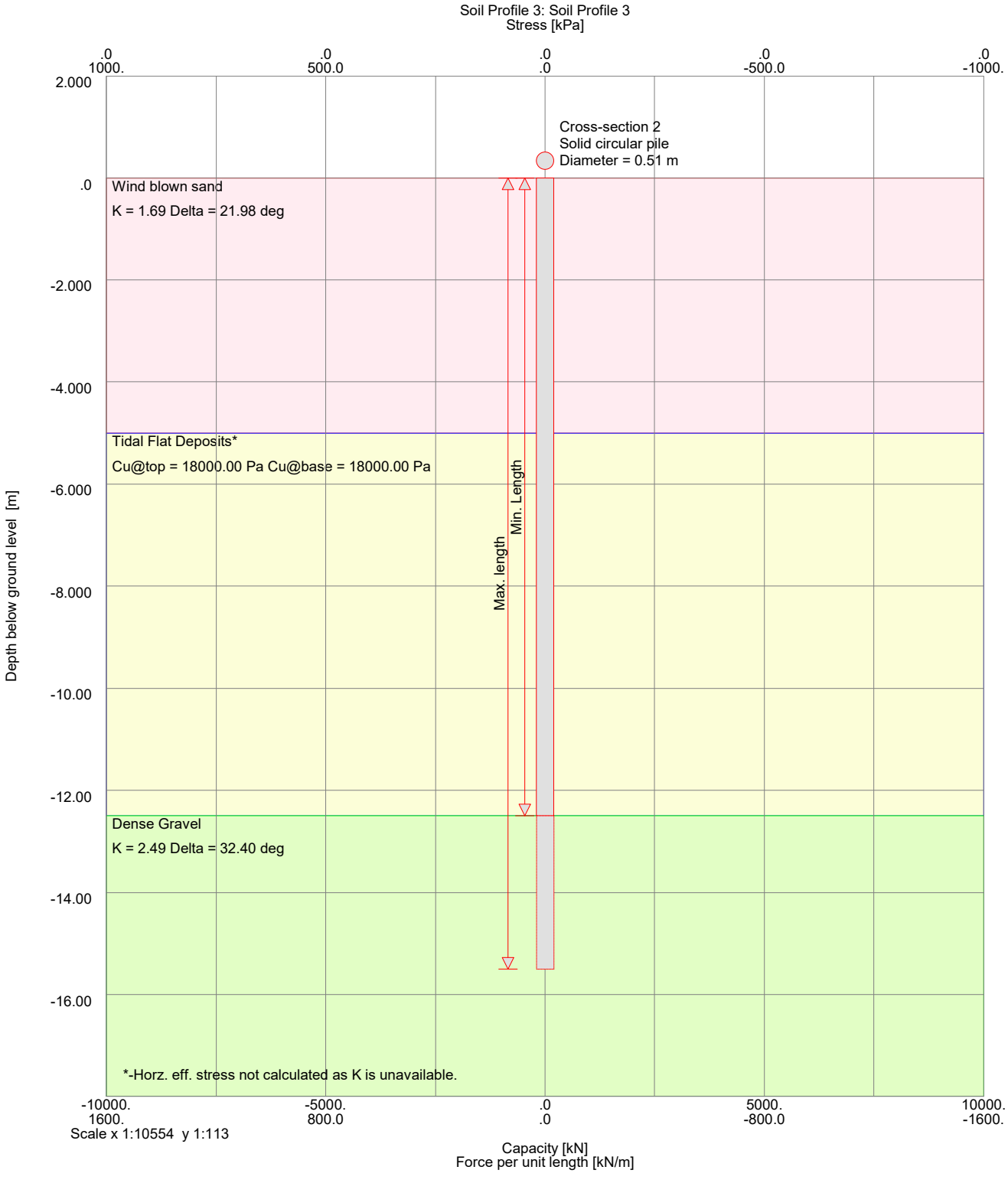
Stage 0: Initial Stage



Stage 0: Initial Stage



Stage 0: Initial Stage



Stage 0: Initial Stage

Analysis Options

Design method	Working load
Are compression calculations enabled?	Yes
Is global FoS criterion for compression active?	Yes
Global factor on ultimate bearing capacity Fg	2.5000
Is partial FoS criterion for compression active?	Yes
Partial factor on ultimate skin friction Fs1	1.5000
Partial factor on ultimate end bearing Fb	3.0000
Is shaft FoS criterion for compression active?	No
Is pile limiting stress criterion for compression active?	No
Are tension calculations enabled?	Yes
Is shaft-only FoS criterion for tension active?	Yes
Factor applied to ultimate skin friction Fs2(Tension)	1.5000
Is pile limiting stress criterion for tension active?	No
Datum type	Depth based
Effective stress profile	Calculated

Pile Properties

Pile type	Solid
Material type	User-defined
Pile cross-section	Circular
Under-ream	No
Calculation profile	Range
Minimum pile length	12.500 m
Maximum pile length	15.500 m
Increment size	0.50000

Cross-section	Number of cross sections	Top Diameter [m]	Second Diameter location [m]	Second Diameter [m]	Third Diameter location [m]	Third Diameter [m]
Cross-section 1	1	0.41000				
Cross-section 2	1	0.51000				

Undrained Materials - General Data

No.	Material description	Bulk unit weight [kN/m³]	Cu material factor	Top Cu [kPa]	Base Cu [kPa]
1	Tidal Flat Deposits	17.800	NA	18.000	18.000

Undrained Materials - Skin Friction Data

No.	Material description	Skin friction computation	Alpha	q_s Top [kPa]	q_s Base [kPa]	$q_{s,lim}$ Spec.	$q_{s,lim}$ Value [kPa]
1	Tidal Flat Deposits	Alpha specified	0.45000	NA	NA	No	NA

Undrained Materials - End Bearing Data

No.	Material description	End bearing computation	Nc	q_b Top [kPa]	q_b Base [kPa]	$q_{b,lim}$ Spec.	$q_{b,lim}$ Value [kPa]
1	Tidal Flat Deposits	Nc specified	9.0000	NA	NA	No	NA

Drained Materials - General Data

No.	Material description	Bulk unit weight [kN/m³]	Tan(δ) material factor
1	Dense Gravel	20.600	NA
2	Wind blown	19.000	NA

No.	Material description	Bulk unit weight [kN/m³]	Tan(δ) material factor
	sand		

Drained Materials - Friction Data

No.	Material description	Skin friction computation	Beta	Delta (δ) [deg]	Coefficient of earth pressure K	q_s Top [kPa]	q_s Base [kPa]	$q_{s,lim}$ Spec.	$q_{s,lim}$ Value [kPa]
1	Dense Gravel	Earth pressure	NA	32.400	2.4900	NA	NA	No	NA
2	Wind blown sand	Earth pressure	NA	21.980	1.6900	NA	NA	No	NA

Drained Materials - End Bearing Data

No.	Material description	End bearing computation	Nq	Phi' [deg]	PhiD [deg]	Phicv' [deg]	Id	q_b Top [kPa]	q_b Base [kPa]	$q_{b,lim}$ Spec.	$q_{b,lim}$ Value [kPa]	Nq-Phi curves	Ed [kPa]	Ko
1	Dense Gravel	Nq specified	100.00	NA	NA	NA	NA	NA	NA	No	NA	NA	NA	NA
2	Wind blown sand	Nq specified	18.000	NA	NA	NA	NA	NA	NA	No	NA	NA	NA	NA

STAGE SPECIFIC DATA

Stage 0 : Initial Stage

Groundwater

No.	Level [m]	Pressure [kPa]	Unit weight of water [kN/m³]

Soil Profiles

Soil Profile 1: Soil Profile 1

No.	Depth [m]	Material description	Contributes to negative skin friction
1	0.0	Tidal Flat Deposits	No
2	12.500	Dense Gravel	No

Soil Profile 2: Soil Profile 2

No.	Depth [m]	Material description	Contributes to negative skin friction
1	0.0	Tidal Flat Deposits	Yes
2	12.500	Dense Gravel	No

Soil Profile 3: Soil Profile 3

No.	Depth [m]	Material description	Contributes to negative skin friction
1	0.0	Wind blown sand	No
2	5.0000	Tidal Flat Deposits	No
3	12.500	Dense Gravel	No

Soil Profile 4: Soil Profile 4

No.	Depth [m]	Material description	Contributes to negative skin friction

No.	Depth [m]	Material description	Contributes to negative skin friction
1	0.0	Wind blown sand	Yes
2	5.0000	Tidal Flat Deposits	Yes
3	12.500	Dense Gravel	No

Soil Profile - Groundwater Map

No.	Soil Profile	Groundwater
1	Soil Profile 1	Groundwater Profile 1
2	Soil Profile 2	Groundwater Profile 1
3	Soil Profile 3	Groundwater Profile 1
4	Soil Profile 4	Groundwater Profile 1

CAPACITY RESULTS

Stress Profiles

Soil Profile 1: Soil Profile 1

Depth [m]	*	Density [kN/m³]	Undrained Cohesion [kPa]	Nq	Total vertical stress [kPa]	Porewater pressure [kPa]	Effective vertical stress [kPa]	Effective horizontal stress* [kPa]	Cumulative skin friction per unit perimeter [kN/m]
0.0	H	17.800	18.000	N.A.	0.0	0.0	0.0	NA	0.0
12.500	T	17.800	18.000	N.A.	222.50	0.0	222.50	NA	101.25
12.500	T	20.600	0.0	100.00	222.50	0.0	222.50	554.03	101.25
13.000	T	20.600	0.0	100.00	232.80	0.0	232.80	579.67	281.12
13.500	T	20.600	0.0	100.00	243.10	0.0	243.10	605.32	469.12
14.000	T	20.600	0.0	100.00	253.40	0.0	253.40	630.97	665.26
14.500	T	20.600	0.0	100.00	263.70	0.0	263.70	656.61	869.54
15.000	T	20.600	0.0	100.00	274.00	0.0	274.00	682.26	1082.0
15.500	T	20.600	0.0	100.00	284.30	0.0	284.30	707.91	1302.5

* Annotation:
H: Pile head location
T: Pile toe locations corresponding to different pile lengths

Soil Profile 2: Soil Profile 2

Depth [m]	*	Density [kN/m³]	Undrained Cohesion [kPa]	Nq	Total vertical stress [kPa]	Porewater pressure [kPa]	Effective vertical stress [kPa]	Effective horizontal stress* [kPa]	Cumulative skin friction per unit perimeter [kN/m]
0.0	H	17.800	18.000	N.A.	0.0	0.0	0.0	NA	0.0
12.500	T	17.800	18.000	N.A.	222.50	0.0	222.50	NA	-101.25
12.500	T	20.600	0.0	100.00	222.50	0.0	222.50	554.03	-101.25
13.000	T	20.600	0.0	100.00	232.80	0.0	232.80	579.67	78.617
13.500	T	20.600	0.0	100.00	243.10	0.0	243.10	605.32	266.62
14.000	T	20.600	0.0	100.00	253.40	0.0	253.40	630.97	462.76
14.500	T	20.600	0.0	100.00	263.70	0.0	263.70	656.61	667.04
15.000	T	20.600	0.0	100.00	274.00	0.0	274.00	682.26	879.46
15.500	T	20.600	0.0	100.00	284.30	0.0	284.30	707.91	1100.0

* Annotation:
H: Pile head location
T: Pile toe locations corresponding to different pile lengths

Soil Profile 3: Soil Profile 3

Depth [m]	*	Density [kN/m³]	Undrained Cohesion [kPa]	Nq	Total vertical stress [kPa]	Porewater pressure [kPa]	Effective vertical stress [kPa]	Effective horizontal stress* [kPa]	Cumulative skin friction

[m]		[kN/m³]	[kPa]		[kPa]	[kPa]	[kPa]	[kPa]	per unit perimeter [kN/m]
0.0	H	19.000	0.0	18.000	0.0	0.0	0.0	0.0	0.0
5.0000	-	19.000	0.0	18.000	95.000	0.0	95.000	160.55	162.00
5.0000	-	17.800	18.000	N.A.	95.000	0.0	95.000	NA	162.00
12.500	T	17.800	18.000	N.A.	228.50	0.0	228.50	NA	222.75
12.500	T	20.600	0.0	100.00	228.50	0.0	228.50	568.97	222.75
13.000	T	20.600	0.0	100.00	238.80	0.0	238.80	594.61	407.36
13.500	T	20.600	0.0	100.00	249.10	0.0	249.10	620.26	600.11
14.000	T	20.600	0.0	100.00	259.40	0.0	259.40	645.91	800.99
14.500	T	20.600	0.0	100.00	269.70	0.0	269.70	671.55	1010.0
15.000	T	20.600	0.0	100.00	280.00	0.0	280.00	697.20	1227.2
15.500	T	20.600	0.0	100.00	290.30	0.0	290.30	722.85	1452.5

* Annotation:
H: Pile head location
T: Pile toe locations corresponding to different pile lengths

Soil Profile 4: Soil Profile 4

[m]	*	[kN/m³]	[kPa]		[kPa]	[kPa]	[kPa]	[kPa]	[kN/m]
0.0	H	19.000	0.0	18.000	0.0	0.0	0.0	0.0	0.0
5.0000	-	19.000	0.0	18.000	95.000	0.0	95.000	160.55	-162.00
5.0000	-	17.800	18.000	N.A.	95.000	0.0	95.000	NA	-162.00
12.500	T	17.800	18.000	N.A.	228.50	0.0	228.50	NA	-222.75
12.500	T	20.600	0.0	100.00	228.50	0.0	228.50	568.97	-222.75
13.000	T	20.600	0.0	100.00	238.80	0.0	238.80	594.61	-38.146
13.500	T	20.600	0.0	100.00	249.10	0.0	249.10	620.26	154.60
14.000	T	20.600	0.0	100.00	259.40	0.0	259.40	645.91	355.48
14.500	T	20.600	0.0	100.00	269.70	0.0	269.70	671.55	564.50
15.000	T	20.600	0.0	100.00	280.00	0.0	280.00	697.20	781.66
15.500	T	20.600	0.0	100.00	290.30	0.0	290.30	722.85	1007.0

* Annotation:
H: Pile head location
T: Pile toe locations corresponding to different pile lengths

* Effective horizontal stress not calculated for "Total Stress" materials and for Beta Method.

Cross-section 1 results:

Uniform pile with top shaft diameter = 0.41 m

Results - Compression

Soil Profile 1: Soil Profile 1

Depth [m]	Pile length [m]	Ultimate base capacity (Q_b) [kN]	Cumulative external Friction (Q_s) [kN]	Average external Friction (q_s) [kN/m]	Negative skin friction (Q_{nsf}) [kN]	Ultimate capacity [kN]	Allowable capacity [kN]	Limiting criterion #
12.500	12.500	21.388	130.42	10.433	0.0	151.80	60.721	1
12.500	12.500	2937.6	130.42	10.433	0.0	3068.0	1066.1	2
13.000	13.000	3073.6	362.09	27.853	0.0	3435.6	1265.9	2
13.500	13.500	3209.5	604.25	44.759	0.0	3813.8	1472.7	2
14.000	14.000	3345.5	856.89	61.207	0.0	4202.4	1681.0	1
14.500	14.500	3481.5	1120.0	77.243	0.0	4601.5	1840.6	1
15.000	15.000	3617.5	1393.6	92.908	0.0	5011.1	2004.4	1
15.500	15.500	3753.5	1677.7	108.24	0.0	5431.2	2172.5	1

Limiting criteria :
1: Global factor of safety
2: Shaft and base factors of safety
3: Shaft factor of safety
4: Pile material limiting stress [Compression]

Level [m]	Pile length [m]	Global Factor: Factored End Bearing [kN]	Global Factor: Factored Skin Friction [kN]	Partial Factor: Factored End Bearing [kN]	Partial Factor: Factored Skin Friction [kN]	Shaft Factor: Factored Skin Friction [kN]
12.500	12.500	8.5552	52.166	7.1294	86.944	-
12.500	12.500	1175.0	52.166	979.19	86.944	-
13.000	13.000	1229.4	144.84	1024.5	241.40	-
13.500	13.500	1283.8	241.70	1069.8	402.84	-
14.000	14.000	1338.2	342.76	1115.2	571.26	-
14.500	14.500	1392.6	448.01	1160.5	746.68	-
15.000	15.000	1447.0	557.45	1205.8	929.08	-
15.500	15.500	1501.4	671.09	1251.2	1118.5	-

Soil Profile 2: Soil Profile 2

Depth [m]	Pile length [m]	Ultimate base capacity (Q_b) [kN]	Cumulative external Friction (Q_s) [kN]	Average external Friction (q_s) [kN/m]	Negative skin friction (Q_{nsf}) [kN]	Ultimate capacity [kN]	Allowable capacity [kN]	Limiting criterion #
12.500	12.500	21.388	0.0	0.0	130.42	-109.03	-123.29	2
12.500	12.500	2937.6	0.0	0.0	130.42	2807.2	848.77	2
13.000	13.000	3073.6	231.68	17.821	130.42	3174.8	1048.6	2
13.500	13.500	3209.5	473.84	35.099	130.42	3553.0	1255.3	2
14.000	14.000	3345.5	726.48	51.891	130.42	3941.6	1469.1	2
14.500	14.500	3481.5	989.60	68.249	130.42	4340.7	1658.0	1
15.000	15.000	3617.5	1263.2	84.214	130.42	4750.3	1821.9	1
15.500	15.500	3753.5	1547.3	99.826	130.42	5170.4	1989.9	1

```
# Limiting criteria :
1: Global factor of safety
2: Shaft and base factors of safety
3: Shaft factor of safety
4: Pile material limiting stress [Compression]
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Level [m]	Pile length [m]	Global Factor: Factored End Bearing [kN]	Global Factor: Factored Skin Friction [kN]	Partial Factor: Factored End Bearing [kN]	Partial Factor: Factored Skin Friction [kN]	Shaft Factor: Factored Skin Friction [kN]
12.500	12.500	8.5552	0.0	7.1294	0.0	-
12.500	12.500	1175.0	0.0	979.19	0.0	-
13.000	13.000	1229.4	92.671	1024.5	154.45	-
13.500	13.500	1283.8	189.53	1069.8	315.89	-
14.000	14.000	1338.2	290.59	1115.2	484.32	-
14.500	14.500	1392.6	395.84	1160.5	659.74	-
15.000	15.000	1447.0	505.28	1205.8	842.14	-
15.500	15.500	1501.4	618.92	1251.2	1031.5	-

Soil Profile 3: Soil Profile 3

Depth [m]	Pile length [m]	Ultimate base capacity (Q_b) [kN]	Cumulative external Friction (Q_s) [kN]	Average external Friction (q_s) [kN/m]	Negative skin friction (Q_{nsf}) [kN]	Ultimate capacity [kN]	Allowable capacity [kN]	Limiting criterion #
12.500	12.500	21.388	286.92	22.953	0.0	308.31	123.32	1
12.500	12.500	3016.8	286.92	22.953	0.0	3303.7	1196.9	2
13.000	13.000	3152.8	524.70	40.362	0.0	3677.5	1400.7	2
13.500	13.500	3288.8	772.97	57.257	0.0	4061.7	1611.6	2
14.000	14.000	3424.7	1031.7	73.694	0.0	4456.5	1782.6	1
14.500	14.500	3560.7	1300.9	89.720	0.0	4861.7	1944.7	1
15.000	15.000	3696.7	1580.7	105.38	0.0	5277.4	2110.9	1
15.500	15.500	3832.7	1870.9	120.70	0.0	5703.6	2281.4	1

```
# Limiting criteria :
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Depth	Pile length	Ultimate base capacity (Q_b)	Cumulative external Friction (Q_s)	Average external Friction (q_s)	Negative skin friction (Q_{nsf})	Ultimate capacity	Allowable capacity	Limiting criterion #

1: Global factor of safety
2: Shaft and base factors of safety
3: Shaft factor of safety
4: Pile material limiting stress [Compression]

Level	Pile length	Global Factor		Partial Factor		Shaft Factor
		Factored End Bearing	Factored Skin Friction	Factored End Bearing	Factored Skin Friction	Factored Skin Friction
[m]	[m]	[kN]	[kN]	[kN]	[kN]	[kN]
12.500	12.500	8.5552	114.77	7.1294	191.28	-
12.500	12.500	1206.7	114.77	1005.6	191.28	-
13.000	13.000	1261.1	209.88	1050.9	349.80	-
13.500	13.500	1315.5	309.19	1096.3	515.31	-
14.000	14.000	1369.9	412.69	1141.6	687.81	-
14.500	14.500	1424.3	520.38	1186.9	867.30	-
15.000	15.000	1478.7	632.26	1232.2	1053.8	-
15.500	15.500	1533.1	748.34	1277.6	1247.2	-

Soil Profile 4: Soil Profile 4

Depth	Pile length	Ultimate base capacity (Q_b)	Cumulative external Friction (Q_s)	Average external Friction (q_s)	Negative skin friction (Q_{nsf})	Ultimate capacity	Allowable capacity	Limiting criterion #
[m]	[m]	[kN]	[kN]	[kN/m]	[kN]	[kN]	[kN]	
12.500	12.500	21.388	0.0	0.0	286.92	-265.53	-279.79	2
12.500	12.500	3016.8	0.0	0.0	286.92	2729.9	718.68	2
13.000	13.000	3152.8	237.78	18.291	286.92	3103.6	922.53	2
13.500	13.500	3288.8	486.05	36.004	286.92	3487.9	1133.4	2
14.000	14.000	3424.7	744.80	53.200	286.92	3882.6	1351.2	2
14.500	14.500	3560.7	1014.0	69.933	286.92	4287.8	1543.0	1
15.000	15.000	3696.7	1293.7	86.249	286.92	4703.5	1709.3	1
15.500	15.500	3832.7	1583.9	102.19	286.92	5129.7	1879.7	1

Limiting criteria :
1: Global factor of safety
2: Shaft and base factors of safety
3: Shaft factor of safety
4: Pile material limiting stress [Compression]

Level	Pile length	Global Factor		Partial Factor		Shaft Factor
		Factored End Bearing	Factored Skin Friction	Factored End Bearing	Factored Skin Friction	Factored Skin Friction
[m]	[m]	[kN]	[kN]	[kN]	[kN]	[kN]
12.500	12.500	8.5552	0.0	7.1294	0.0	-
12.500	12.500	1206.7	0.0	1005.6	0.0	-
13.000	13.000	1261.1	95.114	1050.9	158.52	-
13.500	13.500	1315.5	194.42	1096.3	324.03	-
14.000	14.000	1369.9	297.92	1141.6	496.53	-
14.500	14.500	1424.3	405.61	1186.9	676.02	-
15.000	15.000	1478.7	517.50	1232.2	862.49	-
15.500	15.500	1533.1	633.57	1277.6	1056.0	-

Nq Calculation Details

Soil Profile 1: Soil Profile 1

There are no pile toe levels in any drained material(with Berezantzev/Bolton option) in the given soil profile.

Soil Profile 2: Soil Profile 2

There are no pile toe levels in any drained material(with Berezantzev/Bolton option) in the given soil profile.

Level	Pile length	Global Factor		Partial Factor		Shaft Factor
		Factored End	Factored	Factored End	Factored	Factored

Soil Profile 3: Soil Profile 3

There are no pile toe levels in any drained material(with Berezantzev/Bolton option) in the given soil profile.

Soil Profile 4: Soil Profile 4

There are no pile toe levels in any drained material(with Berezantzev/Bolton option) in the given soil profile.

Results - Tension

Soil Profile 1: Soil Profile 1

Depth	Pile length	Cumulative external Friction (Q_s)	Average external Friction (q_s)	Ultimate capacity	Allowable capacity	Limiting criterion #
[m]	[m]	[kN]	[kN/m]	[kN]	[kN]	
12.500	12.500	130.42	10.433	130.42	86.944	1
12.500	12.500	130.42	10.433	130.42	86.944	1
13.000	13.000	362.09	27.853	362.09	241.40	1
13.500	13.500	604.25	44.759	604.25	402.84	1
14.000	14.000	856.89	61.207	856.89	571.26	1
14.500	14.500	1120.0	77.243	1120.0	746.68	1
15.000	15.000	1393.6	92.908	1393.6	929.08	1
15.500	15.500	1677.7	108.24	1677.7	1118.5	1

Note - The weight of the pile has not been included in the factored load.
Limiting criteria :
1: Factor of safety on shaft
2: Pile material limiting stress [Tension]

Soil Profile 2: Soil Profile 2

Depth	Pile length	Cumulative external Friction (Q_s)	Average external Friction (q_s)	Ultimate capacity	Allowable capacity	Limiting criterion #
[m]	[m]	[kN]	[kN/m]	[kN]	[kN]	
12.500	12.500	0.0	0.0	0.0	0.0	1
12.500	12.500	0.0	0.0	0.0	0.0	1
13.000	13.000	231.68	17.821	231.68	154.45	1
13.500	13.500	473.84	35.099	473.84	315.89	1
14.000	14.000	726.48	51.891	726.48	484.32	1
14.500	14.500	989.60	68.249	989.60	659.74	1
15.000	15.000	1263.2	84.214	1263.2	842.14	1
15.500	15.500	1547.3	99.826	1547.3	1031.5	1

Note - The weight of the pile has not been included in the factored load.
Limiting criteria :
1: Factor of safety on shaft
2: Pile material limiting stress [Tension]

Soil Profile 3: Soil Profile 3

Depth	Pile length	Cumulative external Friction (Q_s)	Average external Friction (q_s)	Ultimate capacity	Allowable capacity	Limiting criterion #
[m]	[m]	[kN]	[kN/m]	[kN]	[kN]	
12.500	12.500	286.92	22.953	286.92	191.28	1
12.500	12.500	286.92	22.953	286.92	191.28	1
13.000	13.000	524.70	40.362	524.70	349.80	1
13.500	13.500	772.97	57.257	772.97	515.31	1
14.000	14.000	1031.7	73.694	1031.7	687.81	1
14.500	14.500	1300.9	89.720	1300.9	867.30	1
15.000	15.000	1580.7	105.38	1580.7	1053.8	1
15.500	15.500	1870.9	120.70	1870.9	1247.2	1

Note - The weight of the pile has not been included in the factored load.
Limiting criteria :
1: Factor of safety on shaft
2: Pile material limiting stress [Tension]

Depth	Pile length	Cumulative external Friction (Q_s)	Average external Friction (q_s)	Ultimate capacity	Allowable capacity	Limiting criterion #

Soil Profile 4: Soil Profile 4

Depth	Pile length	Cumulative external Friction (Q_s)	Average external Friction (q_s)	Ultimate capacity	Allowable capacity	Limiting criterion #
[m]	[m]	[kN]	[kN/m]	[kN]	[kN]	
12.500	12.500	0.0	0.0	0.0	0.0	1
12.500	12.500	0.0	0.0	0.0	0.0	1
13.000	13.000	237.78	18.291	237.78	158.52	1
13.500	13.500	486.05	36.004	486.05	324.03	1
14.000	14.000	744.80	53.200	744.80	496.53	1
14.500	14.500	1014.0	69.933	1014.0	676.02	1
15.000	15.000	1293.7	86.249	1293.7	862.49	1
15.500	15.500	1583.9	102.19	1583.9	1056.0	1

Note - The weight of the pile has not been included in the factored load.
Limiting criteria :
1: Factor of safety on shaft
2: Pile material limiting stress [Tension]

Cross-section 2 results:

Uniform pile with top shaft diameter = 0.51 m

Results - Compression

Soil Profile 1: Soil Profile 1

Depth	Pile length	Ultimate base capacity (Q_b)	Cumulative external Friction (Q_s)	Average external Friction (q_s)	Negative skin friction (Q_{nsf})	Ultimate capacity	Allowable capacity	Limiting criterion #
[m]	[m]	[kN]	[kN]	[kN/m]	[kN]	[kN]	[kN]	
12.500	12.500	33.094	162.22	12.978	0.0	195.32	78.127	1
12.500	12.500	4545.3	162.22	12.978	0.0	4707.5	1623.2	2
13.000	13.000	4755.7	450.41	34.647	0.0	5206.1	1885.5	2
13.500	13.500	4966.1	751.63	55.676	0.0	5717.7	2156.5	2
14.000	14.000	5176.5	1065.9	76.135	0.0	6242.4	2436.1	2
14.500	14.500	5386.9	1393.2	96.082	0.0	6780.1	2712.0	1
15.000	15.000	5597.3	1733.5	115.57	0.0	7330.9	2932.3	1
15.500	15.500	5807.7	2086.9	134.64	0.0	7894.7	3157.9	1

Limiting criteria :
1: Global factor of safety
2: Shaft and base factors of safety
3: Shaft factor of safety
4: Pile material limiting stress [Compression]

Level	Pile length	Global Factor		Partial Factor		Shaft Factor
		Factored End Bearing	Factored Skin Friction	Factored End Bearing	Factored Skin Friction	Factored Skin Friction
[m]	[m]	[kN]	[kN]	[kN]	[kN]	[kN]
12.500	12.500	13.237	64.890	11.031	108.15	-
12.500	12.500	1818.1	64.890	1515.1	108.15	-
13.000	13.000	1902.3	180.16	1585.2	300.27	-
13.500	13.500	1986.4	300.65	1655.4	501.09	-
14.000	14.000	2070.6	426.36	1725.5	710.60	-
14.500	14.500	2154.8	557.28	1795.6	928.80	-
15.000	15.000	2238.9	693.41	1865.8	1155.7	-
15.500	15.500	2323.1	834.77	1935.9	1391.3	-

Soil Profile 2: Soil Profile 2

Depth	Pile length	Ultimate base capacity (Q_b)	Cumulative external Friction (Q_s)	Average external Friction (q_s)	Negative skin friction (Q_{nsf})	Ultimate capacity	Allowable capacity	Limiting criterion #

[m]	[m]	[kN]	[kN]	[kN/m]	[kN]	[kN]	[kN]	
12.500	12.500	33.094	0.0	0.0	162.22	-129.13	-151.19	2
12.500	12.500	4545.3	0.0	0.0	162.22	4383.1	1352.9	2
13.000	13.000	4755.7	288.18	22.168	162.22	4881.6	1615.1	2
13.500	13.500	4966.1	589.41	43.660	162.22	5393.3	1886.1	2
14.000	14.000	5176.5	903.67	64.548	162.22	5918.0	2165.7	2
14.500	14.500	5386.9	1231.0	84.895	162.22	6455.7	2454.1	2
15.000	15.000	5597.3	1571.3	104.75	162.22	7006.4	2705.2	1
15.500	15.500	5807.7	1924.7	124.17	162.22	7570.2	2930.7	1

```
# Limiting criteria :
1: Global factor of safety
2: Shaft and base factors of safety
3: Shaft factor of safety
4: Pile material limiting stress [Compression]
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Level	Pile length	Global Factor		Partial Factor		Shaft Factor
		Factored End Bearing	Factored Skin Friction	Factored End Bearing	Factored Skin Friction	Factored Skin Friction
[m]	[m]	[kN]	[kN]	[kN]	[kN]	[kN]
12.500	12.500	13.237	0.0	11.031	0.0	-
12.500	12.500	1818.1	0.0	1515.1	0.0	-
13.000	13.000	1902.3	115.27	1585.2	192.12	-
13.500	13.500	1986.4	235.76	1655.4	392.94	-
14.000	14.000	2070.6	361.47	1725.5	602.45	-
14.500	14.500	2154.8	492.39	1795.6	820.65	-
15.000	15.000	2238.9	628.52	1865.8	1047.5	-
15.500	15.500	2323.1	769.88	1935.9	1283.1	-

Soil Profile 3: Soil Profile 3

Depth	Pile length	Ultimate base capacity (Q_b)	Cumulative external Friction (Q_s)	Average external Friction (q_s)	Negative skin friction (Q_{nsf})	Ultimate capacity	Allowable capacity	Limiting criterion #
[m]	[m]	[kN]	[kN]	[kN/m]	[kN]	[kN]	[kN]	
12.500	12.500	33.094	356.90	28.552	0.0	389.99	156.00	1
12.500	12.500	4667.8	356.90	28.552	0.0	5024.7	1793.9	2
13.000	13.000	4878.3	652.68	50.206	0.0	5530.9	2061.2	2
13.500	13.500	5088.7	961.50	71.222	0.0	6050.2	2337.2	2
14.000	14.000	5299.1	1283.4	91.668	0.0	6582.4	2621.9	2
14.500	14.500	5509.5	1618.3	111.60	0.0	7127.7	2851.1	1
15.000	15.000	5719.9	1966.2	131.08	0.0	7686.1	3074.4	1
15.500	15.500	5930.3	2327.2	150.14	0.0	8257.5	3303.0	1

```
# Limiting criteria :
1: Global factor of safety
2: Shaft and base factors of safety
3: Shaft factor of safety
4: Pile material limiting stress [Compression]
```

Level	Pile length	Global Factor		Partial Factor		Shaft Factor
		Factored End Bearing	Factored Skin Friction	Factored End Bearing	Factored Skin Friction	Factored Skin Friction
[m]	[m]	[kN]	[kN]	[kN]	[kN]	[kN]
12.500	12.500	13.237	142.76	11.031	237.93	-
12.500	12.500	1867.1	142.76	1555.9	237.93	-
13.000	13.000	1951.3	261.07	1626.1	435.12	-
13.500	13.500	2035.5	384.60	1696.2	641.00	-
14.000	14.000	2119.6	513.34	1766.4	855.57	-
14.500	14.500	2203.8	647.30	1836.5	1078.8	-
15.000	15.000	2288.0	786.47	1906.6	1310.8	-
15.500	15.500	2372.1	930.86	1976.8	1551.4	-

Level	Pile length	Global Factor			Partial Factor		Shaft Factor
		Factored End	Factored	Factored	Factored End	Factored	Factored

Soil Profile 4: Soil Profile 4

Depth	Pile length	Ultimate base capacity (Q_b)	Cumulative external Friction (Q_s)	Average external Friction (q_s)	Negative skin friction (Q_{nsf})	Ultimate capacity	Allowable capacity	Limiting criterion #
[m]	[m]	[kN]	[kN]	[kN/m]	[kN]	[kN]	[kN]	
12.500	12.500	33.094	0.0	0.0	356.90	-323.80	-345.87	2
12.500	12.500	4667.8	0.0	0.0	356.90	4310.9	1199.1	2
13.000	13.000	4878.3	295.78	22.752	356.90	4817.1	1466.4	2
13.500	13.500	5088.7	604.60	44.785	356.90	5336.4	1742.4	2
14.000	14.000	5299.1	926.46	66.175	356.90	5868.6	2027.1	2
14.500	14.500	5509.5	1261.4	86.990	356.90	6413.9	2320.5	2
15.000	15.000	5719.9	1609.3	107.29	356.90	6972.3	2574.8	1
15.500	15.500	5930.3	1970.3	127.11	356.90	7543.7	2803.3	1

Limiting criteria :
1: Global factor of safety
2: Shaft and base factors of safety
3: Shaft factor of safety
4: Pile material limiting stress [Compression]

Level	Pile length	Global Factor			Partial Factor		Shaft Factor
		Factored End Bearing	Factored Skin Friction	Factored	Factored End Bearing	Factored Skin Friction	Factored Skin Friction
[m]	[m]	[kN]	[kN]		[kN]	[kN]	
12.500	12.500	13.237	0.0		11.031	0.0	-
12.500	12.500	1867.1	0.0		1555.9	0.0	-
13.000	13.000	1951.3	118.31		1626.1	197.19	-
13.500	13.500	2035.5	241.84		1696.2	403.07	-
14.000	14.000	2119.6	370.58		1766.4	617.64	-
14.500	14.500	2203.8	504.54		1836.5	840.90	-
15.000	15.000	2288.0	643.72		1906.6	1072.9	-
15.500	15.500	2372.1	788.10		1976.8	1313.5	-

Nq Calculation Details

Soil Profile 1: Soil Profile 1

There are no pile toe levels in any drained material(with Berezantzev/Bolton option) in the given soil profile.

Soil Profile 2: Soil Profile 2

There are no pile toe levels in any drained material(with Berezantzev/Bolton option) in the given soil profile.

Soil Profile 3: Soil Profile 3

There are no pile toe levels in any drained material(with Berezantzev/Bolton option) in the given soil profile.

Soil Profile 4: Soil Profile 4

There are no pile toe levels in any drained material(with Berezantzev/Bolton option) in the given soil profile.

Results - Tension

Soil Profile 1: Soil Profile 1

Depth	Pile length	Cumulative external Friction (Q_s)	Average external Friction (q_s)	Ultimate capacity	Allowable capacity	Limiting criterion #
[m]	[m]	[kN]	[kN/m]	[kN]	[kN]	
12.500	12.500	162.22	12.978	162.22	108.15	1
12.500	12.500	162.22	12.978	162.22	108.15	1
13.000	13.000	450.41	34.647	450.41	300.27	1
13.500	13.500	751.63	55.676	751.63	501.09	1
14.000	14.000	1065.9	76.135	1065.9	710.60	1

Depth	Pile length	Cumulative external Friction (Q_s)	Average external Friction (q_s)	Ultimate capacity	Allowable capacity	Limiting criterion #
14.500	14.500	1393.2	96.082	1393.2	928.80	1
15.000	15.000	1733.5	115.57	1733.5	1155.7	1
15.500	15.500	2086.9	134.64	2086.9	1391.3	1

Note - The weight of the pile has not been included in the factored load.
Limiting criteria :
1: Factor of safety on shaft
2: Pile material limiting stress [Tension]

Soil Profile 2: Soil Profile 2

Depth	Pile length	Cumulative external Friction (Q_s)	Average external Friction (q_s)	Ultimate capacity	Allowable capacity	Limiting criterion #
[m]	[m]	[kN]	[kN/m]	[kN]	[kN]	
12.500	12.500	0.0	0.0	0.0	0.0	1
12.500	12.500	0.0	0.0	0.0	0.0	1
13.000	13.000	288.18	22.168	288.18	192.12	1
13.500	13.500	589.41	43.660	589.41	392.94	1
14.000	14.000	903.67	64.548	903.67	602.45	1
14.500	14.500	1231.0	84.895	1231.0	820.65	1
15.000	15.000	1571.3	104.75	1571.3	1047.5	1
15.500	15.500	1924.7	124.17	1924.7	1283.1	1

Note - The weight of the pile has not been included in the factored load.
Limiting criteria :
1: Factor of safety on shaft
2: Pile material limiting stress [Tension]

Soil Profile 3: Soil Profile 3

Depth	Pile length	Cumulative external Friction (Q_s)	Average external Friction (q_s)	Ultimate capacity	Allowable capacity	Limiting criterion #
[m]	[m]	[kN]	[kN/m]	[kN]	[kN]	
12.500	12.500	356.90	28.552	356.90	237.93	1
12.500	12.500	356.90	28.552	356.90	237.93	1
13.000	13.000	652.68	50.206	652.68	435.12	1
13.500	13.500	961.50	71.222	961.50	641.00	1
14.000	14.000	1283.4	91.668	1283.4	855.57	1
14.500	14.500	1618.3	111.60	1618.3	1078.8	1
15.000	15.000	1966.2	131.08	1966.2	1310.8	1
15.500	15.500	2327.2	150.14	2327.2	1551.4	1

Note - The weight of the pile has not been included in the factored load.
Limiting criteria :
1: Factor of safety on shaft
2: Pile material limiting stress [Tension]

Soil Profile 4: Soil Profile 4

Depth	Pile length	Cumulative external Friction (Q_s)	Average external Friction (q_s)	Ultimate capacity	Allowable capacity	Limiting criterion #
[m]	[m]	[kN]	[kN/m]	[kN]	[kN]	
12.500	12.500	0.0	0.0	0.0	0.0	1
12.500	12.500	0.0	0.0	0.0	0.0	1
13.000	13.000	295.78	22.752	295.78	197.19	1
13.500	13.500	604.60	44.785	604.60	403.07	1
14.000	14.000	926.46	66.175	926.46	617.64	1
14.500	14.500	1261.4	86.990	1261.4	840.90	1
15.000	15.000	1609.3	107.29	1609.3	1072.9	1
15.500	15.500	1970.3	127.11	1970.3	1313.5	1

Note - The weight of the pile has not been included in the factored load.
Limiting criteria :
1: Factor of safety on shaft
2: Pile material limiting stress [Tension]

Analysis Options

Design approach:	DA1(C1 + C2)
Pile type:	Bored
Model factor:	1.40
Partial factor on negative skin friction - Set A1:	1.00
Partial factor on negative skin friction - Set A2:	1.00
Serviceability verified by load tests (preliminary/working) carried out on more than 1% of constructed piles to loads not less than 1.5 times the representative load for which they are designed?	No
Resistance verified by a maintained load test taken to the calculated, unfactored, ultimate resistance?	No
Is BS8004 SLS check enabled?	No
Is pile capacity limited by pile material compressive strength?	No
Pile material compressive strength calculation type	Grade based
Limiting pile material compressive strength[kPa]	0.000000
Datum type	Depth based
Effective stress profile	Calculated

Pile Properties

Pile type	Solid
Material type	Concrete
Concrete code	EN 1992-1-1:2004 Eurocode 2
Concrete grade	C16/20
Concrete capacity factor	0.30000
Pile cross-section	Circular
Under-ream	No
Calculation profile	Range
Minimum pile length	12.500 m
Maximum pile length	15.500 m
Increment size	0.50000

Cross-section	Number of cross sections	Top Diameter [m]	Second Diameter location [m]	Second Diameter [m]	Third Diameter location [m]	Third Diameter [m]
Cross-section 1	1	0.41000				
Cross-section 2	1	0.51000				

Undrained Materials - General Data

No.	Material description	Bulk unit weight [kN/m³]	Cu material factor	Top Cu [kPa]	Base Cu [kPa]
1	Tidal Flat Deposits	17.800	NA	18.000	18.000

Undrained Materials - Skin Friction Data

No.	Material description	Skin friction computation	Alpha	q_s Top [kPa]	q_s Base [kPa]	$q_{s,lim}$ Spec.	$q_{s,lim}$ Value [kPa]
1	Tidal Flat Deposits	Alpha specified	0.45000	NA	NA	No	NA

Undrained Materials - End Bearing Data

No.	Material description	End bearing computation	Nc	q_b Top [kPa]	q_b Base [kPa]	$q_{b,lim}$ Spec.	$q_{b,lim}$ Value [kPa]
1	Tidal Flat Deposits	Nc specified	9.0000	NA	NA	No	NA

No.	Material description	End bearing computation	Nc	q_b	$q_{b,lim}$	
				Top [kPa]	Base [kPa]	Spec. Value [kPa]

Undrained Materials - Material Factors (Code Based)

No.	Material description	Qs factors		Nc factors		Qb factors	
		M1	M2	M1	M2	M1	M2
1	Tidal Flat Deposits	N.A.	N.A.	1.0000	1.0000	N.A.	N.A.

Drained Materials - General Data

No.	Material description	Bulk unit weight [kN/m³]	Tan(δ) material factor
1	Dense Gravel	20.600	NA
2	Wind blown sand	19.000	NA

Drained Materials - Friction Data

No.	Material description	Skin friction computation	Beta	Delta (δ) [deg]	Coefficient of earth pressure K	q_s Top [kPa]	q_s Base [kPa]	$q_{s,lim}$ Spec.	$q_{s,lim}$ Value [kPa]
1	Dense Gravel	Earth pressure	NA	32.400	2.4900	NA	NA	No	NA
2	Wind blown sand	Earth pressure	NA	21.980	1.6900	NA	NA	No	NA

Drained Materials - End Bearing Data

No.	Material description	End bearing computation	Nq	Phi' [deg]	PhiD [deg]	Phicv' [deg]	Id	q_b Top [kPa]	q_b Base [kPa]	$q_{b,lim}$ Spec.	$q_{b,lim}$ Value [kPa]	Nq-Phi curves	Ed [kPa]	Ko
1	Dense Gravel	Nq specified	100.00	NA	NA	NA	NA	NA	NA	No	NA	NA	NA	NA
2	Wind blown sand	Nq specified	18.000	NA	NA	NA	NA	NA	NA	No	NA	NA	NA	NA

Drained Materials - Material Factors (Code Based)

No.	Material description	Qs factors		Nq factors		Qb factors	
		M1	M2	M1	M2	M1	M2
1	Dense Gravel	N.A.	N.A.	1.0000	1.0000	N.A.	N.A.
2	Wind blown sand	N.A.	N.A.	1.0000	1.0000	N.A.	N.A.

STAGE SPECIFIC DATA

Stage 0 : Initial Stage

Groundwater

No.	Level [m]	Pressure [kPa]	Unit weight of water [kN/m³]

Soil Profiles

Soil Profile 1: Soil Profile 1

No.	Depth [m]	Material description	Contributes to negative skin friction
1	0.0	Tidal Flat Deposits	No

No.	Depth [m]	Material description	Contributes to negative skin friction
2	12.500	Dense Gravel	No

Soil Profile 2: Soil Profile 2

No.	Depth [m]	Material description	Contributes to negative skin friction
1	0.0	Tidal Flat Deposits	Yes
2	12.500	Dense Gravel	No

Soil Profile 3: Soil Profile 3

No.	Depth [m]	Material description	Contributes to negative skin friction
1	0.0	Wind blown sand	No
2	5.0000	Tidal Flat Deposits	No
3	12.500	Dense Gravel	No

Soil Profile 4: Soil Profile 4

No.	Depth [m]	Material description	Contributes to negative skin friction
1	0.0	Wind blown sand	Yes
2	5.0000	Tidal Flat Deposits	Yes
3	12.500	Dense Gravel	No

Soil Profile - Groundwater Map

No.	Soil Profile	Groundwater
1	Soil Profile 1	Groundwater Profile 1
2	Soil Profile 2	Groundwater Profile 1
3	Soil Profile 3	Groundwater Profile 1
4	Soil Profile 4	Groundwater Profile 1

CAPACITY RESULTS

Partial Resistance Factors Used:

DA1 C1

Shaft resistance factor for set R1 (Compression):	1.00
Base resistance factor for set R1:	1.00
Shaft resistance factor for set R1 (Tension):	1.00

DA1 C2

Shaft resistance factor for set R4 (Compression):	1.60
Base resistance factor for set R4:	2.00
Shaft resistance factor for set R4 (Tension):	2.00
Model factor:	1.40

Stress Profiles

Soil Profile 1: Soil Profile 1

Depth [m]	*	Density [kN/m³]	Undrained Cohesion [kPa]	Nq	Total vertical stress [kPa]	Porewater pressure [kPa]	Effective vertical stress [kPa]	Effective horizontal stress* [kPa]	Cumulative skin friction per unit perimeter [kN/m]
0.0	H	17.800	18.000	N.A.	0.0	0.0	0.0	NA	0.0

Depth	*	Density	Undrained Cohesion	Nq	Total vertical stress	Porewater pressure	Effective vertical stress	Effective horizontal stress*	Cumulative skin friction per unit
12.500	T	17.800	18.000	N.A.	222.50	0.0	222.50	NA	101.25
12.500	T	20.600	0.0	100.00	222.50	0.0	222.50	554.03	101.25
13.000	T	20.600	0.0	100.00	232.80	0.0	232.80	579.67	281.12
13.500	T	20.600	0.0	100.00	243.10	0.0	243.10	605.32	469.12
14.000	T	20.600	0.0	100.00	253.40	0.0	253.40	630.97	665.26
14.500	T	20.600	0.0	100.00	263.70	0.0	263.70	656.61	869.54
15.000	T	20.600	0.0	100.00	274.00	0.0	274.00	682.26	1082.0
15.500	T	20.600	0.0	100.00	284.30	0.0	284.30	707.91	1302.5

* Annotation:
H: Pile head location
T: Pile toe locations corresponding to different pile lengths

Soil Profile 2: Soil Profile 2

Depth	*	Density	Undrained Cohesion	Nq	Total vertical stress	Porewater pressure	Effective vertical stress	Effective horizontal stress*	Cumulative skin friction per unit perimeter
[m]		[kN/m³]	[kPa]		[kPa]	[kPa]	[kPa]	[kPa]	[kN/m]
0.0	H	17.800	18.000	N.A.	0.0	0.0	0.0	NA	0.0
12.500	T	17.800	18.000	N.A.	222.50	0.0	222.50	NA	-101.25
12.500	T	20.600	0.0	100.00	222.50	0.0	222.50	554.03	-101.25
13.000	T	20.600	0.0	100.00	232.80	0.0	232.80	579.67	78.617
13.500	T	20.600	0.0	100.00	243.10	0.0	243.10	605.32	266.62
14.000	T	20.600	0.0	100.00	253.40	0.0	253.40	630.97	462.76
14.500	T	20.600	0.0	100.00	263.70	0.0	263.70	656.61	667.04
15.000	T	20.600	0.0	100.00	274.00	0.0	274.00	682.26	879.46
15.500	T	20.600	0.0	100.00	284.30	0.0	284.30	707.91	1100.0

* Annotation:
H: Pile head location
T: Pile toe locations corresponding to different pile lengths

Soil Profile 3: Soil Profile 3

Depth	*	Density	Undrained Cohesion	Nq	Total vertical stress	Porewater pressure	Effective vertical stress	Effective horizontal stress*	Cumulative skin friction per unit perimeter
[m]		[kN/m³]	[kPa]		[kPa]	[kPa]	[kPa]	[kPa]	[kN/m]
0.0	H	19.000	0.0	18.000	0.0	0.0	0.0	0.0	0.0
5.0000	-	19.000	0.0	18.000	95.000	0.0	95.000	160.55	162.00
5.0000	-	17.800	18.000	N.A.	95.000	0.0	95.000	NA	162.00
12.500	T	17.800	18.000	N.A.	228.50	0.0	228.50	NA	222.75
12.500	T	20.600	0.0	100.00	228.50	0.0	228.50	568.97	222.75
13.000	T	20.600	0.0	100.00	238.80	0.0	238.80	594.61	407.36
13.500	T	20.600	0.0	100.00	249.10	0.0	249.10	620.26	600.11
14.000	T	20.600	0.0	100.00	259.40	0.0	259.40	645.91	800.99
14.500	T	20.600	0.0	100.00	269.70	0.0	269.70	671.55	1010.0
15.000	T	20.600	0.0	100.00	280.00	0.0	280.00	697.20	1227.2
15.500	T	20.600	0.0	100.00	290.30	0.0	290.30	722.85	1452.5

* Annotation:
H: Pile head location
T: Pile toe locations corresponding to different pile lengths

Soil Profile 4: Soil Profile 4

Depth	*	Density	Undrained Cohesion	Nq	Total vertical stress	Porewater pressure	Effective vertical stress	Effective horizontal stress*	Cumulative skin friction per unit perimeter
[m]		[kN/m³]	[kPa]		[kPa]	[kPa]	[kPa]	[kPa]	[kN/m]
0.0	H	19.000	0.0	18.000	0.0	0.0	0.0	0.0	0.0
5.0000	-	19.000	0.0	18.000	95.000	0.0	95.000	160.55	-162.00
5.0000	-	17.800	18.000	N.A.	95.000	0.0	95.000	NA	-162.00
12.500	T	17.800	18.000	N.A.	228.50	0.0	228.50	NA	-222.75
12.500	T	20.600	0.0	100.00	228.50	0.0	228.50	568.97	-222.75
13.000	T	20.600	0.0	100.00	238.80	0.0	238.80	594.61	-38.146
13.500	T	20.600	0.0	100.00	249.10	0.0	249.10	620.26	154.60
14.000	T	20.600	0.0	100.00	259.40	0.0	259.40	645.91	355.48

Depth	*	Density	Undrained Cohesion	Nq	Total vertical stress	Porewater pressure	Effective vertical stress	Effective horizontal stress*	Cumulative skin friction per unit
14.500	T	20.600	0.0	100.00	269.70	0.0	269.70	671.55	564.50
15.000	T	20.600	0.0	100.00	280.00	0.0	280.00	697.20	781.66
15.500	T	20.600	0.0	100.00	290.30	0.0	290.30	722.85	1007.0

* Annotation:
H: Pile head location
T: Pile toe locations corresponding to different pile lengths

* Effective horizontal stress not calculated for "Total Stress" materials and for Beta Method.

Cross-section 1 results:

Uniform pile with top shaft diameter = 0.41 m

Results - Compression

Soil Profile 1: Soil Profile 1

Depth	Pile length	Ultimate base capacity (Q_b)	Cumulative external Friction (Q_s)	Average external Friction (q_s)	Negative skin friction (Q_{nsf})	Net ultimate resistance
[m]	[m]	[kN]	[kN]	[kN/m]	[kN]	[kN]
12.500	12.500	21.388	130.42	10.433	0.0	151.80
12.500	12.500	2937.6	130.42	10.433	0.0	3068.0
13.000	13.000	3073.6	362.09	27.853	0.0	3435.6
13.500	13.500	3209.5	604.25	44.759	0.0	3813.8
14.000	14.000	3345.5	856.89	61.207	0.0	4202.4
14.500	14.500	3481.5	1120.0	77.243	0.0	4601.5
15.000	15.000	3617.5	1393.6	92.908	0.0	5011.1
15.500	15.500	3753.5	1677.7	108.24	0.0	5431.2

Depth	Pile length	Design resistance		Combination with least resistance #	Factored load*	
		DA1-C1	DA1-C2		DA1-C1	DA1-C2
[m]	[m]	[kN]	[kN]		[kN]	[kN]
12.500	12.500	108.43	65.860	2	0.0(C)	0.0(C)
12.500	12.500	2191.4	1107.4	2	0.0(C)	0.0(C)
13.000	13.000	2454.0	1259.3	2	0.0(C)	0.0(C)
13.500	13.500	2724.1	1416.0	2	0.0(C)	0.0(C)
14.000	14.000	3001.7	1577.4	2	0.0(C)	0.0(C)
14.500	14.500	3286.8	1743.4	2	0.0(C)	0.0(C)
15.000	15.000	3579.4	1914.1	2	0.0(C)	0.0(C)
15.500	15.500	3879.4	2089.5	2	0.0(C)	0.0(C)

Limiting criteria :
1 : DA1 C1
2 : DA1 C2
*(C)-> Compression load, (T)-> Tension load
Note: Design resistance does not include any consideration of negative skin friction.

Level	Pile length	Factored Shaft Resistance		Factored Base Resistance	
		DA1-C1	DA1-C2	DA1-C1	DA1-C2
[m]	[m]	[kN]	[kN]	[kN]	[kN]
12.500	12.500	93.154	58.221	15.277	7.6386
12.500	12.500	93.154	58.221	2098.3	1049.1
13.000	13.000	258.64	161.65	2195.4	1097.7
13.500	13.500	431.61	269.76	2292.5	1146.3
14.000	14.000	612.07	382.54	2389.7	1194.8
14.500	14.500	800.01	500.01	2486.8	1243.4
15.000	15.000	995.45	622.15	2583.9	1292.0
15.500	15.500	1198.4	748.98	2681.1	1340.5

Soil Profile 2: Soil Profile 2

Depth	Pile length	Ultimate base capacity (Q_b)	Cumulative external Friction (Q_s)	Average external Friction (q_s)	Negative skin friction (Q_{nsf})	Net ultimate resistance

[m]	[m]	[kN]	[kN]	[kN/m]	[kN]	[kN]
12.500	12.500	21.388	0.0	0.0	130.42	-109.03
12.500	12.500	2937.6	0.0	0.0	130.42	2807.2
13.000	13.000	3073.6	231.68	17.821	130.42	3174.8
13.500	13.500	3209.5	473.84	35.099	130.42	3553.0
14.000	14.000	3345.5	726.48	51.891	130.42	3941.6
14.500	14.500	3481.5	989.60	68.249	130.42	4340.7
15.000	15.000	3617.5	1263.2	84.214	130.42	4750.3
15.500	15.500	3753.5	1547.3	99.826	130.42	5170.4

Depth	Pile length	Design resistance		Combination with least resistance #	Factored load*	
		DA1-C1	DA1-C2		DA1-C1	DA1-C2
[m]	[m]	[kN]	[kN]		[kN]	[kN]
12.500	12.500	15.277	7.6386	2	130.42(C)	182.58(C)
12.500	12.500	2098.3	1049.1	2	130.42(C)	182.58(C)
13.000	13.000	2360.9	1201.1	2	130.42(C)	182.58(C)
13.500	13.500	2631.0	1357.8	2	130.42(C)	182.58(C)
14.000	14.000	2908.6	1519.2	2	130.42(C)	182.58(C)
14.500	14.500	3193.7	1685.2	2	130.42(C)	182.58(C)
15.000	15.000	3486.2	1855.9	2	130.42(C)	182.58(C)
15.500	15.500	3786.3	2031.3	2	130.42(C)	182.58(C)

Limiting criteria :
1 : DA1 C1
2 : DA1 C2
*(C)-> Compression load, (T)-> Tension load
Note: Design resistance does not include any consideration of negative skin friction.

Level	Pile length	Factored Shaft Resistance		Factored Base Resistance	
		DA1-C1	DA1-C2	DA1-C1	DA1-C2
[m]	[m]	[kN]	[kN]	[kN]	[kN]
12.500	12.500	0.0	0.0	15.277	7.6386
12.500	12.500	0.0	0.0	2098.3	1049.1
13.000	13.000	165.48	103.43	2195.4	1097.7
13.500	13.500	338.46	211.53	2292.5	1146.3
14.000	14.000	518.91	324.32	2389.7	1194.8
14.500	14.500	706.86	441.79	2486.8	1243.4
15.000	15.000	902.29	563.93	2583.9	1292.0
15.500	15.500	1105.2	690.76	2681.1	1340.5

Soil Profile 3: Soil Profile 3

Depth	Pile length	Ultimate base capacity (Q_b)	Cumulative external Friction (Q_s)	Average external Friction (q_s)	Negative skin friction (Q_{nsf})	Net ultimate resistance
[m]	[m]	[kN]	[kN]	[kN/m]	[kN]	[kN]
12.500	12.500	21.388	286.92	22.953	0.0	308.31
12.500	12.500	3016.8	286.92	22.953	0.0	3303.7
13.000	13.000	3152.8	524.70	40.362	0.0	3677.5
13.500	13.500	3288.8	772.97	57.257	0.0	4061.7
14.000	14.000	3424.7	1031.7	73.694	0.0	4456.5
14.500	14.500	3560.7	1300.9	89.720	0.0	4861.7
15.000	15.000	3696.7	1580.7	105.38	0.0	5277.4
15.500	15.500	3832.7	1870.9	120.70	0.0	5703.6

Depth	Pile length	Design resistance		Combination with least resistance #	Factored load*	
		DA1-C1	DA1-C2		DA1-C1	DA1-C2
[m]	[m]	[kN]	[kN]		[kN]	[kN]
12.500	12.500	220.22	135.73	2	0.0(C)	0.0(C)
12.500	12.500	2359.8	1205.5	2	0.0(C)	0.0(C)
13.000	13.000	2626.8	1360.2	2	0.0(C)	0.0(C)
13.500	13.500	2901.2	1519.6	2	0.0(C)	0.0(C)
14.000	14.000	3183.2	1683.7	2	0.0(C)	0.0(C)
14.500	14.500	3472.6	1852.5	2	0.0(C)	0.0(C)
15.000	15.000	3769.6	2025.9	2	0.0(C)	0.0(C)

Depth	Pile length	Design resistance	Combination with least resistance #	Factored load*	
15.500	15.500	4074.0	2204.0	2	0.0(C) 0.0(C)

Limiting criteria :
1 : DA1 C1
2 : DA1 C2
*(C)-> Compression load, (T)-> Tension load
Note: Design resistance does not include any consideration of negative skin friction.

Level	Pile length	Factored Shaft Resistance		Factored Base Resistance	
		DA1-C1	DA1-C2	DA1-C1	DA1-C2
[m]	[m]	[kN]	[kN]	[kN]	[kN]
12.500	12.500	204.94	128.09	15.277	7.6386
12.500	12.500	204.94	128.09	2154.8	1077.4
13.000	13.000	374.79	234.24	2252.0	1126.0
13.500	13.500	552.12	345.07	2349.1	1174.6
14.000	14.000	736.94	460.59	2446.2	1223.1
14.500	14.500	929.25	580.78	2543.4	1271.7
15.000	15.000	1129.0	705.65	2640.5	1320.3
15.500	15.500	1336.3	835.20	2737.6	1368.8

Soil Profile 4: Soil Profile 4

Depth	Pile length	Ultimate base capacity (Q_b)	Cumulative external Friction (Q_s)	Average external Friction (q_s)	Negative skin friction (Q_{nsf})	Net ultimate resistance
[m]	[m]	[kN]	[kN]	[kN/m]	[kN]	[kN]
12.500	12.500	21.388	0.0	0.0	286.92	-265.53
12.500	12.500	3016.8	0.0	0.0	286.92	2729.9
13.000	13.000	3152.8	237.78	18.291	286.92	3103.6
13.500	13.500	3288.8	486.05	36.004	286.92	3487.9
14.000	14.000	3424.7	744.80	53.200	286.92	3882.6
14.500	14.500	3560.7	1014.0	69.933	286.92	4287.8
15.000	15.000	3696.7	1293.7	86.249	286.92	4703.5
15.500	15.500	3832.7	1583.9	102.19	286.92	5129.7

Depth	Pile length	Design resistance		Combination with least resistance #	Factored load*	
		DA1-C1	DA1-C2		DA1-C1	DA1-C2
[m]	[m]	[kN]	[kN]		[kN]	[kN]
12.500	12.500	15.277	7.6386	2	286.92(C)	370.38(C)
12.500	12.500	2154.8	1077.4	2	286.92(C)	370.38(C)
13.000	13.000	2421.8	1232.1	2	286.92(C)	370.38(C)
13.500	13.500	2696.3	1391.5	2	286.92(C)	370.38(C)
14.000	14.000	2978.2	1555.6	2	286.92(C)	370.38(C)
14.500	14.500	3267.7	1724.4	2	286.92(C)	370.38(C)
15.000	15.000	3564.6	1897.8	2	286.92(C)	370.38(C)
15.500	15.500	3869.0	2075.9	2	286.92(C)	370.38(C)

Limiting criteria :
1 : DA1 C1
2 : DA1 C2
*(C)-> Compression load, (T)-> Tension load
Note: Design resistance does not include any consideration of negative skin friction.

Level	Pile length	Factored Shaft Resistance		Factored Base Resistance	
		DA1-C1	DA1-C2	DA1-C1	DA1-C2
[m]	[m]	[kN]	[kN]	[kN]	[kN]
12.500	12.500	0.0	0.0	15.277	7.6386
12.500	12.500	0.0	0.0	2154.8	1077.4
13.000	13.000	169.85	106.15	2252.0	1126.0
13.500	13.500	347.18	216.99	2349.1	1174.6
14.000	14.000	532.00	332.50	2446.2	1223.1
14.500	14.500	724.31	452.69	2543.4	1271.7
15.000	15.000	924.10	577.56	2640.5	1320.3
15.500	15.500	1131.4	707.11	2737.6	1368.8

Level	Pile length	Factored Shaft Resistance		Factored Base Resistance	
		DA1-C1	DA1-C2	DA1-C1	DA1-C2

Nq Calculation Details

Soil Profile 1: Soil Profile 1 - Material Factor Set - 1

There are no pile toe levels in any drained material(with Berezantzev/Bolton option) in the given soil profile.

Soil Profile 1: Soil Profile 1 - Material Factor Set - 2

There are no pile toe levels in any drained material(with Berezantzev/Bolton option) in the given soil profile.

Soil Profile 2: Soil Profile 2 - Material Factor Set - 1

There are no pile toe levels in any drained material(with Berezantzev/Bolton option) in the given soil profile.

Soil Profile 2: Soil Profile 2 - Material Factor Set - 2

There are no pile toe levels in any drained material(with Berezantzev/Bolton option) in the given soil profile.

Soil Profile 3: Soil Profile 3 - Material Factor Set - 1

There are no pile toe levels in any drained material(with Berezantzev/Bolton option) in the given soil profile.

Soil Profile 3: Soil Profile 3 - Material Factor Set - 2

There are no pile toe levels in any drained material(with Berezantzev/Bolton option) in the given soil profile.

Soil Profile 4: Soil Profile 4 - Material Factor Set - 1

There are no pile toe levels in any drained material(with Berezantzev/Bolton option) in the given soil profile.

Soil Profile 4: Soil Profile 4 - Material Factor Set - 2

There are no pile toe levels in any drained material(with Berezantzev/Bolton option) in the given soil profile.

Results - Tension

Soil Profile 1: Soil Profile 1

Depth	Pile length	Cumulative external Friction	Average external Friction	Net ultimate resistance	Design resistance		Combination with least resistance #	Factored load*	
		(Q_s)	(q_s)		DA1-C1	DA1-C2		DA1-C1	DA1-C2
[m]	[m]	[kN]	[kN/m]	[kN]	[kN]	[kN]		[kN]	[kN]
12.500	12.500	130.42	10.433	130.42	93.154	46.577	2	N.A.	N.A.
12.500	12.500	130.42	10.433	130.42	93.154	46.577	2	N.A.	N.A.
13.000	13.000	362.09	27.853	362.09	258.64	129.32	2	N.A.	N.A.
13.500	13.500	604.25	44.759	604.25	431.61	215.80	2	N.A.	N.A.
14.000	14.000	856.89	61.207	856.89	612.07	306.03	2	N.A.	N.A.
14.500	14.500	1120.0	77.243	1120.0	800.01	400.01	2	N.A.	N.A.
15.000	15.000	1393.6	92.908	1393.6	995.45	497.72	2	N.A.	N.A.
15.500	15.500	1677.7	108.24	1677.7	1198.4	599.18	2	N.A.	N.A.

Note - The weight of the pile has not been included in the factored load.
Limiting criteria :
1 : DA1 C1 [Shaft Tension]
2 : DA1 C2 [Shaft Tension]
*(C)-> Compression load, (T)-> Tension load
Note: Design resistance does not include any consideration of negative skin friction.

Soil Profile 2: Soil Profile 2

Depth	Pile length	Cumulative external Friction	Average external Friction	Net ultimate resistance	Design resistance		Combination with least resistance #	Factored load*	
		(Q_s)	(q_s)		DA1-C1	DA1-C2		DA1-C1	DA1-C2
[m]	[m]	[kN]	[kN/m]	[kN]	[kN]	[kN]		[kN]	[kN]
12.500	12.500	0.0	0.0	0.0	0.0	0.0	2	N.A.	N.A.
12.500	12.500	0.0	0.0	0.0	0.0	0.0	2	N.A.	N.A.
13.000	13.000	231.68	17.821	231.68	165.48	82.742	2	N.A.	N.A.

Depth	Pile length	Cumulative external Friction	Average external Friction	Net ultimate resistance	Design resistance		Combination with least resistance #	Factored load*	
		(Q_s)	(q_s)		DA1-C1	DA1-C2		DA1-C1	DA1-C2
[m]	[m]	[kN]	[kN/m]	[kN]	[kN]	[kN]		[kN]	[kN]
13.500	13.500	473.84	35.099	473.84	338.46	169.23	2	N.A.	N.A.
14.000	14.000	726.48	51.891	726.48	518.91	259.46	2	N.A.	N.A.
14.500	14.500	989.60	68.249	989.60	706.86	353.43	2	N.A.	N.A.
15.000	15.000	1263.2	84.214	1263.2	902.29	451.15	2	N.A.	N.A.
15.500	15.500	1547.3	99.826	1547.3	1105.2	552.61	2	N.A.	N.A.

Note - The weight of the pile has not been included in the factored load.
Limiting criteria :
1 : DA1 C1 [Shaft Tension]
2 : DA1 C2 [Shaft Tension]
*(C)-> Compression load, (T)-> Tension load
Note: Design resistance does not include any consideration of negative skin friction.

Soil Profile 3: Soil Profile 3

Depth	Pile length	Cumulative external Friction	Average external Friction	Net ultimate resistance	Design resistance		Combination with least resistance #	Factored load*	
		(Q_s)	(q_s)		DA1-C1	DA1-C2		DA1-C1	DA1-C2
[m]	[m]	[kN]	[kN/m]	[kN]	[kN]	[kN]		[kN]	[kN]
12.500	12.500	286.92	22.953	286.92	204.94	102.47	2	N.A.	N.A.
12.500	12.500	286.92	22.953	286.92	204.94	102.47	2	N.A.	N.A.
13.000	13.000	524.70	40.362	524.70	374.79	187.39	2	N.A.	N.A.
13.500	13.500	772.97	57.257	772.97	552.12	276.06	2	N.A.	N.A.
14.000	14.000	1031.7	73.694	1031.7	736.94	368.47	2	N.A.	N.A.
14.500	14.500	1300.9	89.720	1300.9	929.25	464.62	2	N.A.	N.A.
15.000	15.000	1580.7	105.38	1580.7	1129.0	564.52	2	N.A.	N.A.
15.500	15.500	1870.9	120.70	1870.9	1336.3	668.16	2	N.A.	N.A.

Note - The weight of the pile has not been included in the factored load.
Limiting criteria :
1 : DA1 C1 [Shaft Tension]
2 : DA1 C2 [Shaft Tension]
*(C)-> Compression load, (T)-> Tension load
Note: Design resistance does not include any consideration of negative skin friction.

Soil Profile 4: Soil Profile 4

Depth	Pile length	Cumulative external Friction	Average external Friction	Net ultimate resistance	Design resistance		Combination with least resistance #	Factored load*	
		(Q_s)	(q_s)		DA1-C1	DA1-C2		DA1-C1	DA1-C2
[m]	[m]	[kN]	[kN/m]	[kN]	[kN]	[kN]		[kN]	[kN]
12.500	12.500	0.0	0.0	0.0	0.0	0.0	2	N.A.	N.A.
12.500	12.500	0.0	0.0	0.0	0.0	0.0	2	N.A.	N.A.
13.000	13.000	237.78	18.291	237.78	169.85	84.923	2	N.A.	N.A.
13.500	13.500	486.05	36.004	486.05	347.18	173.59	2	N.A.	N.A.
14.000	14.000	744.80	53.200	744.80	532.00	266.00	2	N.A.	N.A.
14.500	14.500	1014.0	69.933	1014.0	724.31	362.15	2	N.A.	N.A.
15.000	15.000	1293.7	86.249	1293.7	924.10	462.05	2	N.A.	N.A.
15.500	15.500	1583.9	102.19	1583.9	1131.4	565.69	2	N.A.	N.A.

Note - The weight of the pile has not been included in the factored load.
Limiting criteria :
1 : DA1 C1 [Shaft Tension]
2 : DA1 C2 [Shaft Tension]
*(C)-> Compression load, (T)-> Tension load
Note: Design resistance does not include any consideration of negative skin friction.

Cross-section 2 results:

Uniform pile with top shaft diameter = 0.51 m

Results - Compression

Soil Profile 1: Soil Profile 1

Depth	Pile length	Ultimate base capacity	Cumulative external Friction	Average external Friction	Negative skin friction	Net ultimate resistance

		(Q_b)	(Q_s)	(q_s)	(Q_{nsf})	
[m]	[m]	[kN]	[kN]	[kN/m]	[kN]	[kN]
12.500	12.500	33.094	162.22	12.978	0.0	195.32
12.500	12.500	4545.3	162.22	12.978	0.0	4707.5
13.000	13.000	4755.7	450.41	34.647	0.0	5206.1
13.500	13.500	4966.1	751.63	55.676	0.0	5717.7
14.000	14.000	5176.5	1065.9	76.135	0.0	6242.4
14.500	14.500	5386.9	1393.2	96.082	0.0	6780.1
15.000	15.000	5597.3	1733.5	115.57	0.0	7330.9
15.500	15.500	5807.7	2086.9	134.64	0.0	7894.7

Depth	Pile length	Design resistance		Combination with least resistance #	Factored load*	
		DA1-C1	DA1-C2		DA1-C1	DA1-C2
[m]	[m]	[kN]	[kN]		[kN]	[kN]
12.500	12.500	139.51	84.241	2	0.0(C)	0.0(C)
12.500	12.500	3362.5	1695.7	2	0.0(C)	0.0(C)
13.000	13.000	3718.6	1899.5	2	0.0(C)	0.0(C)
13.500	13.500	4084.1	2109.2	2	0.0(C)	0.0(C)
14.000	14.000	4458.9	2324.6	2	0.0(C)	0.0(C)
14.500	14.500	4842.9	2545.9	2	0.0(C)	0.0(C)
15.000	15.000	5236.3	2772.9	2	0.0(C)	0.0(C)
15.500	15.500	5639.0	3005.9	2	0.0(C)	0.0(C)

Limiting criteria :
1 : DA1 C1
2 : DA1 C2
*(C)-> Compression load, (T)-> Tension load
Note: Design resistance does not include any consideration of negative skin friction.

Level	Pile length	Factored Shaft Resistance		Factored Base Resistance	
		DA1-C1	DA1-C2	DA1-C1	DA1-C2
[m]	[m]	[kN]	[kN]	[kN]	[kN]
12.500	12.500	115.87	72.421	23.638	11.819
12.500	12.500	115.87	72.421	3246.6	1623.3
13.000	13.000	321.72	201.08	3396.9	1698.5
13.500	13.500	536.88	335.55	3547.2	1773.6
14.000	14.000	761.35	475.85	3697.5	1848.8
14.500	14.500	995.14	621.96	3847.8	1923.9
15.000	15.000	1238.2	773.90	3998.1	1999.0
15.500	15.500	1490.7	931.66	4148.4	2074.2

Soil Profile 2: Soil Profile 2

Depth	Pile length	Ultimate base capacity (Q_b)	Cumulative external Friction (Q_s)	Average external Friction (q_s)	Negative skin friction (Q_{nsf})	Net ultimate resistance
[m]	[m]	[kN]	[kN]	[kN/m]	[kN]	[kN]
12.500	12.500	33.094	0.0	0.0	162.22	-129.13
12.500	12.500	4545.3	0.0	0.0	162.22	4383.1
13.000	13.000	4755.7	288.18	22.168	162.22	4881.6
13.500	13.500	4966.1	589.41	43.660	162.22	5393.3
14.000	14.000	5176.5	903.67	64.548	162.22	5918.0
14.500	14.500	5386.9	1231.0	84.895	162.22	6455.7
15.000	15.000	5597.3	1571.3	104.75	162.22	7006.4
15.500	15.500	5807.7	1924.7	124.17	162.22	7570.2

Depth	Pile length	Design resistance		Combination with least resistance #	Factored load*	
		DA1-C1	DA1-C2		DA1-C1	DA1-C2
[m]	[m]	[kN]	[kN]		[kN]	[kN]
12.500	12.500	23.638	11.819	2	162.22(C)	227.11(C)
12.500	12.500	3246.6	1623.3	2	162.22(C)	227.11(C)
13.000	13.000	3602.8	1827.1	2	162.22(C)	227.11(C)
13.500	13.500	3968.2	2036.7	2	162.22(C)	227.11(C)
14.000	14.000	4343.0	2252.2	2	162.22(C)	227.11(C)
14.500	14.500	4727.1	2473.4	2	162.22(C)	227.11(C)

Depth [m]	Pile length [m]	Design resistance [kN]	Combination with least resistance #	Factored load* [kN]
15.000	15.000	5120.5	2	162.22(C) 227.11(C)
15.500	15.500	5523.2	2	162.22(C) 227.11(C)

Limiting criteria :
1 : DA1 C1
2 : DA1 C2
*(C)-> Compression load, (T)-> Tension load
Note: Design resistance does not include any consideration of negative skin friction.

Level [m]	Pile length [m]	Factored Shaft Resistance DA1-C1 [kN]	Factored Shaft Resistance DA1-C2 [kN]	Factored Base Resistance DA1-C1 [kN]	Factored Base Resistance DA1-C2 [kN]
12.500	12.500	0.0	0.0	23.638	11.819
12.500	12.500	0.0	0.0	3246.6	1623.3
13.000	13.000	205.85	128.65	3396.9	1698.5
13.500	13.500	421.01	263.13	3547.2	1773.6
14.000	14.000	645.48	403.42	3697.5	1848.8
14.500	14.500	879.26	549.54	3847.8	1923.9
15.000	15.000	1122.4	701.48	3998.1	1999.0
15.500	15.500	1374.8	859.24	4148.4	2074.2

Soil Profile 3: Soil Profile 3

Depth [m]	Pile length [m]	Ultimate base capacity (Q_b) [kN]	Cumulative external Friction (Q_s) [kN]	Average external Friction (q_s) [kN/m]	Negative skin friction (Q_{nsf}) [kN]	Net ultimate resistance [kN]
12.500	12.500	33.094	356.90	28.552	0.0	389.99
12.500	12.500	4667.8	356.90	28.552	0.0	5024.7
13.000	13.000	4878.3	652.68	50.206	0.0	5530.9
13.500	13.500	5088.7	961.50	71.222	0.0	6050.2
14.000	14.000	5299.1	1283.4	91.668	0.0	6582.4
14.500	14.500	5509.5	1618.3	111.60	0.0	7127.7
15.000	15.000	5719.9	1966.2	131.08	0.0	7686.1
15.500	15.500	5930.3	2327.2	150.14	0.0	8257.5

Depth [m]	Pile length [m]	Design resistance DA1-C1 [kN]	Design resistance DA1-C2 [kN]	Combination with least resistance #	Factored load* DA1-C1 [kN]	Factored load* DA1-C2 [kN]
12.500	12.500	278.57	171.15	2	0.0(C)	0.0(C)
12.500	12.500	3589.1	1826.4	2	0.0(C)	0.0(C)
13.000	13.000	3950.7	2033.6	2	0.0(C)	0.0(C)
13.500	13.500	4321.5	2246.6	2	0.0(C)	0.0(C)
14.000	14.000	4701.7	2465.5	2	0.0(C)	0.0(C)
14.500	14.500	5091.2	2690.1	2	0.0(C)	0.0(C)
15.000	15.000	5490.1	2920.6	2	0.0(C)	0.0(C)
15.500	15.500	5898.2	3156.9	2	0.0(C)	0.0(C)

Limiting criteria :
1 : DA1 C1
2 : DA1 C2
*(C)-> Compression load, (T)-> Tension load
Note: Design resistance does not include any consideration of negative skin friction.

Level [m]	Pile length [m]	Factored Shaft Resistance DA1-C1 [kN]	Factored Shaft Resistance DA1-C2 [kN]	Factored Base Resistance DA1-C1 [kN]	Factored Base Resistance DA1-C2 [kN]
12.500	12.500	254.93	159.33	23.638	11.819
12.500	12.500	254.93	159.33	3334.2	1667.1
13.000	13.000	466.20	291.37	3484.5	1742.2
13.500	13.500	686.78	429.24	3634.8	1817.4
14.000	14.000	916.68	572.93	3785.1	1892.5
14.500	14.500	1155.9	722.43	3935.3	1967.7
15.000	15.000	1404.4	877.76	4085.6	2042.8
15.500	15.500	1662.3	1038.9	4235.9	2118.0

Level	Pile length	Factored Shaft Resistance		Factored Base Resistance	
		DA1-C1	DA1-C2	DA1-C1	DA1-C2

Soil Profile 4: Soil Profile 4

Depth	Pile length	Ultimate base capacity (Q_b)	Cumulative external Friction (Q_s)	Average external Friction (q_s)	Negative skin friction (Q_{nsf})	Net ultimate resistance
[m]	[m]	[kN]	[kN]	[kN/m]	[kN]	[kN]
12.500	12.500	33.094	0.0	0.0	356.90	-323.80
12.500	12.500	4667.8	0.0	0.0	356.90	4310.9
13.000	13.000	4878.3	295.78	22.752	356.90	4817.1
13.500	13.500	5088.7	604.60	44.785	356.90	5336.4
14.000	14.000	5299.1	926.46	66.175	356.90	5868.6
14.500	14.500	5509.5	1261.4	86.990	356.90	6413.9
15.000	15.000	5719.9	1609.3	107.29	356.90	6972.3
15.500	15.500	5930.3	1970.3	127.11	356.90	7543.7

Depth	Pile length	Design resistance		Combination with least resistance #	Factored load*	
		DA1-C1	DA1-C2		DA1-C1	DA1-C2
[m]	[m]	[kN]	[kN]		[kN]	[kN]
12.500	12.500	23.638	11.819	2	356.90(C)	460.72(C)
12.500	12.500	3334.2	1667.1	2	356.90(C)	460.72(C)
13.000	13.000	3695.7	1874.3	2	356.90(C)	460.72(C)
13.500	13.500	4066.6	2087.3	2	356.90(C)	460.72(C)
14.000	14.000	4446.8	2306.1	2	356.90(C)	460.72(C)
14.500	14.500	4836.3	2530.8	2	356.90(C)	460.72(C)
15.000	15.000	5235.1	2761.3	2	356.90(C)	460.72(C)
15.500	15.500	5643.3	2997.5	2	356.90(C)	460.72(C)

```
# Limiting criteria :
1 : DA1 C1
2 : DA1 C2
*(C)-> Compression load, (T)-> Tension load
Note: Design resistance does not include any consideration of negative skin friction.
```

Level	Pile length	Factored Shaft Resistance		Factored Base Resistance	
		DA1-C1	DA1-C2	DA1-C1	DA1-C2
[m]	[m]	[kN]	[kN]	[kN]	[kN]
12.500	12.500	0.0	0.0	23.638	11.819
12.500	12.500	0.0	0.0	3334.2	1667.1
13.000	13.000	211.27	132.04	3484.5	1742.2
13.500	13.500	431.86	269.91	3634.8	1817.4
14.000	14.000	661.75	413.60	3785.1	1892.5
14.500	14.500	900.97	563.10	3935.3	1967.7
15.000	15.000	1149.5	718.43	4085.6	2042.8
15.500	15.500	1407.3	879.58	4235.9	2118.0

Nq Calculation Details

Soil Profile 1: Soil Profile 1 - Material Factor Set - 1

There are no pile toe levels in any drained material(with Berezantzev/Bolton option) in the given soil profile.

Soil Profile 1: Soil Profile 1 - Material Factor Set - 2

There are no pile toe levels in any drained material(with Berezantzev/Bolton option) in the given soil profile.

Soil Profile 2: Soil Profile 2 - Material Factor Set - 1

There are no pile toe levels in any drained material(with Berezantzev/Bolton option) in the given soil profile.

Soil Profile 2: Soil Profile 2 - Material Factor Set - 2

There are no pile toe levels in any drained material(with Berezantzev/Bolton option) in the given soil profile.

Soil Profile 3: Soil Profile 3 - Material Factor Set - 1

Level	Pile length	Factored Shaft Resistance		Factored Base Resistance	
		DA1-C1	DA1-C2	DA1-C1	DA1-C2

There are no pile toe levels in any drained material(with Berezantzev/Bolton option) in the given soil profile.

Soil Profile 3: Soil Profile 3 - Material Factor Set - 2

There are no pile toe levels in any drained material(with Berezantzev/Bolton option) in the given soil profile.

Soil Profile 4: Soil Profile 4 - Material Factor Set - 1

There are no pile toe levels in any drained material(with Berezantzev/Bolton option) in the given soil profile.

Soil Profile 4: Soil Profile 4 - Material Factor Set - 2

There are no pile toe levels in any drained material(with Berezantzev/Bolton option) in the given soil profile.

Results - Tension

Soil Profile 1: Soil Profile 1

Depth	Pile length	Cumulative external Friction	Average external Friction	Net ultimate resistance	Design resistance		Combination with least resistance #	Factored load*	
		(Q_s)	(q_s)		DA1-C1	DA1-C2		DA1-C1	DA1-C2
[m]	[m]	[kN]	[kN/m]	[kN]	[kN]	[kN]		[kN]	[kN]
12.500	12.500	162.22	12.978	162.22	115.87	57.937	2	N.A.	N.A.
12.500	12.500	162.22	12.978	162.22	115.87	57.937	2	N.A.	N.A.
13.000	13.000	450.41	34.647	450.41	321.72	160.86	2	N.A.	N.A.
13.500	13.500	751.63	55.676	751.63	536.88	268.44	2	N.A.	N.A.
14.000	14.000	1065.9	76.135	1065.9	761.35	380.68	2	N.A.	N.A.
14.500	14.500	1393.2	96.082	1393.2	995.14	497.57	2	N.A.	N.A.
15.000	15.000	1733.5	115.57	1733.5	1238.2	619.12	2	N.A.	N.A.
15.500	15.500	2086.9	134.64	2086.9	1490.7	745.33	2	N.A.	N.A.

Note - The weight of the pile has not been included in the factored load.
Limiting criteria :
1 : DA1 C1 [Shaft Tension]
2 : DA1 C2 [Shaft Tension]
*(C)-> Compression load, (T)-> Tension load
Note: Design resistance does not include any consideration of negative skin friction.

Soil Profile 2: Soil Profile 2

Depth	Pile length	Cumulative external Friction	Average external Friction	Net ultimate resistance	Design resistance		Combination with least resistance #	Factored load*	
		(Q_s)	(q_s)		DA1-C1	DA1-C2		DA1-C1	DA1-C2
[m]	[m]	[kN]	[kN/m]	[kN]	[kN]	[kN]		[kN]	[kN]
12.500	12.500	0.0	0.0	0.0	0.0	0.0	2	N.A.	N.A.
12.500	12.500	0.0	0.0	0.0	0.0	0.0	2	N.A.	N.A.
13.000	13.000	288.18	22.168	288.18	205.85	102.92	2	N.A.	N.A.
13.500	13.500	589.41	43.660	589.41	421.01	210.50	2	N.A.	N.A.
14.000	14.000	903.67	64.548	903.67	645.48	322.74	2	N.A.	N.A.
14.500	14.500	1231.0	84.895	1231.0	879.26	439.63	2	N.A.	N.A.
15.000	15.000	1571.3	104.75	1571.3	1122.4	561.18	2	N.A.	N.A.
15.500	15.500	1924.7	124.17	1924.7	1374.8	687.39	2	N.A.	N.A.

Note - The weight of the pile has not been included in the factored load.
Limiting criteria :
1 : DA1 C1 [Shaft Tension]
2 : DA1 C2 [Shaft Tension]
*(C)-> Compression load, (T)-> Tension load
Note: Design resistance does not include any consideration of negative skin friction.

Soil Profile 3: Soil Profile 3

Depth	Pile length	Cumulative external Friction	Average external Friction	Net ultimate resistance	Design resistance		Combination with least resistance #	Factored load*	
		(Q_s)	(q_s)		DA1-C1	DA1-C2		DA1-C1	DA1-C2
[m]	[m]	[kN]	[kN/m]	[kN]	[kN]	[kN]		[kN]	[kN]
12.500	12.500	356.90	28.552	356.90	254.93	127.46	2	N.A.	N.A.

Depth	Pile length	Cumulative external Friction	Average external Friction	Net ultimate resistance	Design resistance		Combination with least resistance #	Factored load*	
12.500	12.500	356.90	28.552	356.90	254.93	127.46	2	N.A.	N.A.
13.000	13.000	652.68	50.206	652.68	466.20	233.10	2	N.A.	N.A.
13.500	13.500	961.50	71.222	961.50	686.78	343.39	2	N.A.	N.A.
14.000	14.000	1283.4	91.668	1283.4	916.68	458.34	2	N.A.	N.A.
14.500	14.500	1618.3	111.60	1618.3	1155.9	577.95	2	N.A.	N.A.
15.000	15.000	1966.2	131.08	1966.2	1404.4	702.21	2	N.A.	N.A.
15.500	15.500	2327.2	150.14	2327.2	1662.3	831.13	2	N.A.	N.A.

Note - The weight of the pile has not been included in the factored load.
Limiting criteria :
1 : DA1 C1 [Shaft Tension]
2 : DA1 C2 [Shaft Tension]
*(C)-> Compression load, (T)-> Tension load
Note: Design resistance does not include any consideration of negative skin friction.

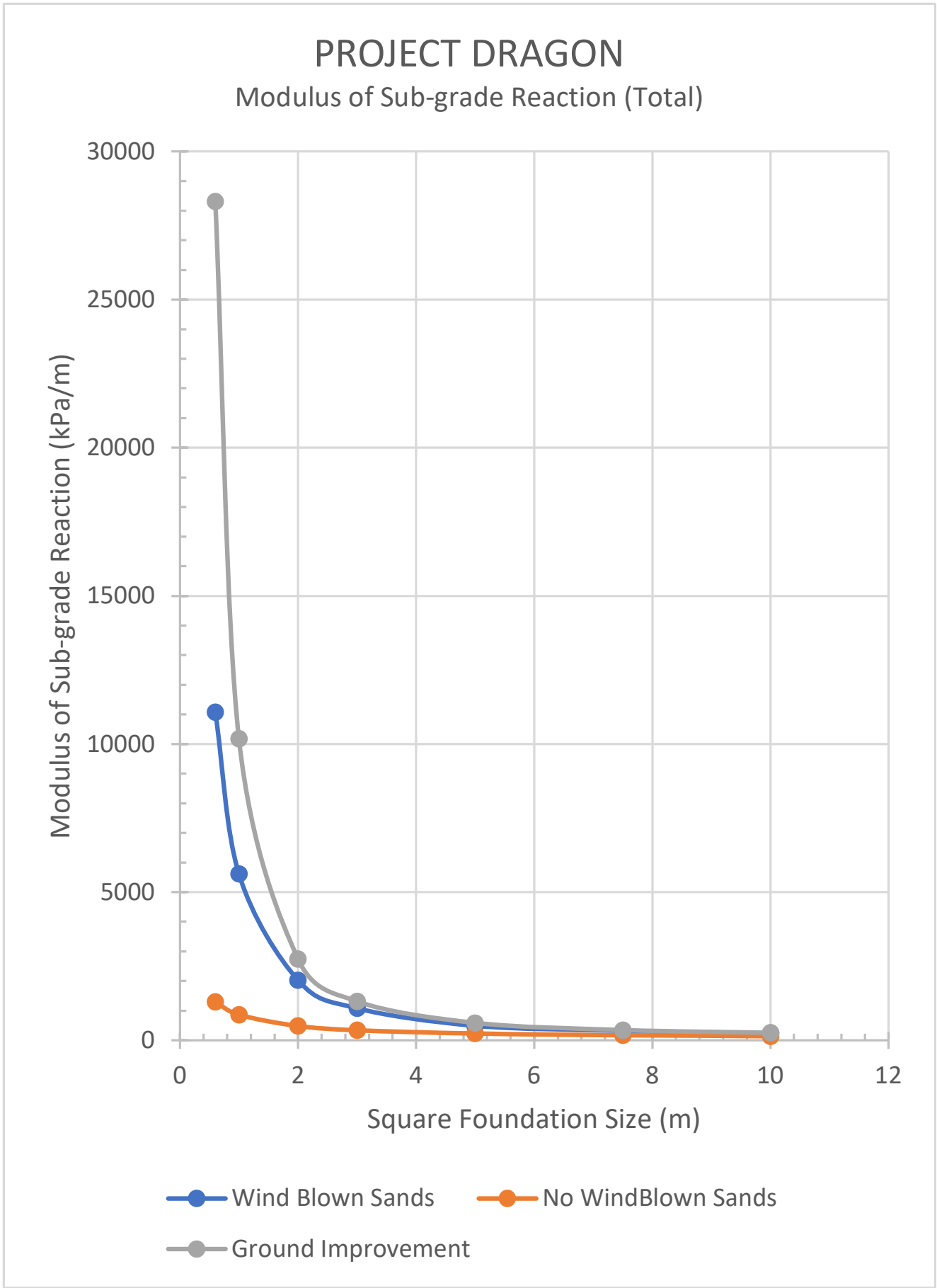
Soil Profile 4: Soil Profile 4

Depth	Pile length	Cumulative external Friction	Average external Friction	Net ultimate resistance	Design resistance		Combination with least resistance #	Factored load*	
		(Q_s)	(q_s)		DA1-C1	DA1-C2		DA1-C1	DA1-C2
[m]	[m]	[kN]	[kN/m]	[kN]	[kN]	[kN]		[kN]	[kN]
12.500	12.500	0.0	0.0	0.0	0.0	0.0	2	N.A.	N.A.
12.500	12.500	0.0	0.0	0.0	0.0	0.0	2	N.A.	N.A.
13.000	13.000	295.78	22.752	295.78	211.27	105.64	2	N.A.	N.A.
13.500	13.500	604.60	44.785	604.60	431.86	215.93	2	N.A.	N.A.
14.000	14.000	926.46	66.175	926.46	661.75	330.88	2	N.A.	N.A.
14.500	14.500	1261.4	86.990	1261.4	900.97	450.48	2	N.A.	N.A.
15.000	15.000	1609.3	107.29	1609.3	1149.5	574.75	2	N.A.	N.A.
15.500	15.500	1970.3	127.11	1970.3	1407.3	703.66	2	N.A.	N.A.

Note - The weight of the pile has not been included in the factored load.
Limiting criteria :
1 : DA1 C1 [Shaft Tension]
2 : DA1 C2 [Shaft Tension]
*(C)-> Compression load, (T)-> Tension load
Note: Design resistance does not include any consideration of negative skin friction.

Appendix K

Rocscience SETTLE 3D Outputs


PROJECT DRAGON
Modulus of Sub-grade Reaction (Total)
Modulus of Sub-grade Reaction (kPa/m)
30000
25000
20000
15000
10000
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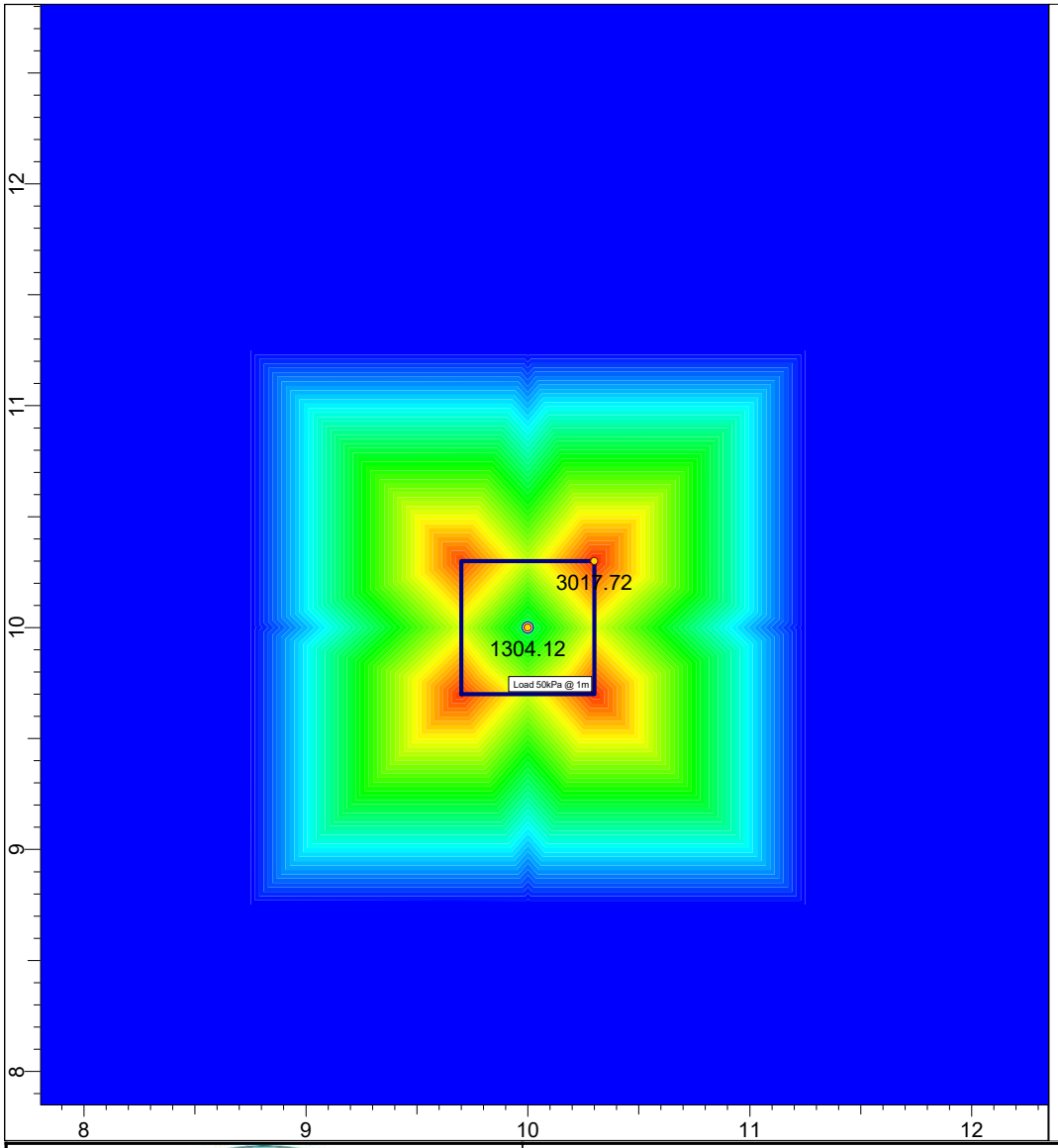
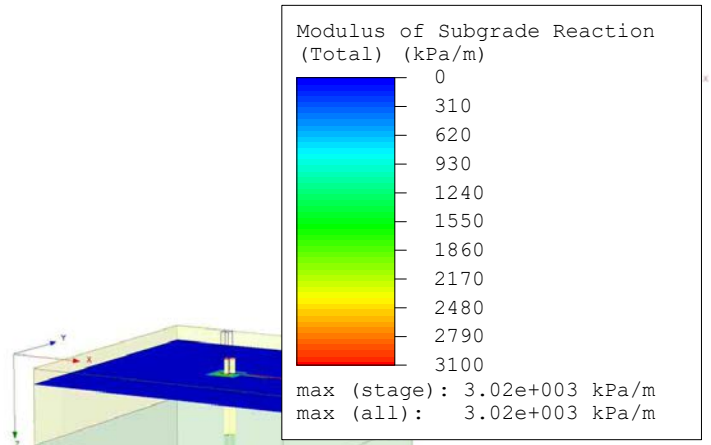
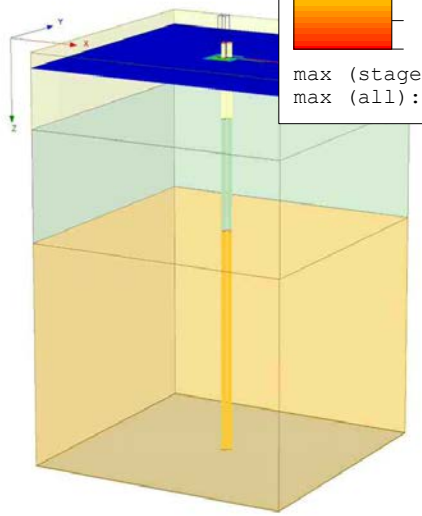
0
2
4
6
8
10
12
Square Foundation Size (m)
Wind Blown Sands
No WindBlown Sands
Ground Improvement







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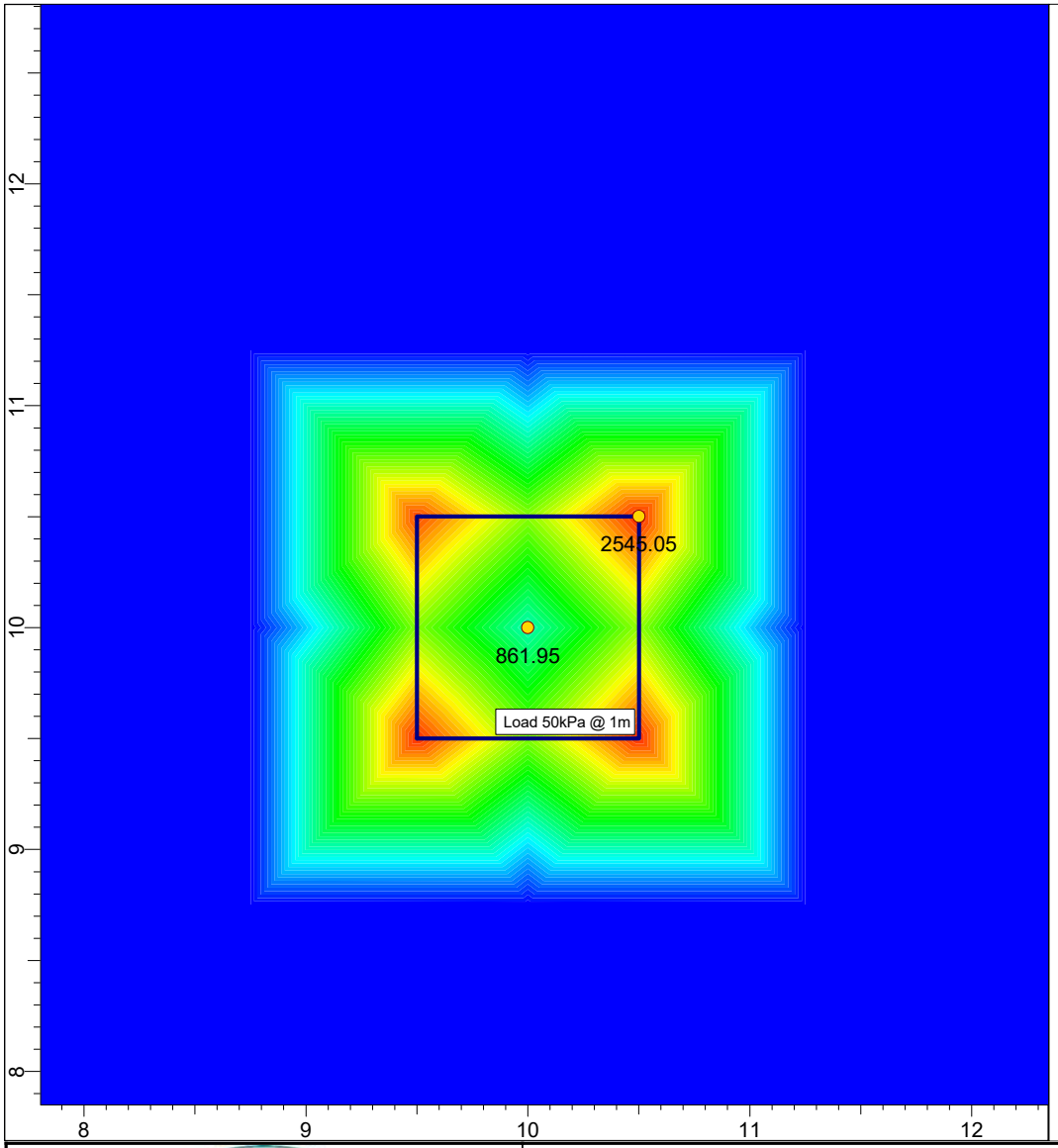
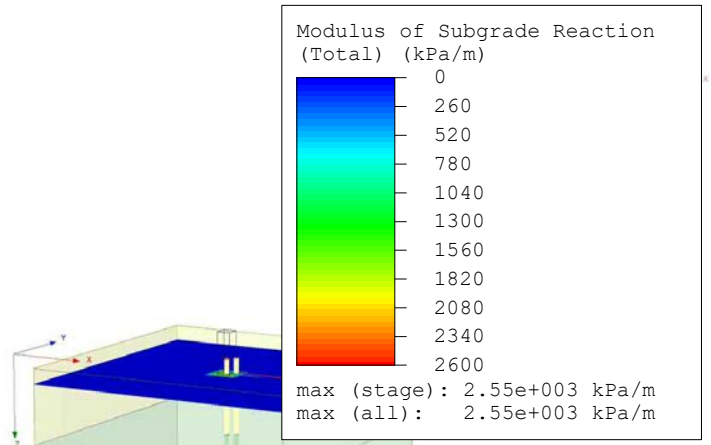
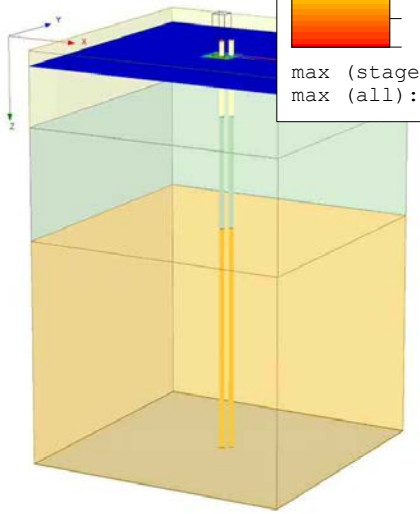
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* No WBS.s3z







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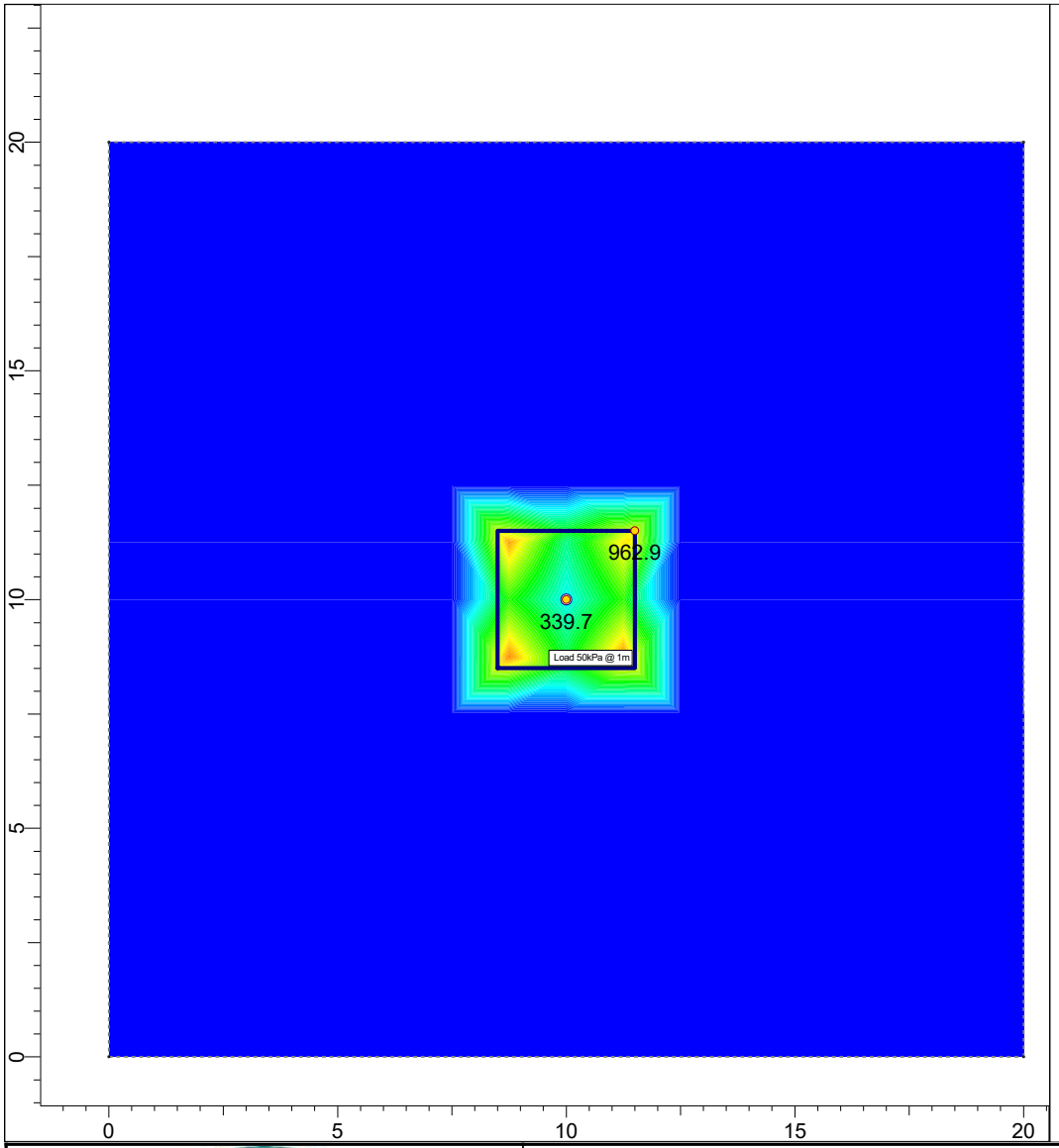
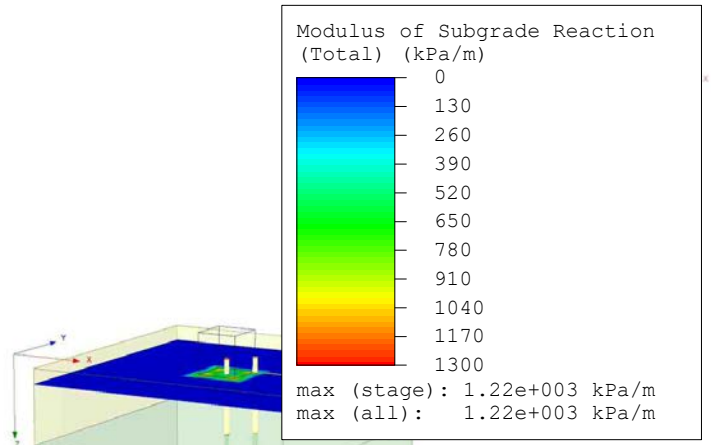
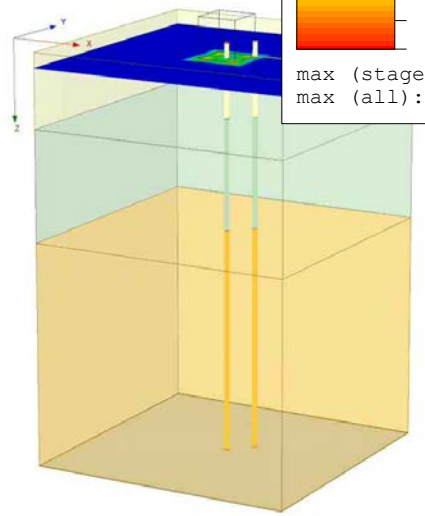
	Analysis Description	Settlement - Typical Ground Conditions (No WBS)	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* No WBS.s3z







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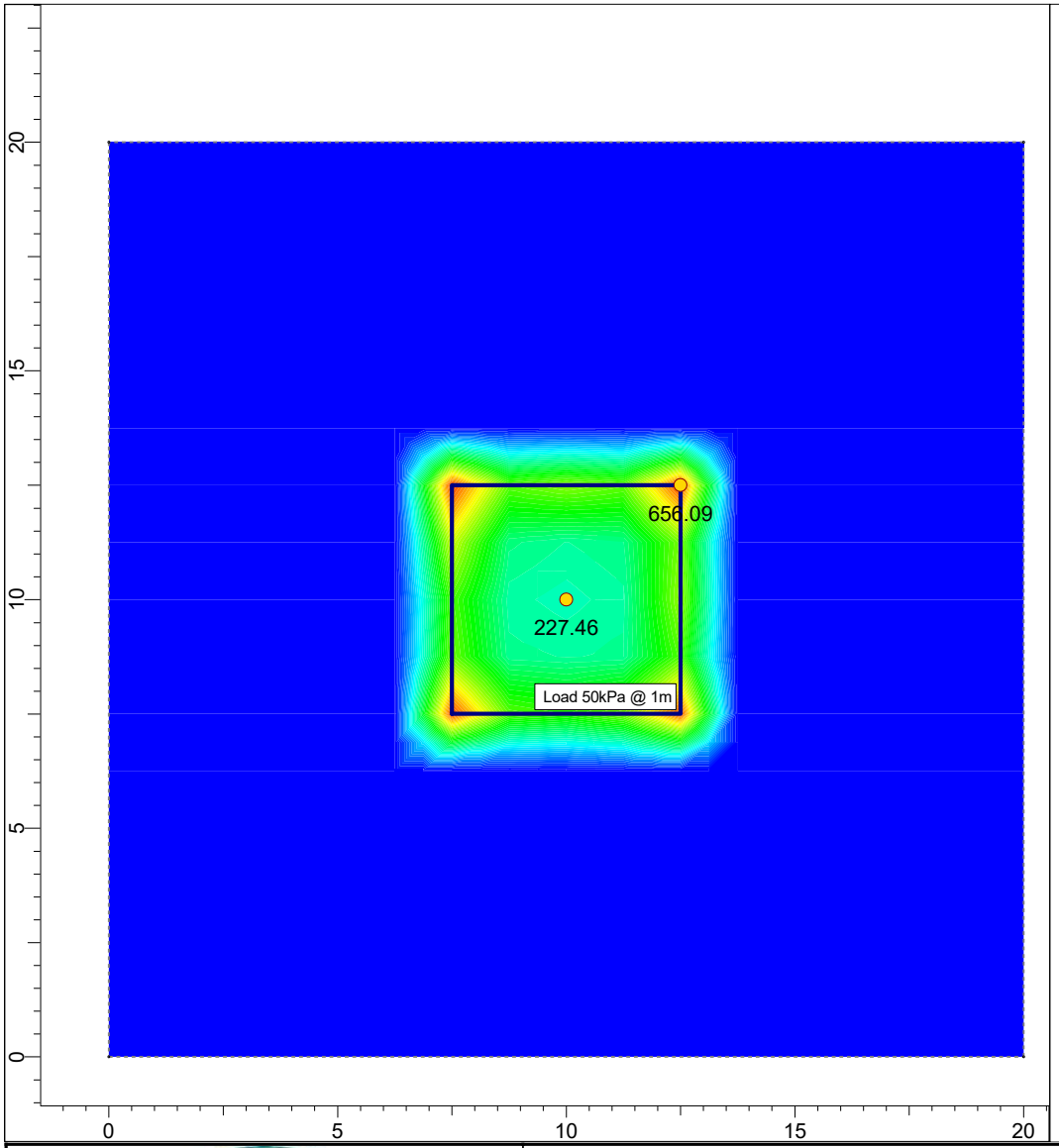
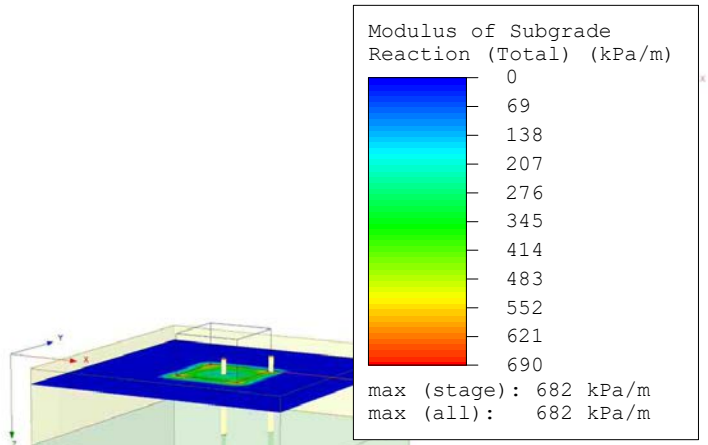
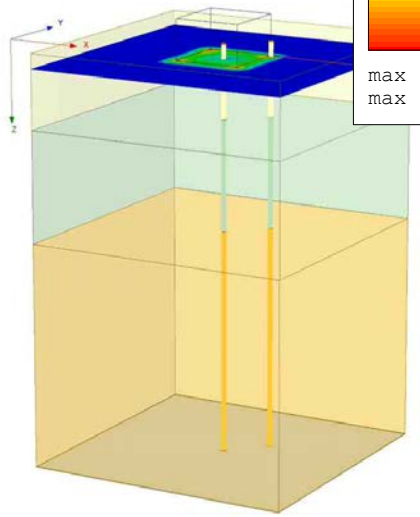
	Analysis Description	Settlement - Typical Ground Conditions (No WBS)	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* No WBS.s3z







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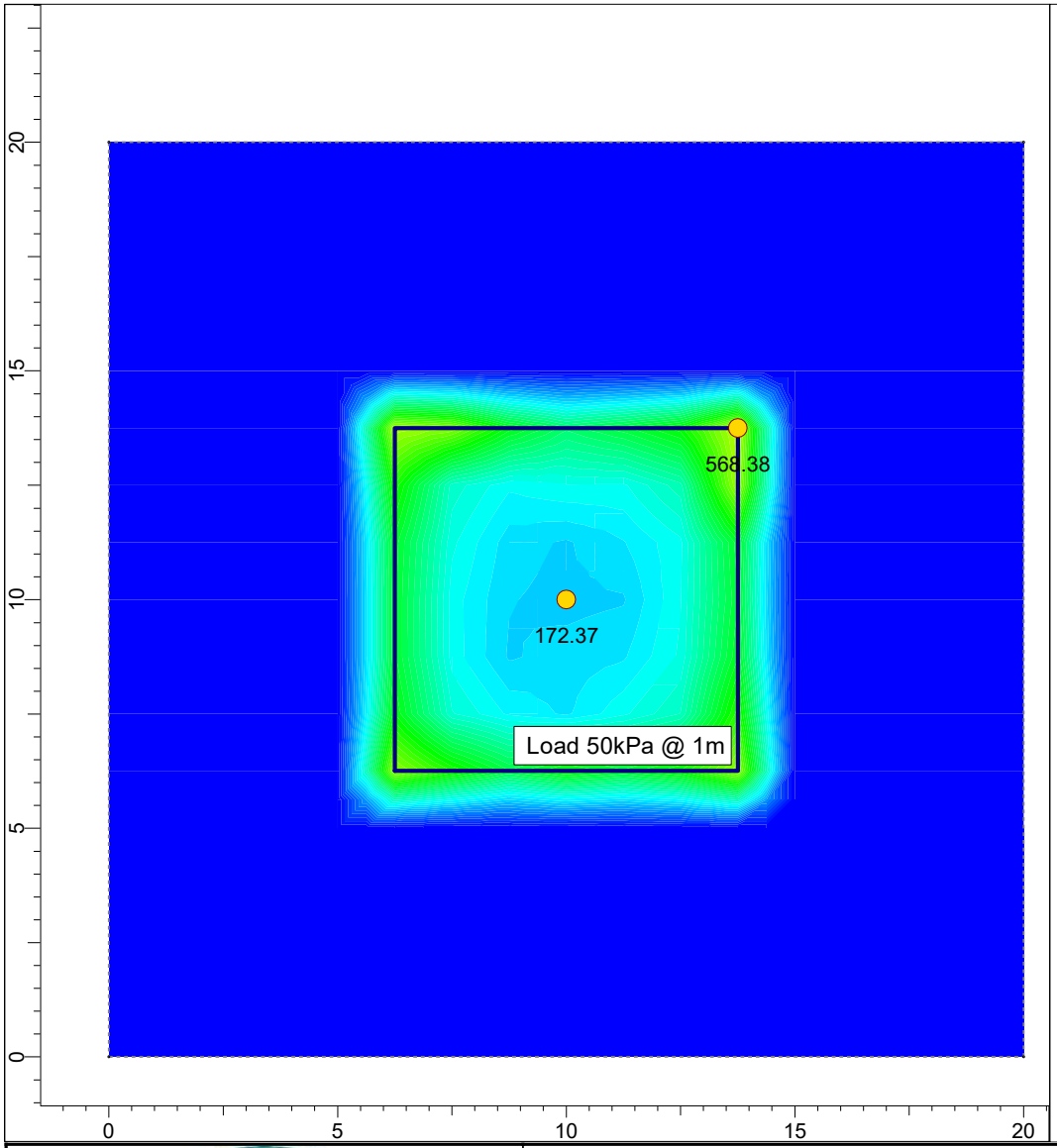
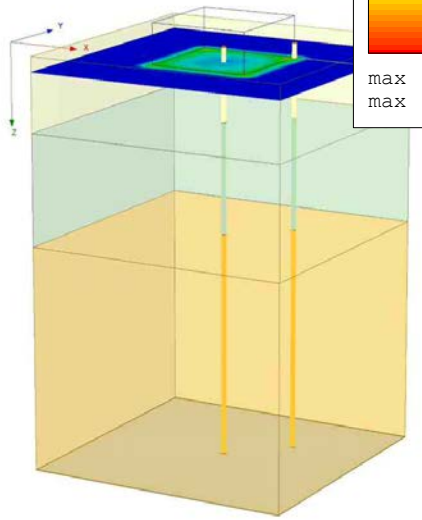
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* No WBS.s3z



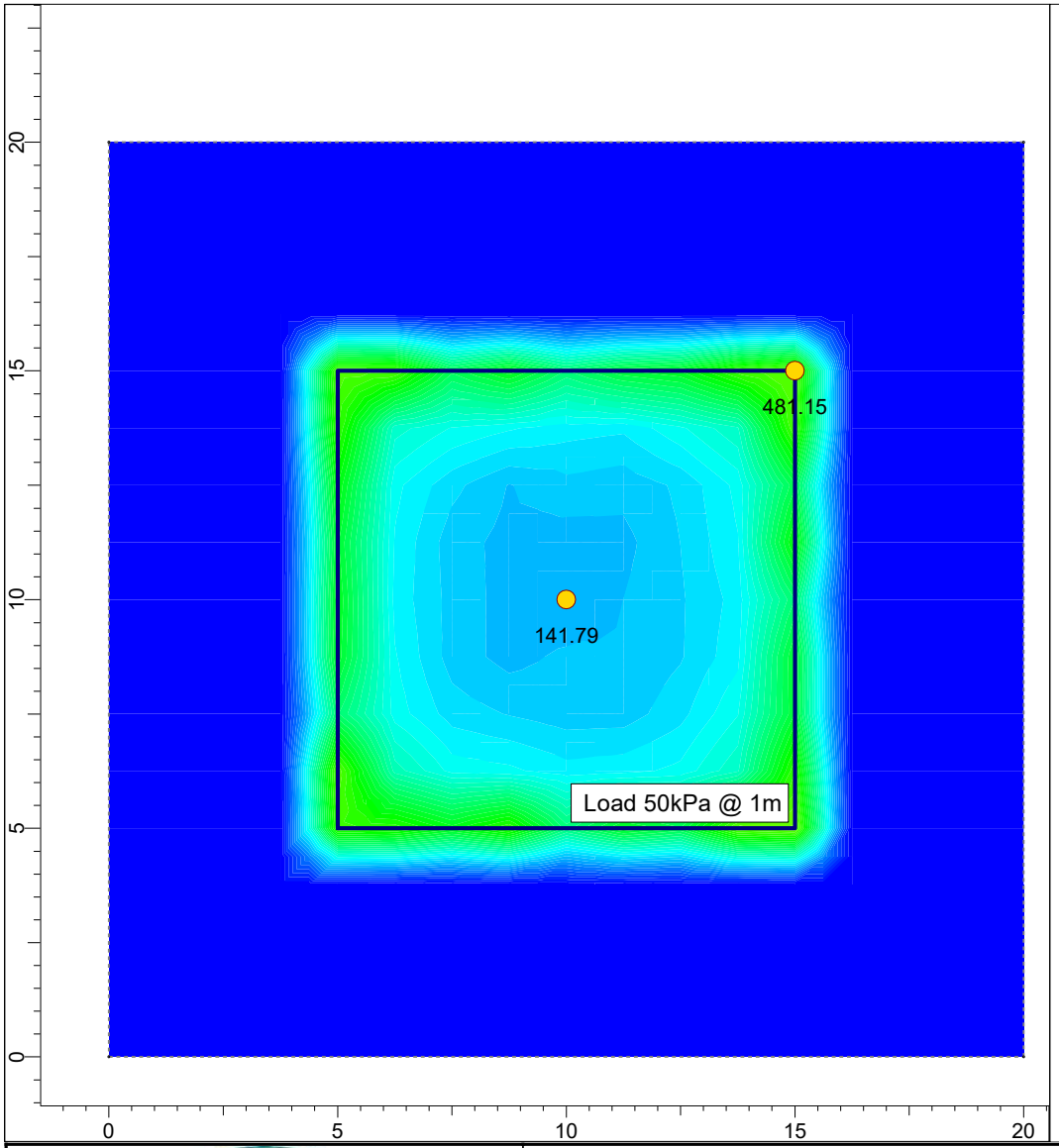


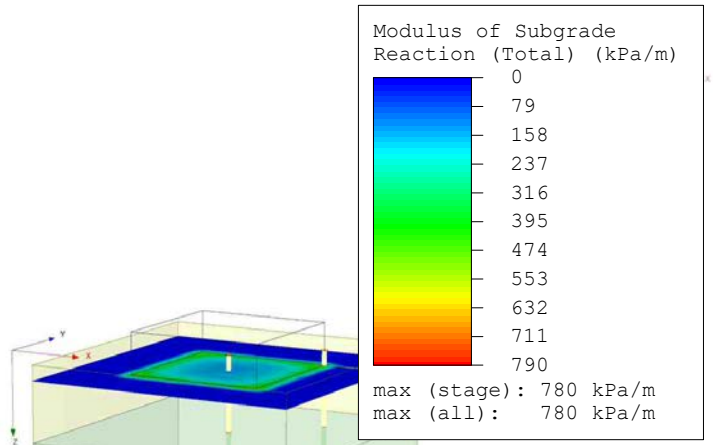
Modulus of Subgrade Reaction (Total) (kPa/m)

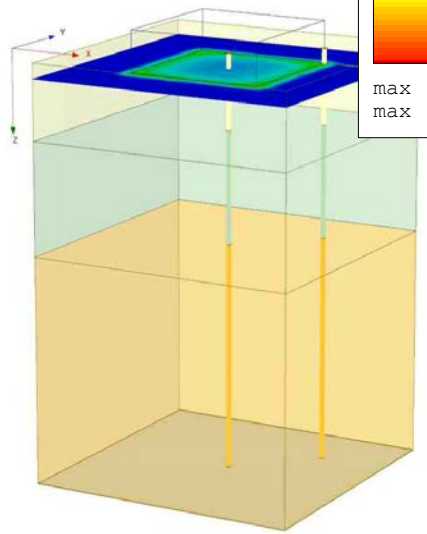
0
81
162
243
324
405
486
567
648
729
810

max (stage): 804 kPa/m
max (all): 804 kPa/m

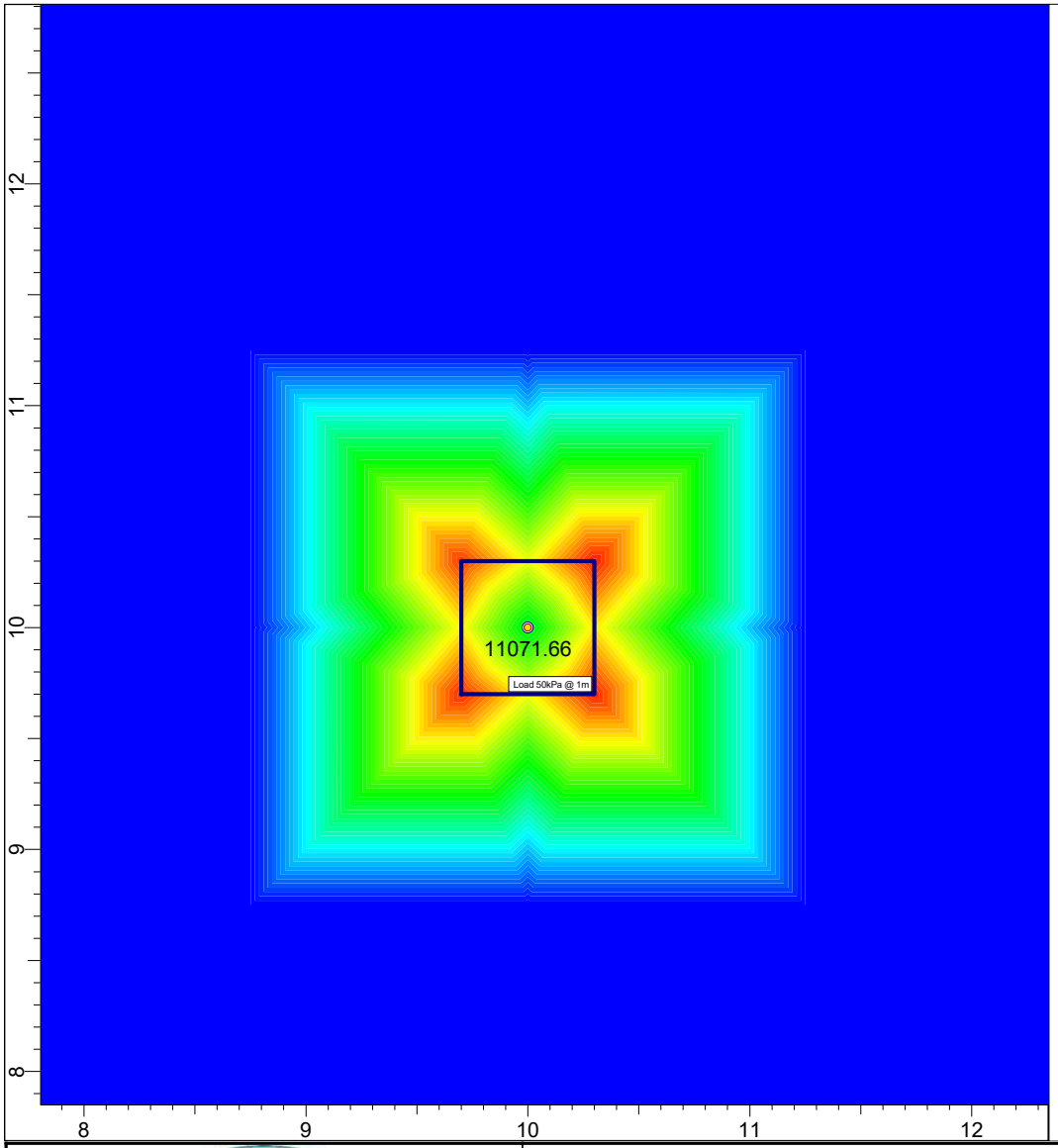
SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Settlement - Typical Ground Conditions (No WBS)	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* No WBS.s3z

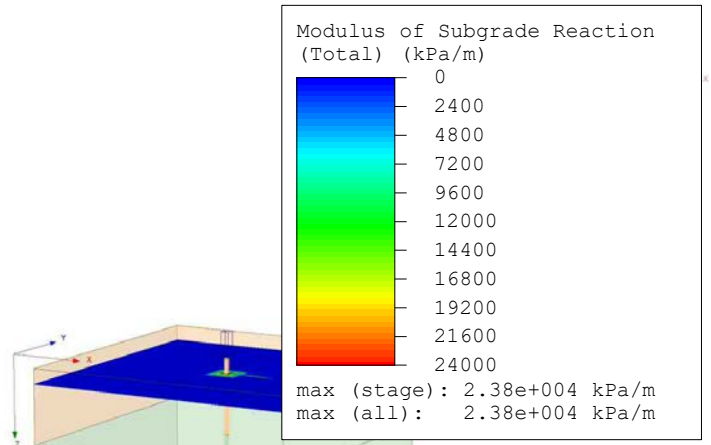


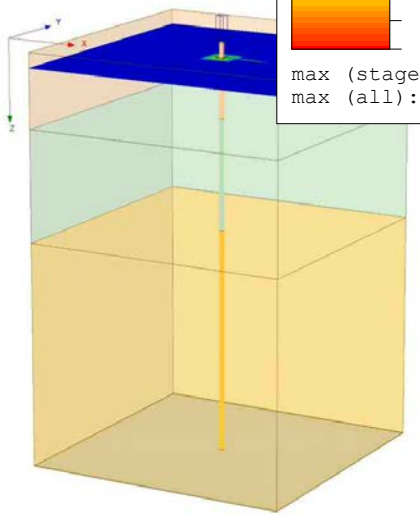




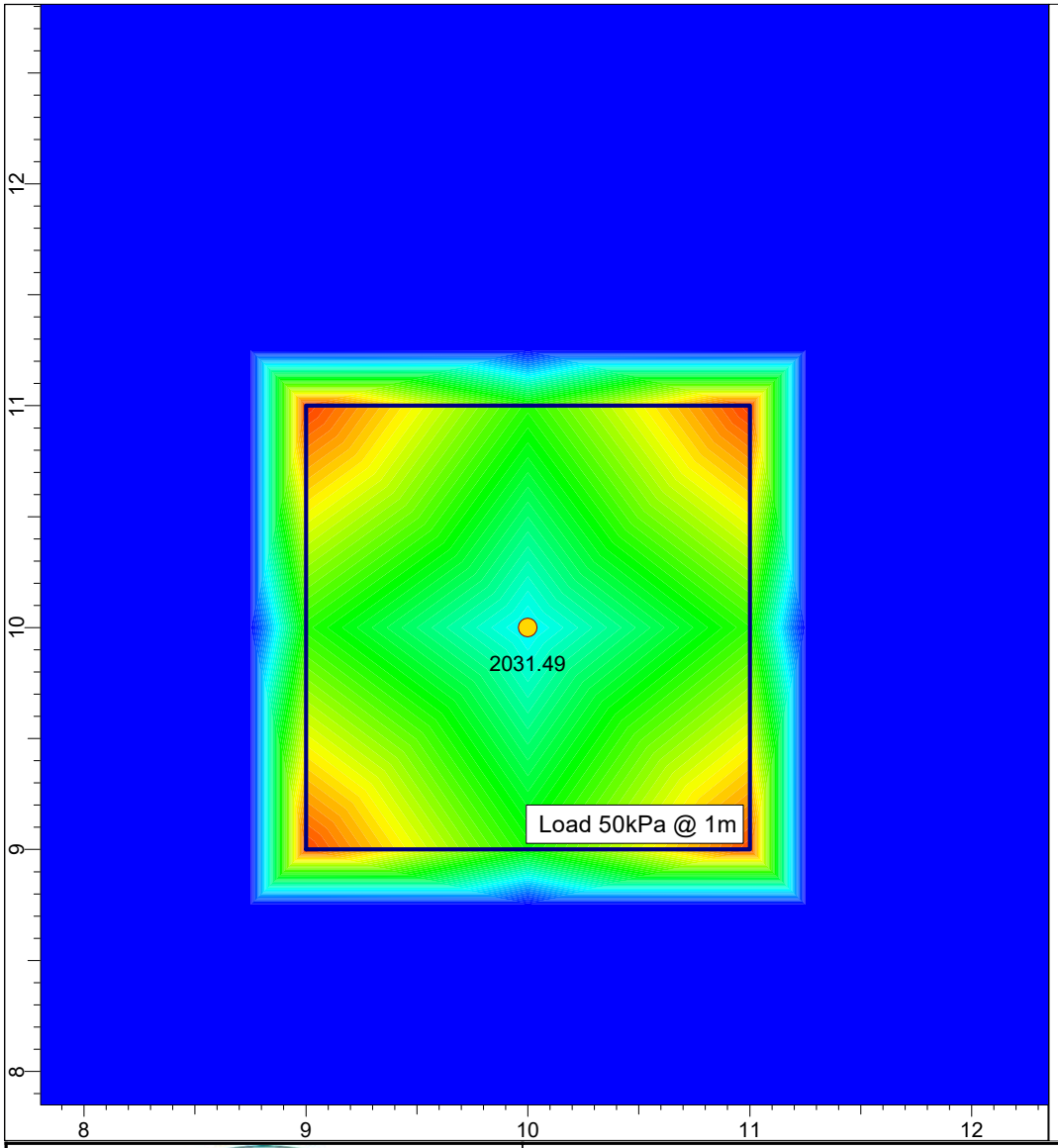
SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Settlement - Typical Ground Conditions (No WBS)	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* No WBS.s3z

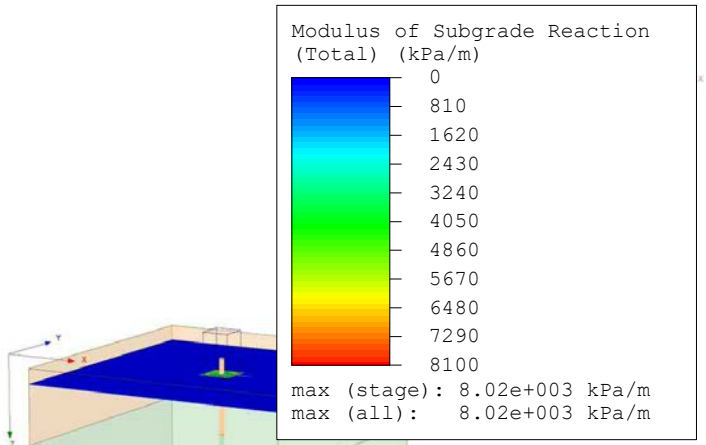


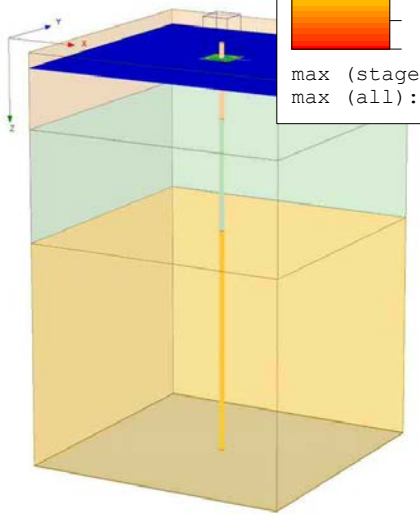




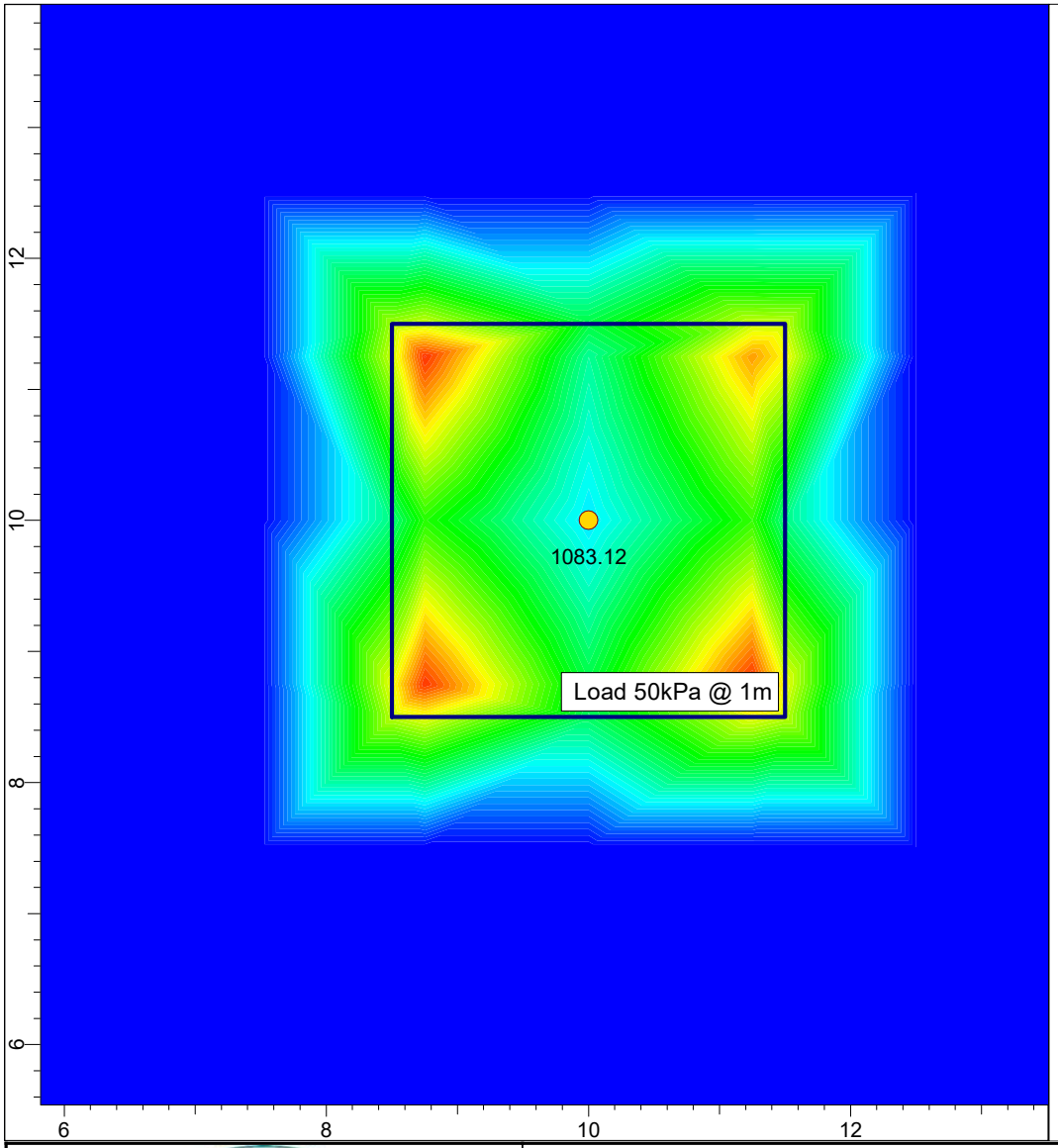
SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Settlement - Typical Ground Conditions (WBS)	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* WBS.s3z

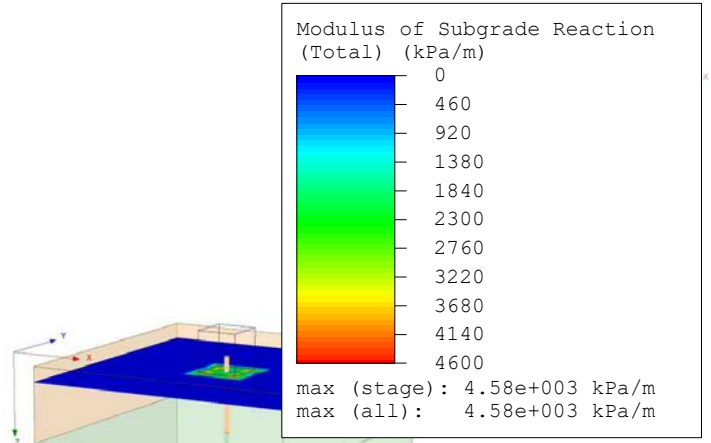






SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Settlement - Typical Ground Conditions (WBS)	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* WBS.s3z





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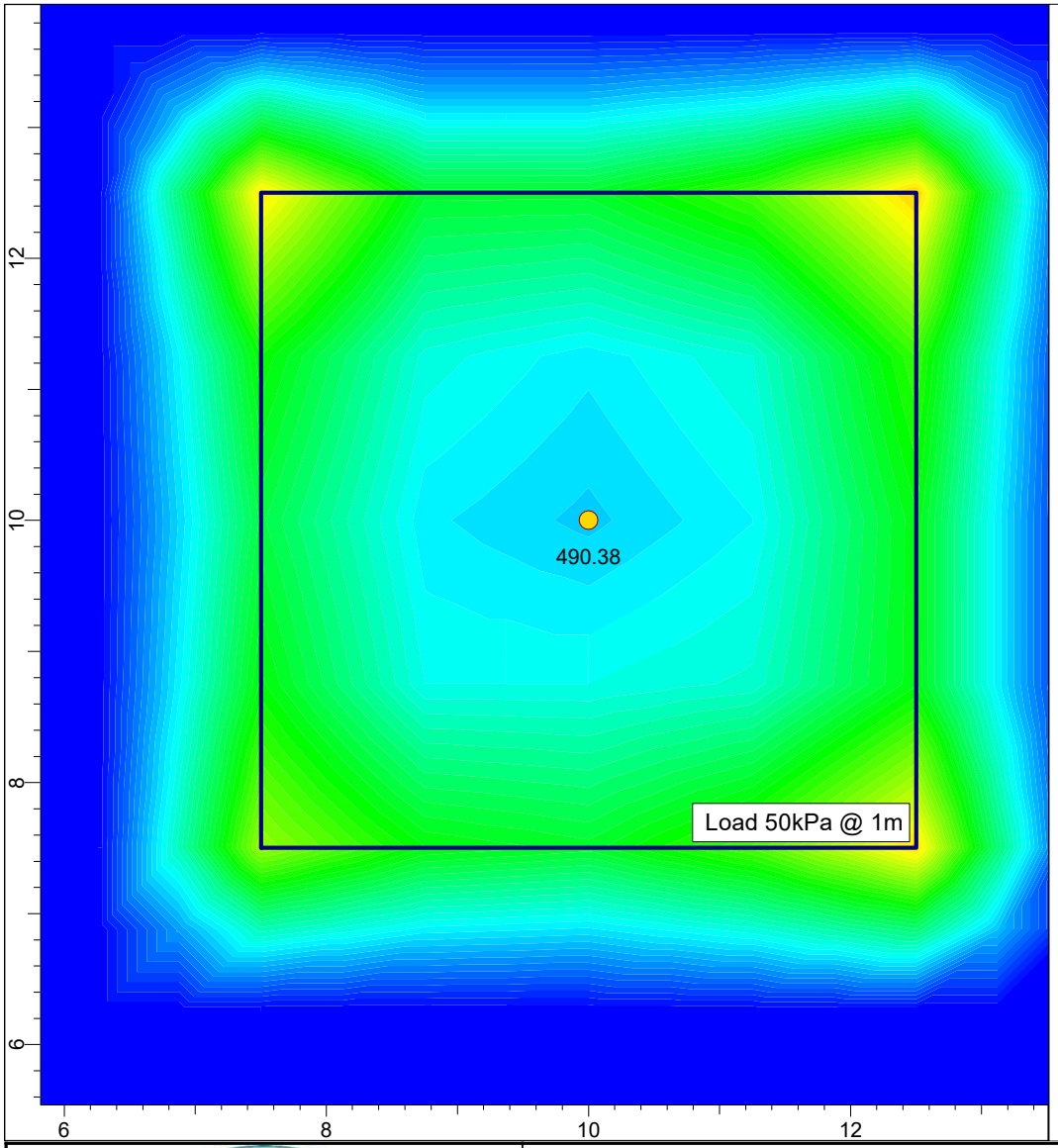
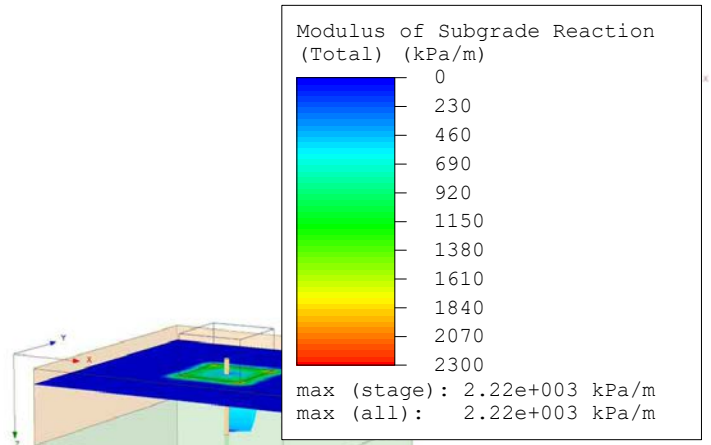
	Analysis Description	Settlement - Typical Ground Conditions (WBS)	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* WBS.s3z





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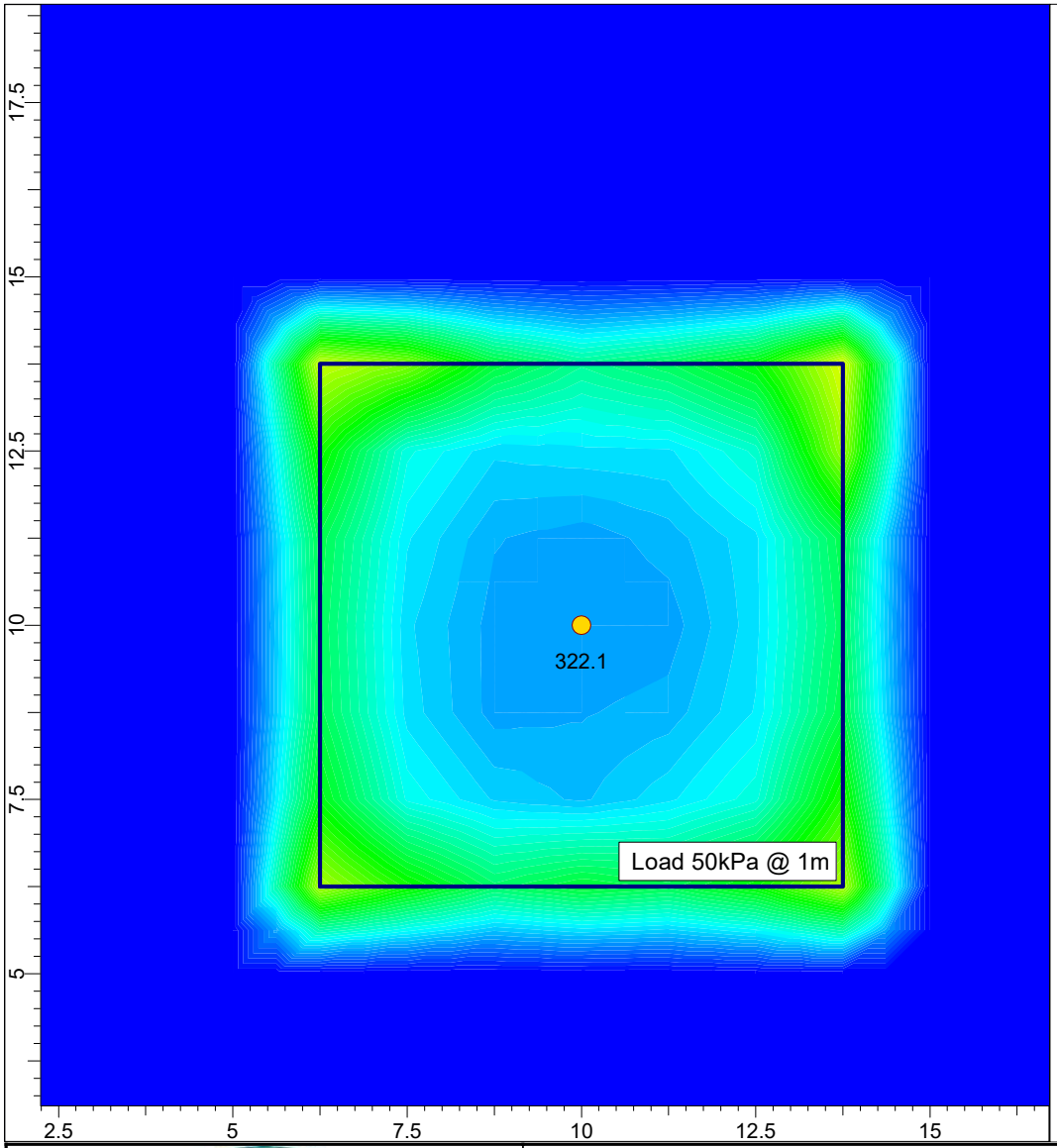
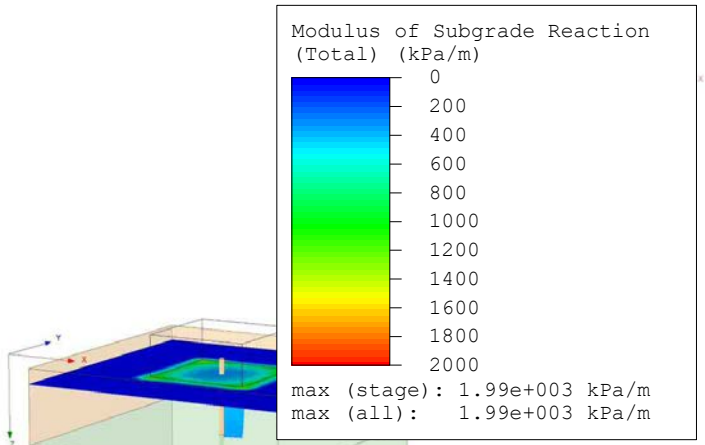
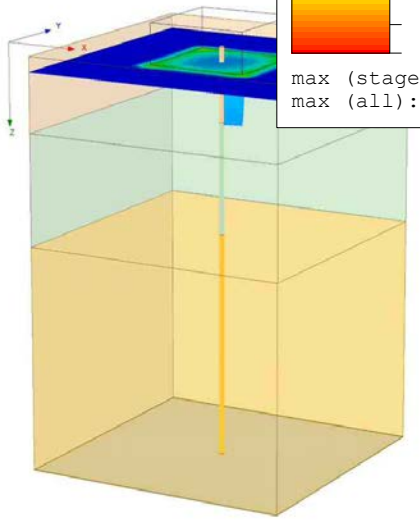
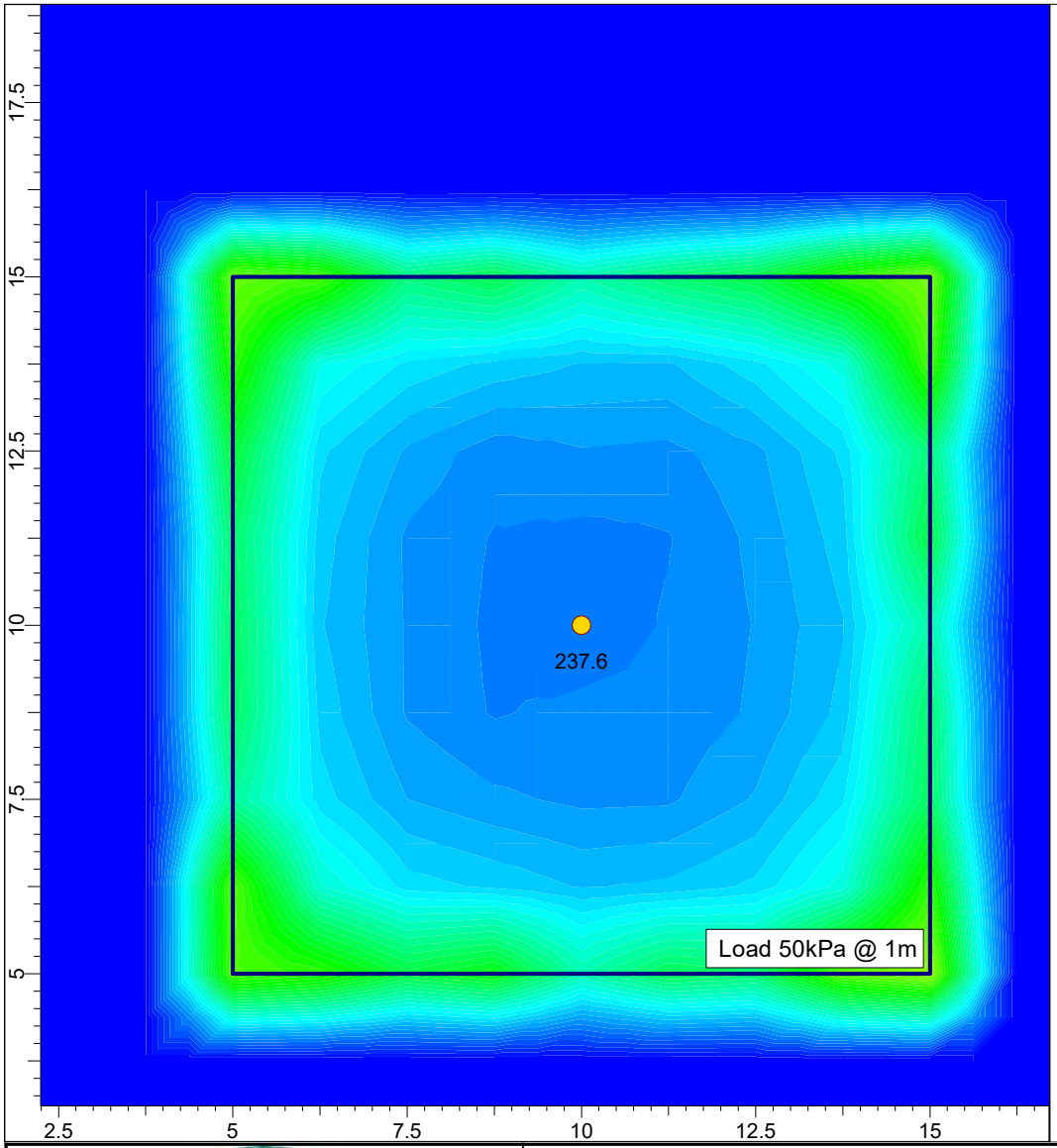
	Analysis Description	Settlement - Typical Ground Conditions (WBS)	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* WBS.s3z

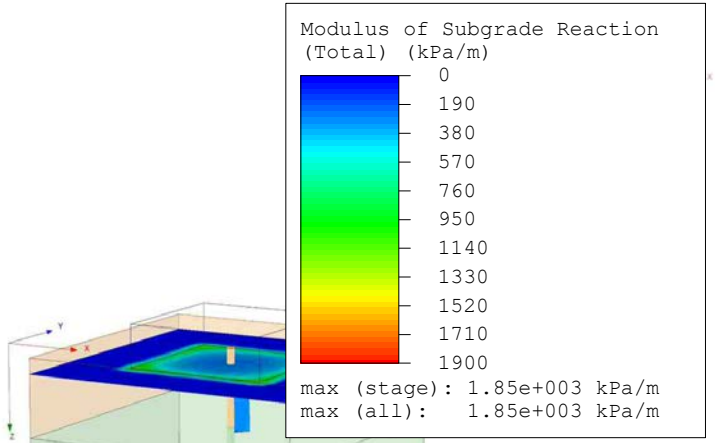


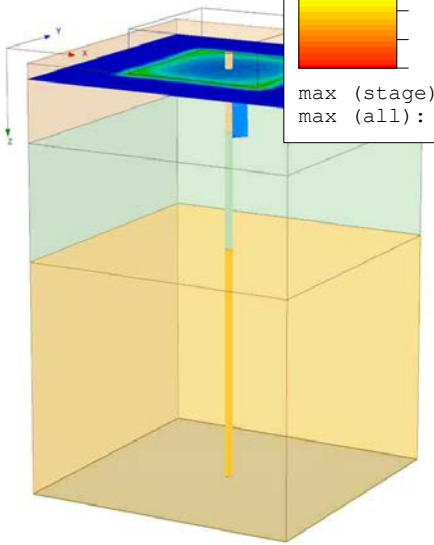




SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Settlement - Typical Ground Conditions (WBS)	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* WBS.s3z







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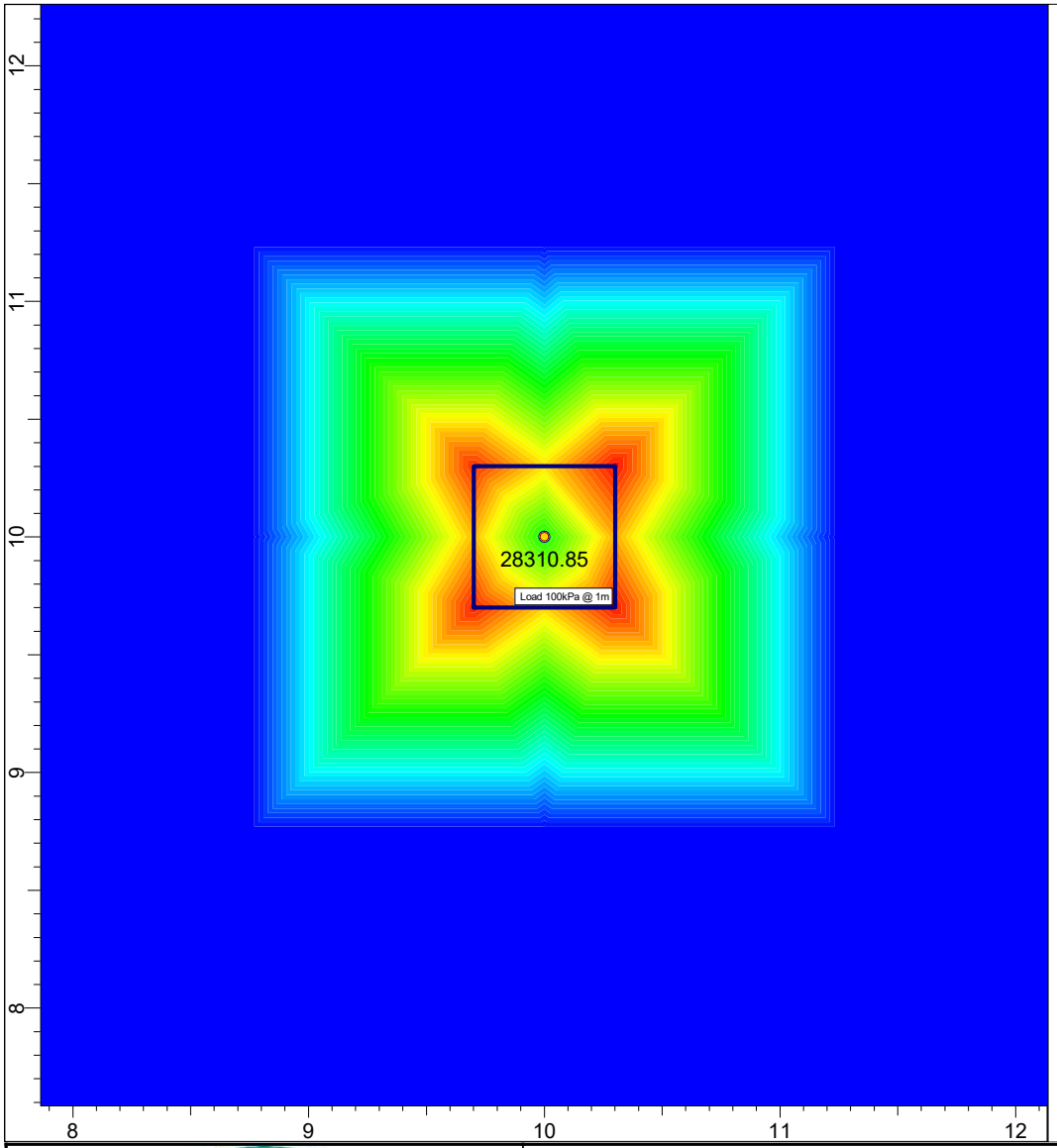
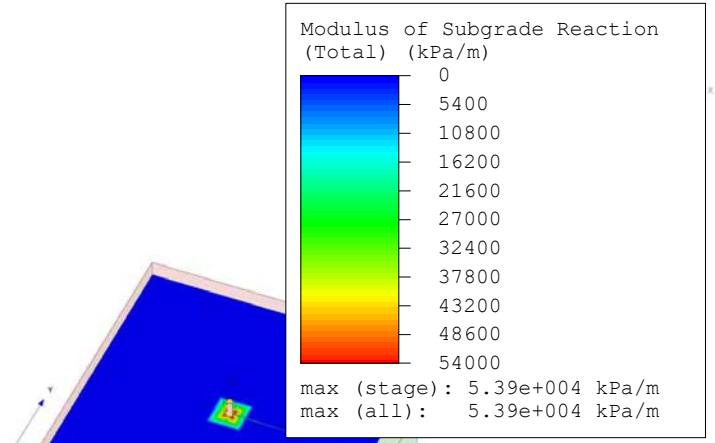
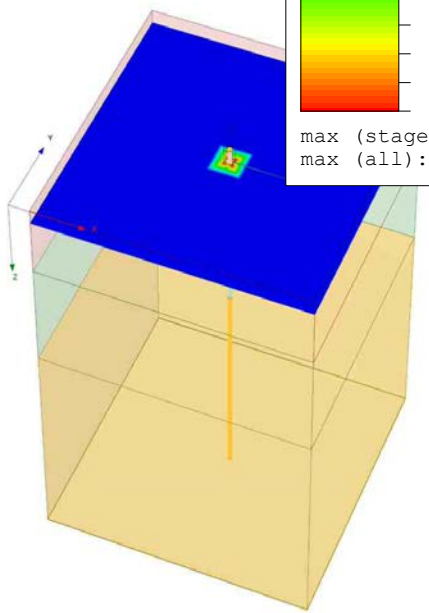
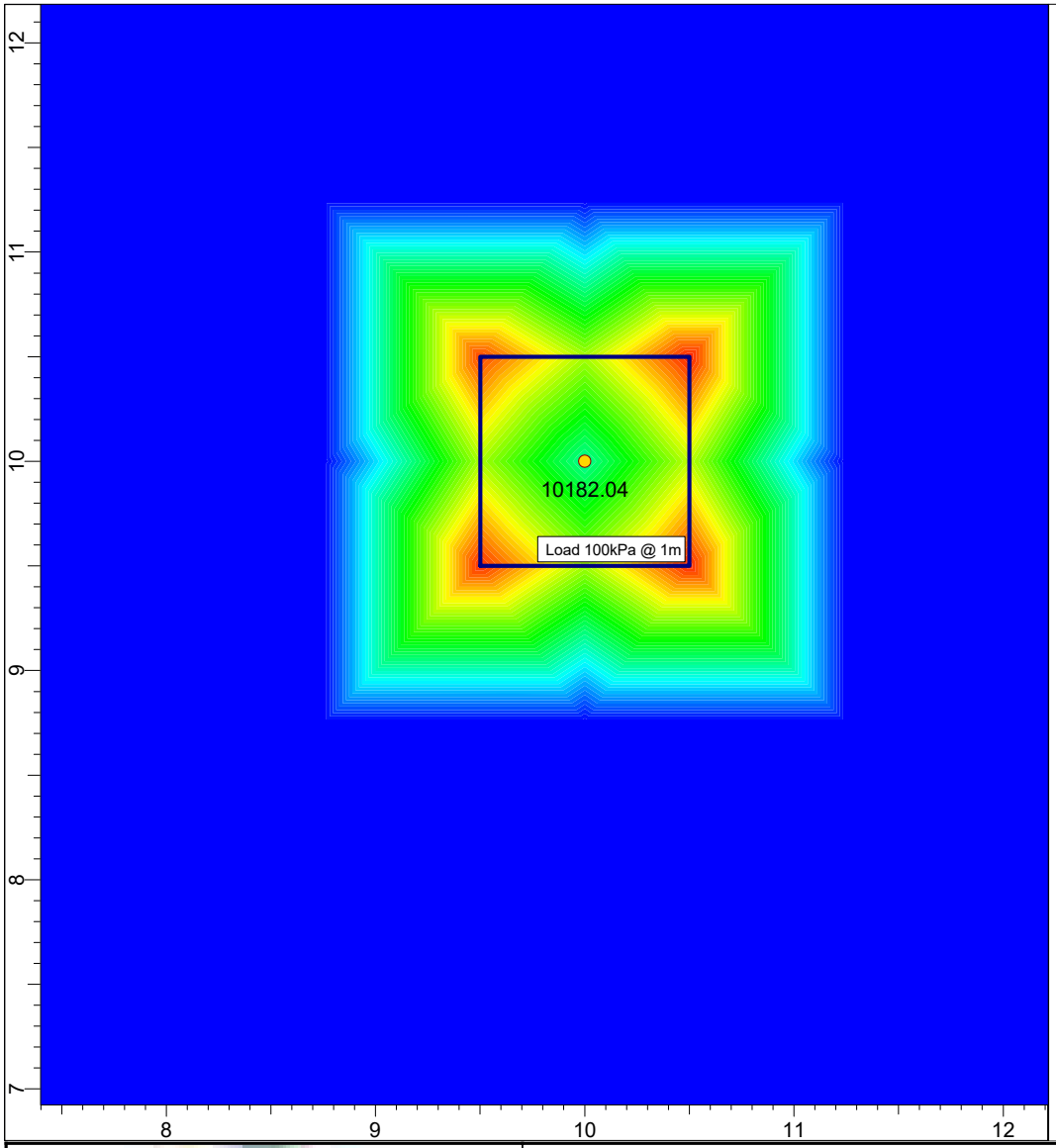
	Analysis Description	Settlement - Typical Ground Conditions (WBS)	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* WBS.s3z

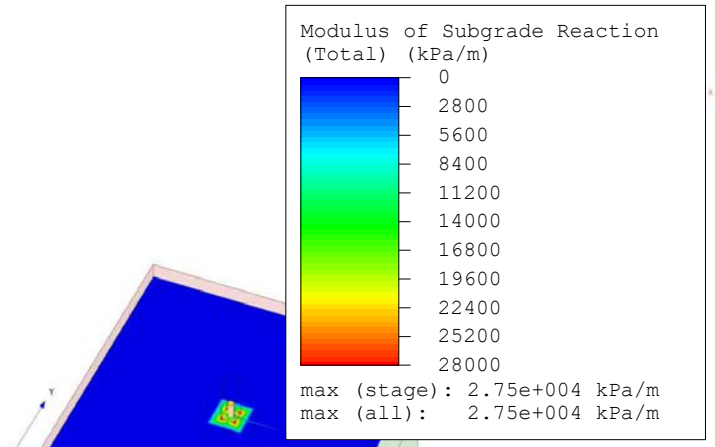


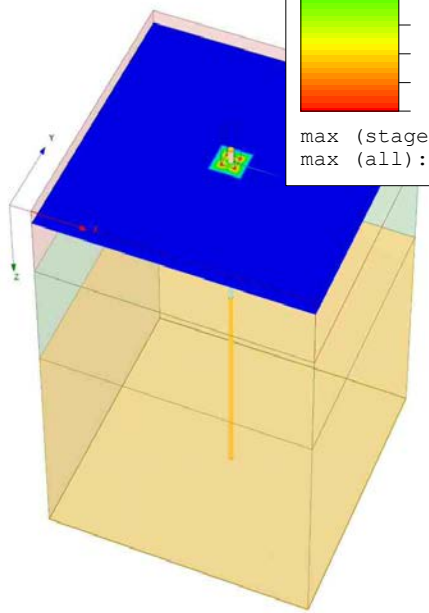




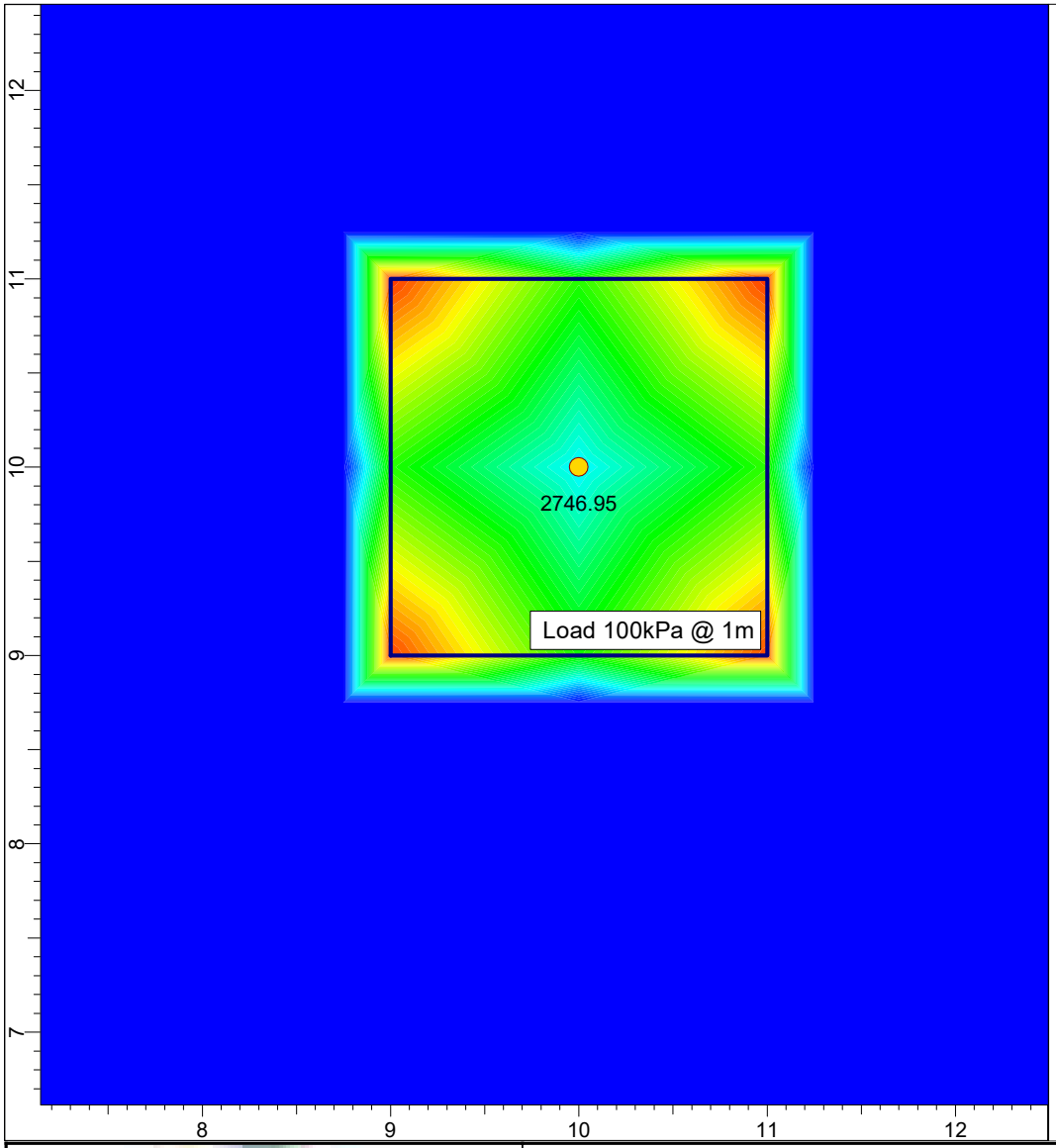
SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Settlement below improved ground	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* Ground improvement to 5m.s3z

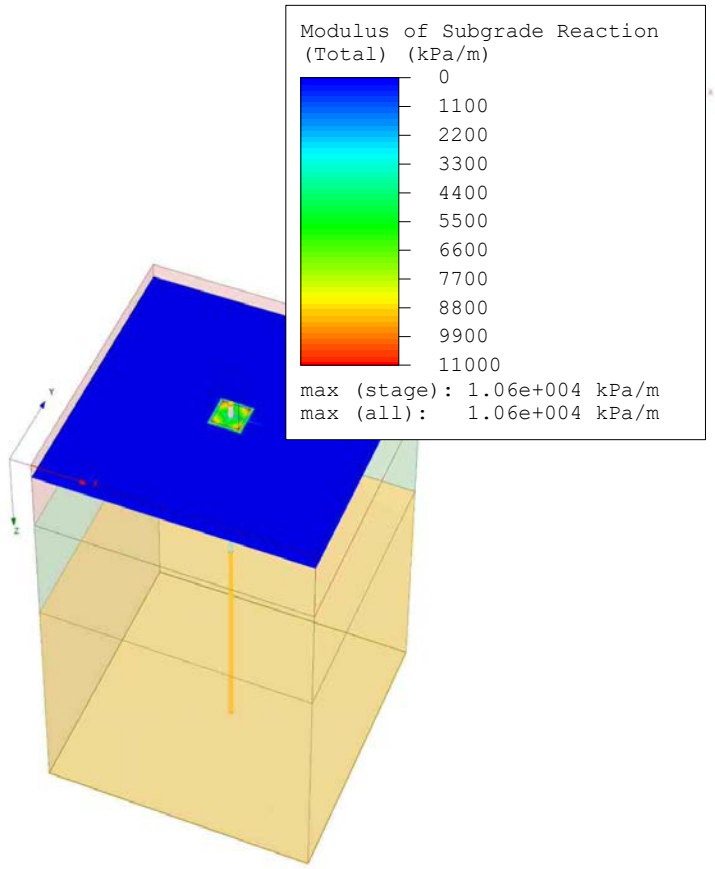




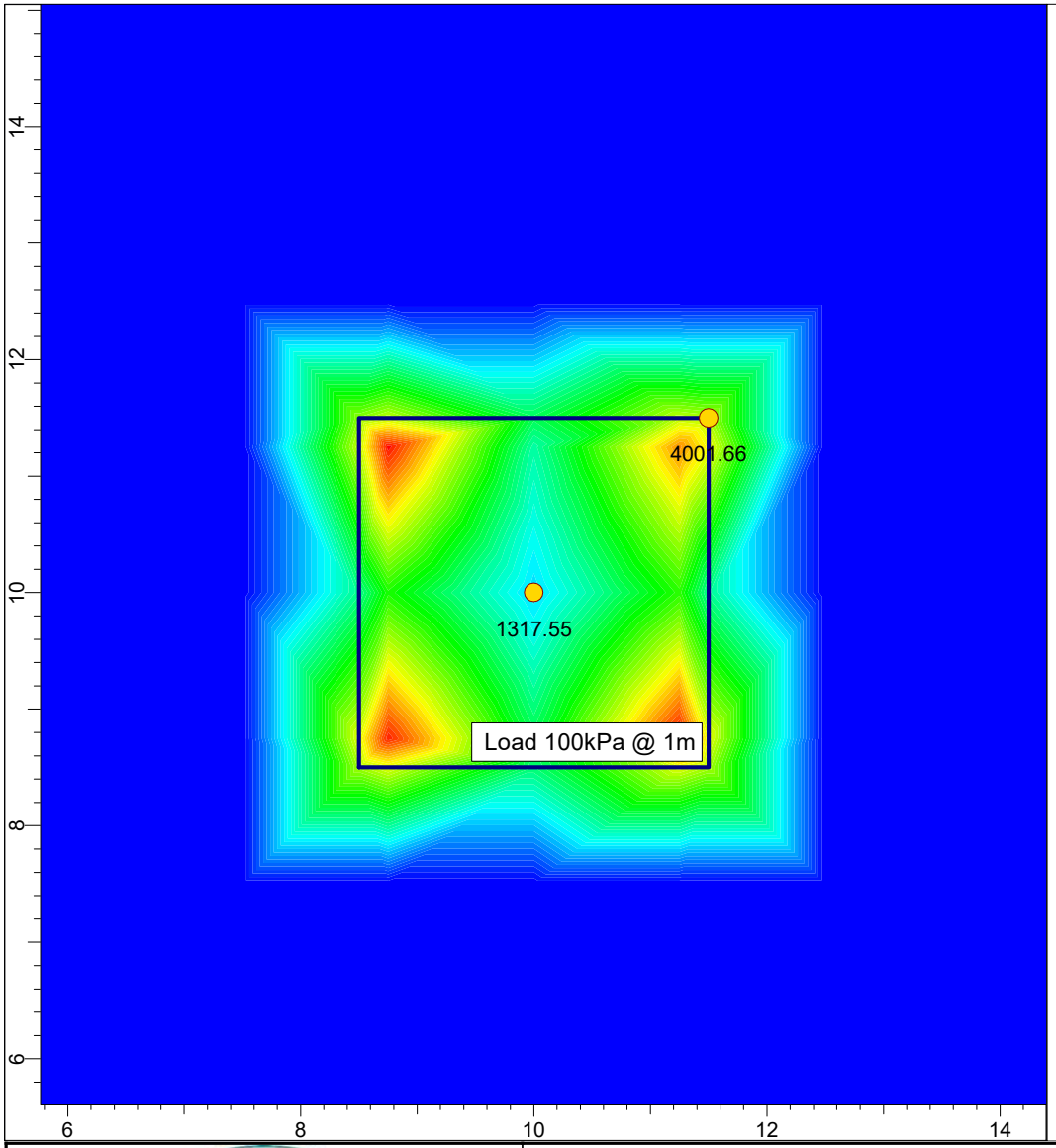


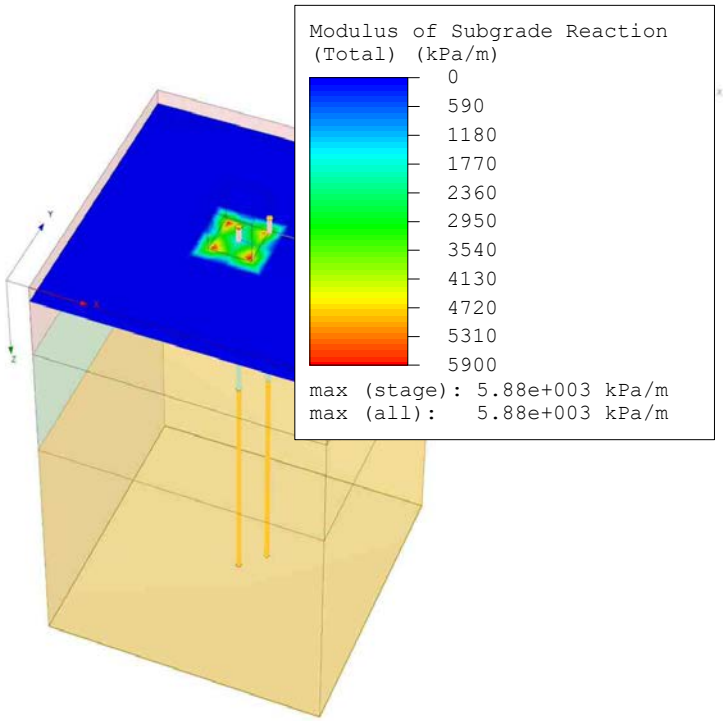
SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Settlement below improved ground	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* Ground improvement to 5m.s3z



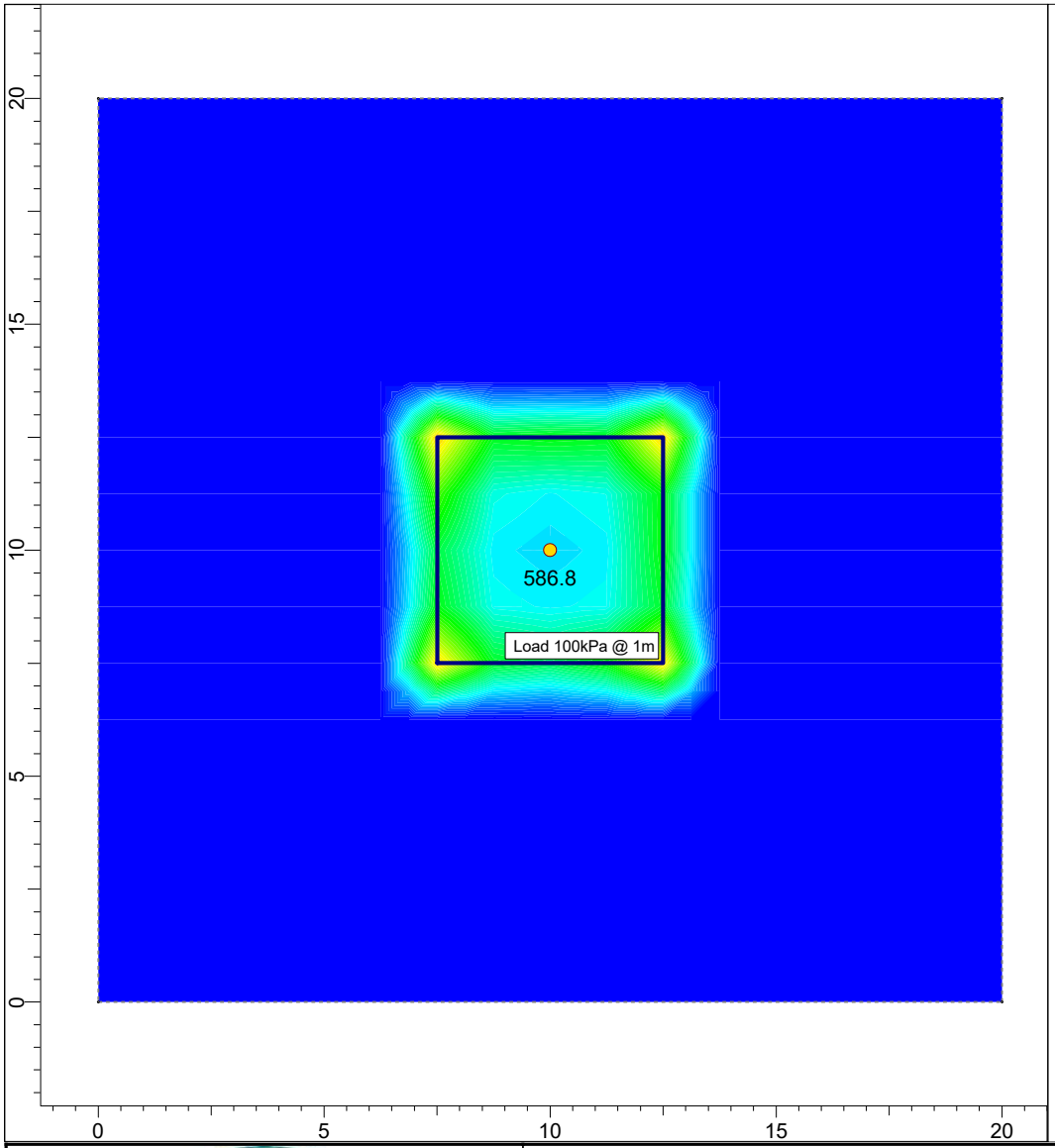


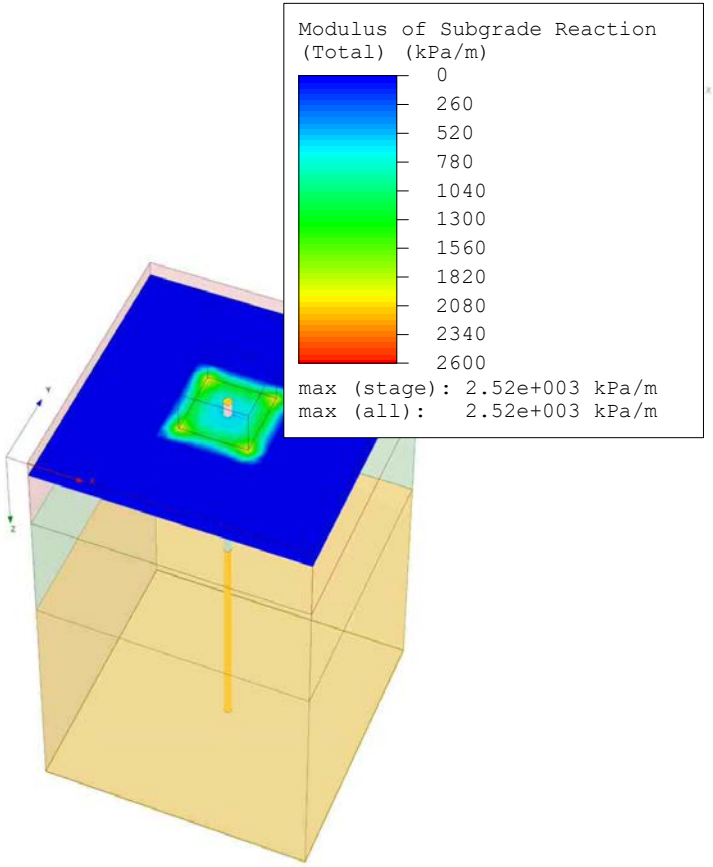
SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Settlement below improved ground	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* Ground improvement to 5m.s3z



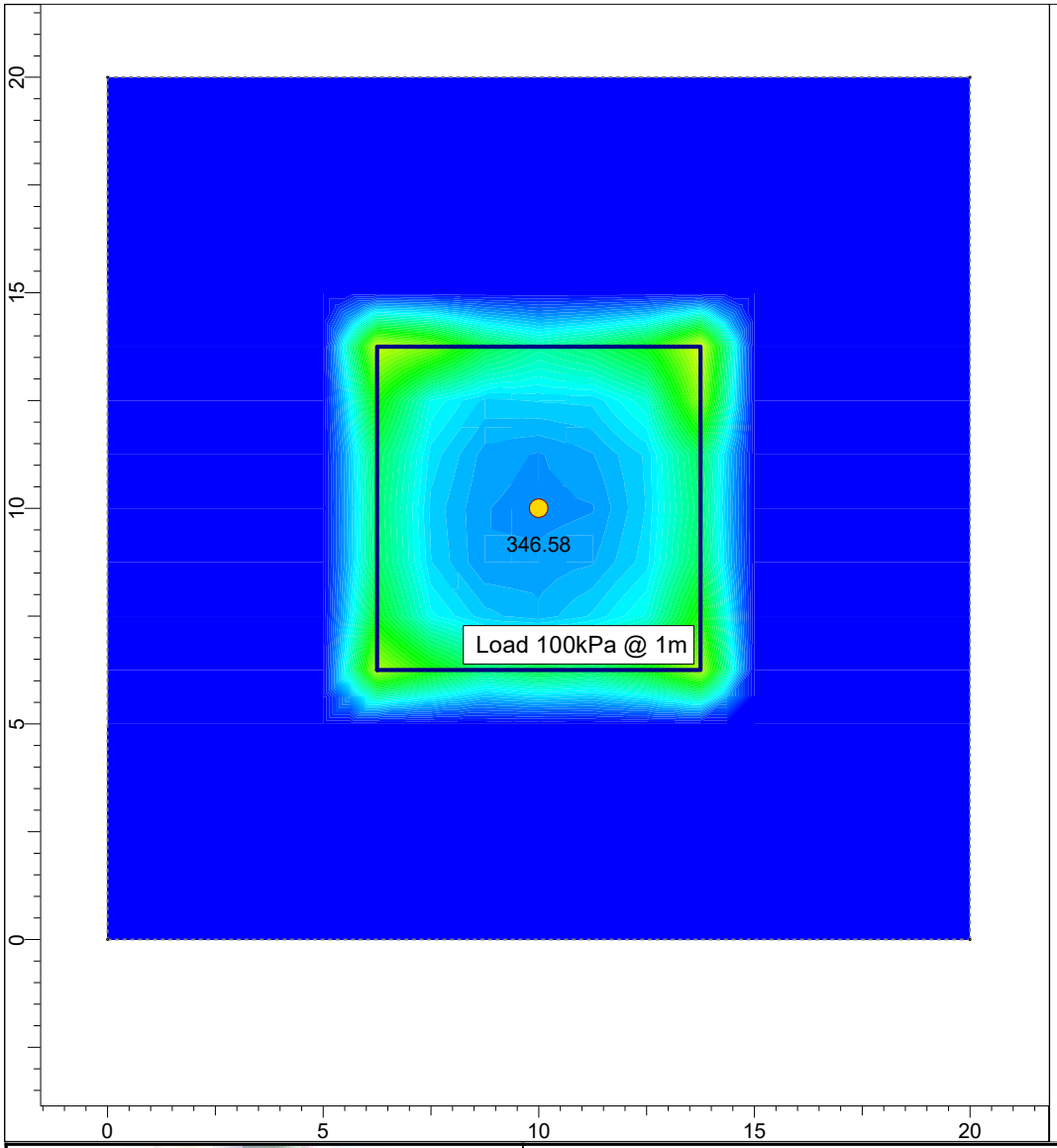


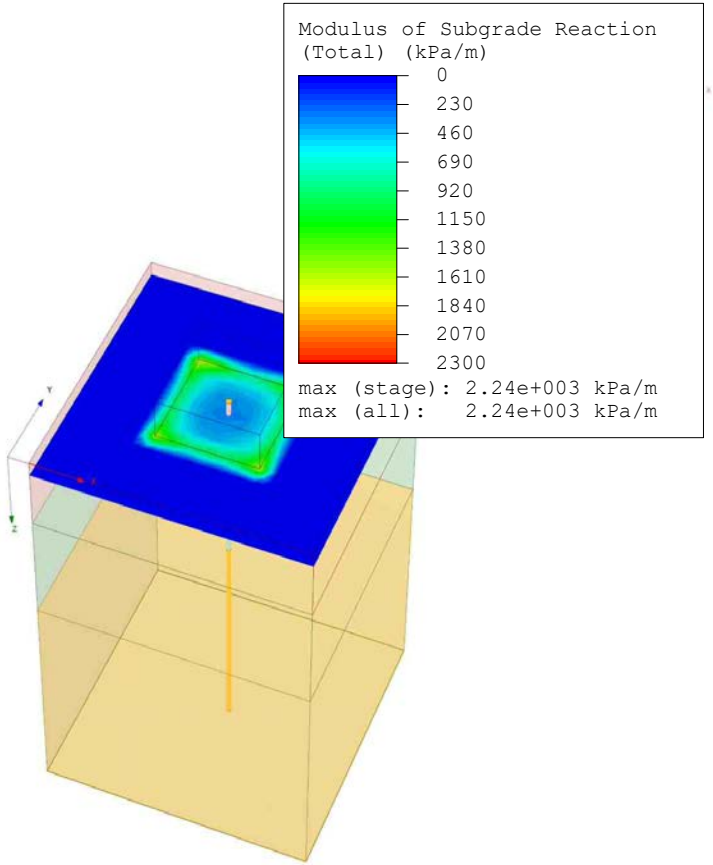
SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Settlement below improved ground	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* Ground improvement to 5m.s3z





SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Settlement below improved ground	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* Ground improvement to 5m.s3z





SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Settlement below improved ground	
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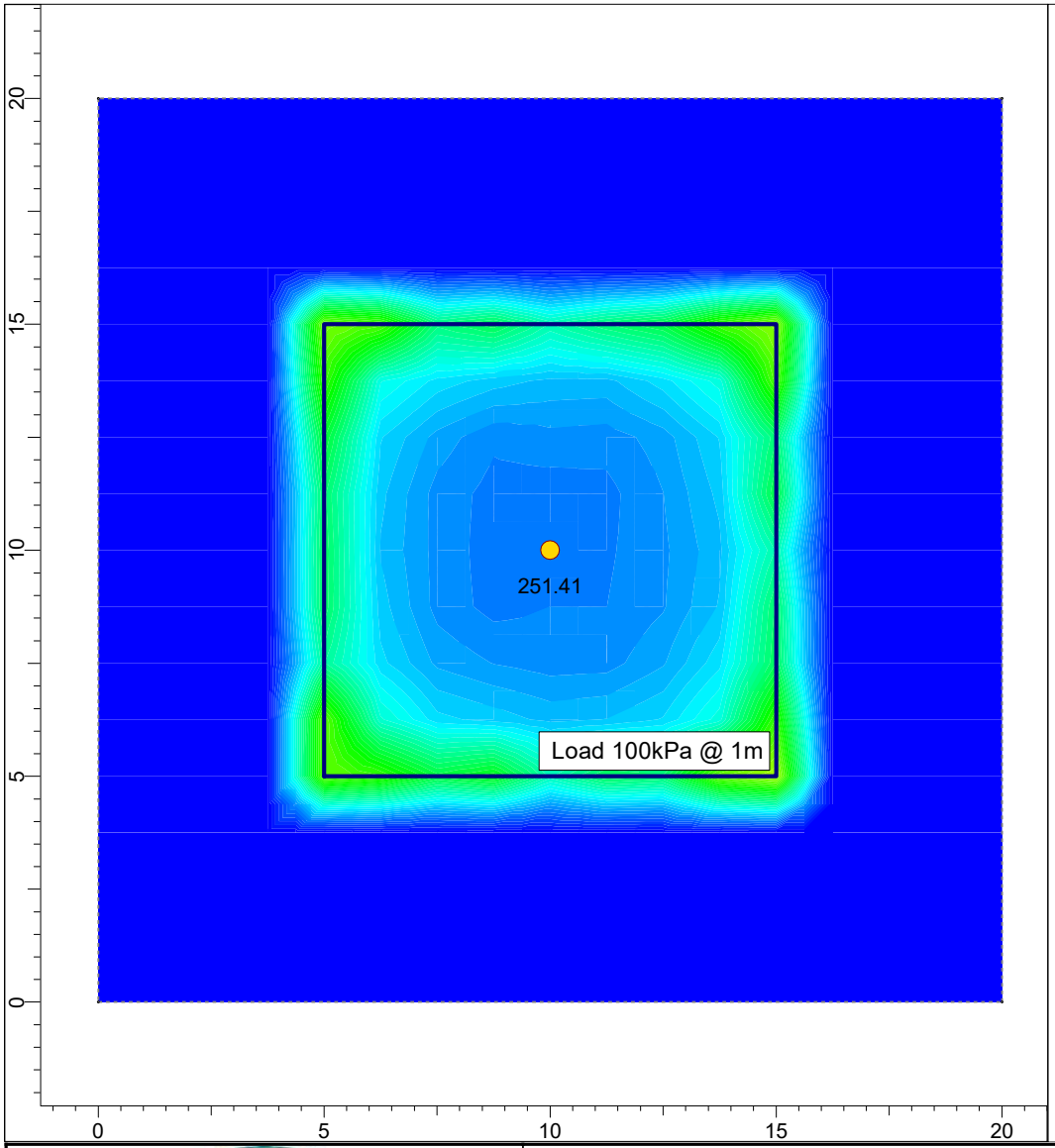
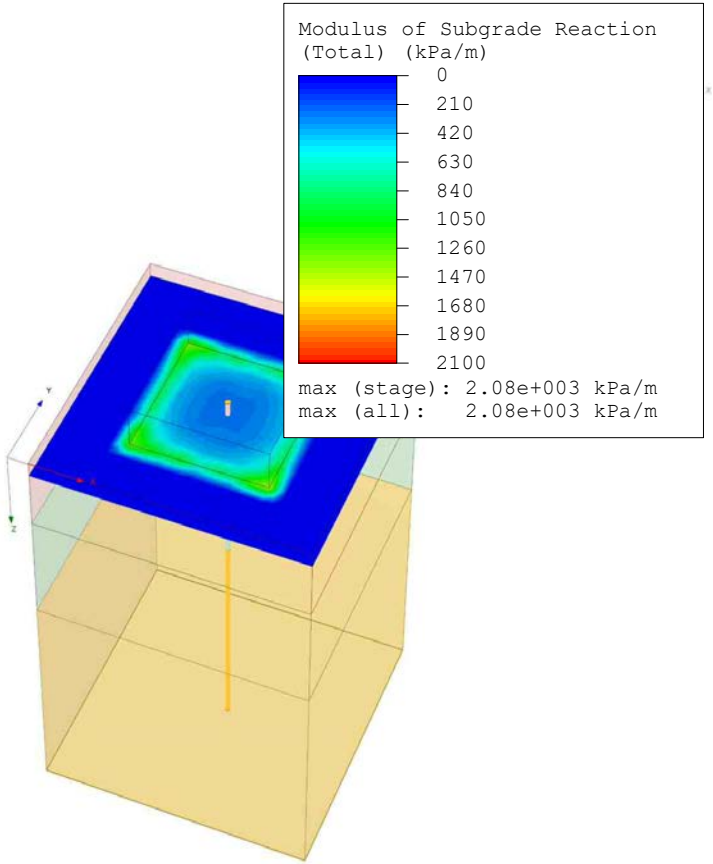
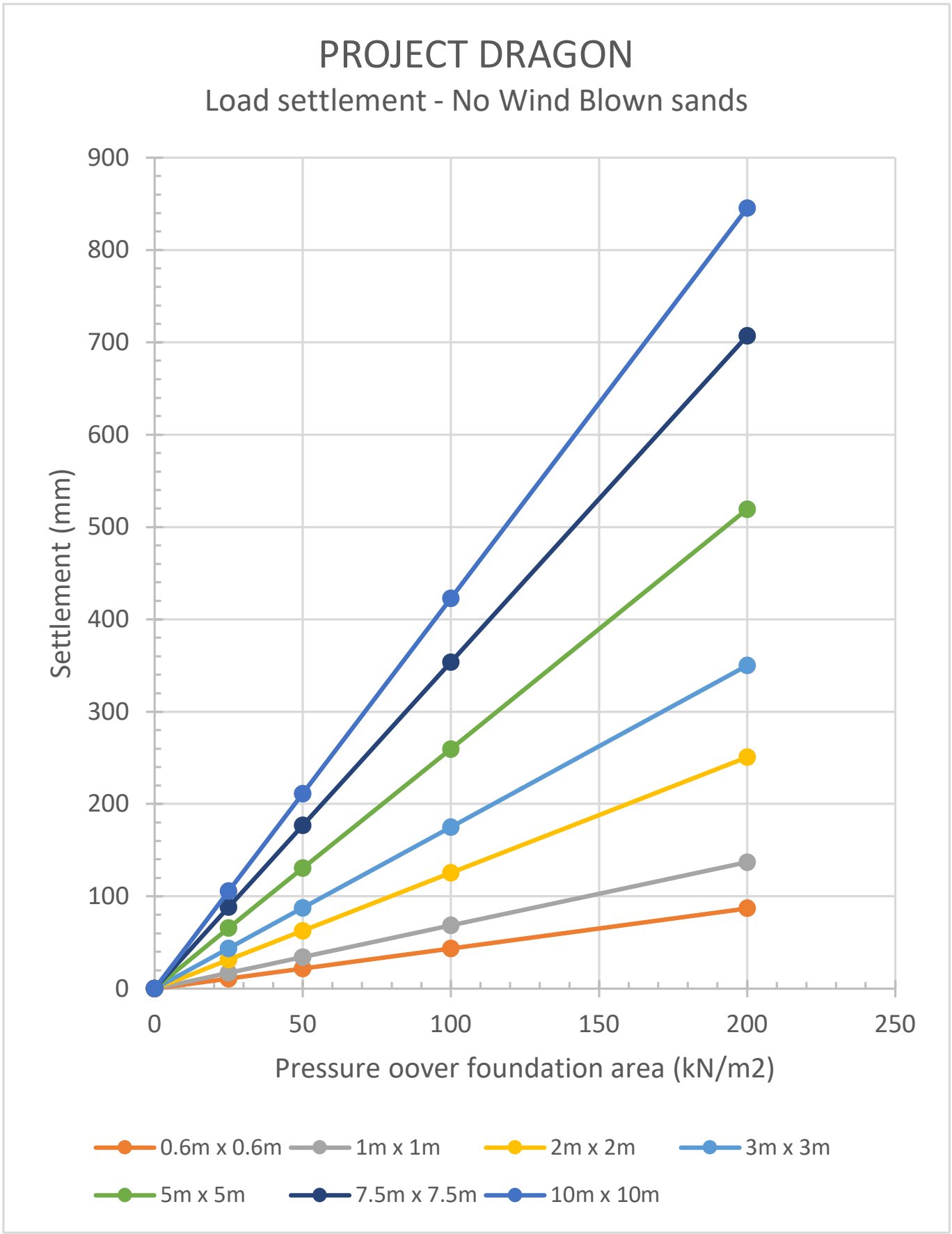
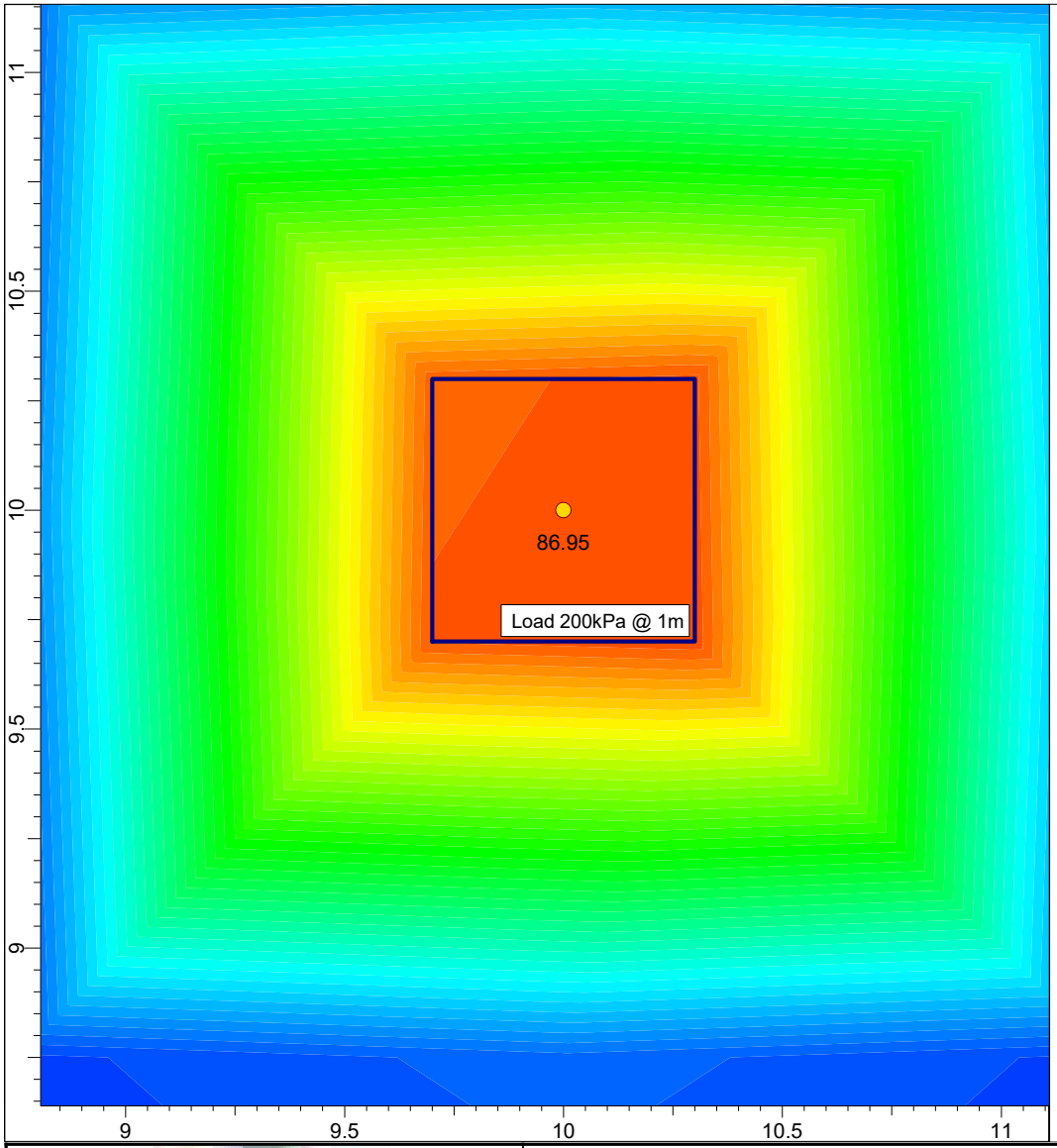
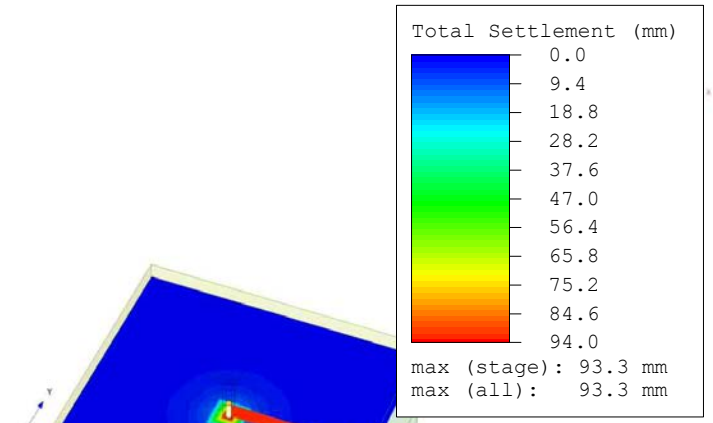


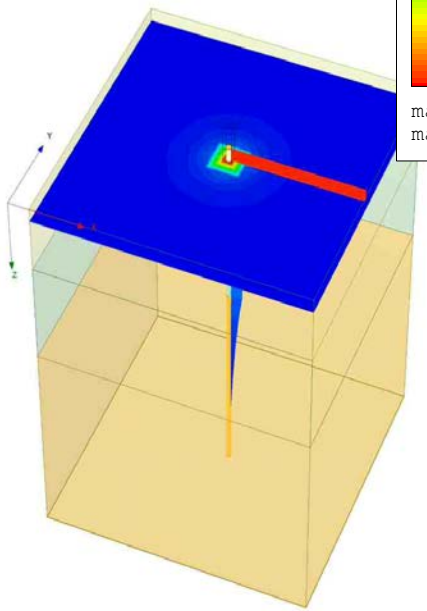


SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Settlement below improved ground	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* Ground improvement to 5m.s3z


PROJECT DRAGON
Load settlement - No Wind Blown sands
Settlement (mm)
900
800
700
600
500
400
300
200
100
0
0
50
100
150
200
250
Pressure oover foundation area (kN/m2)
0.6m x 0.6m
1m x 1m
2m x 2m
3m x 3m
5m x 5m
7.5m x 7.5m
10m x 10m







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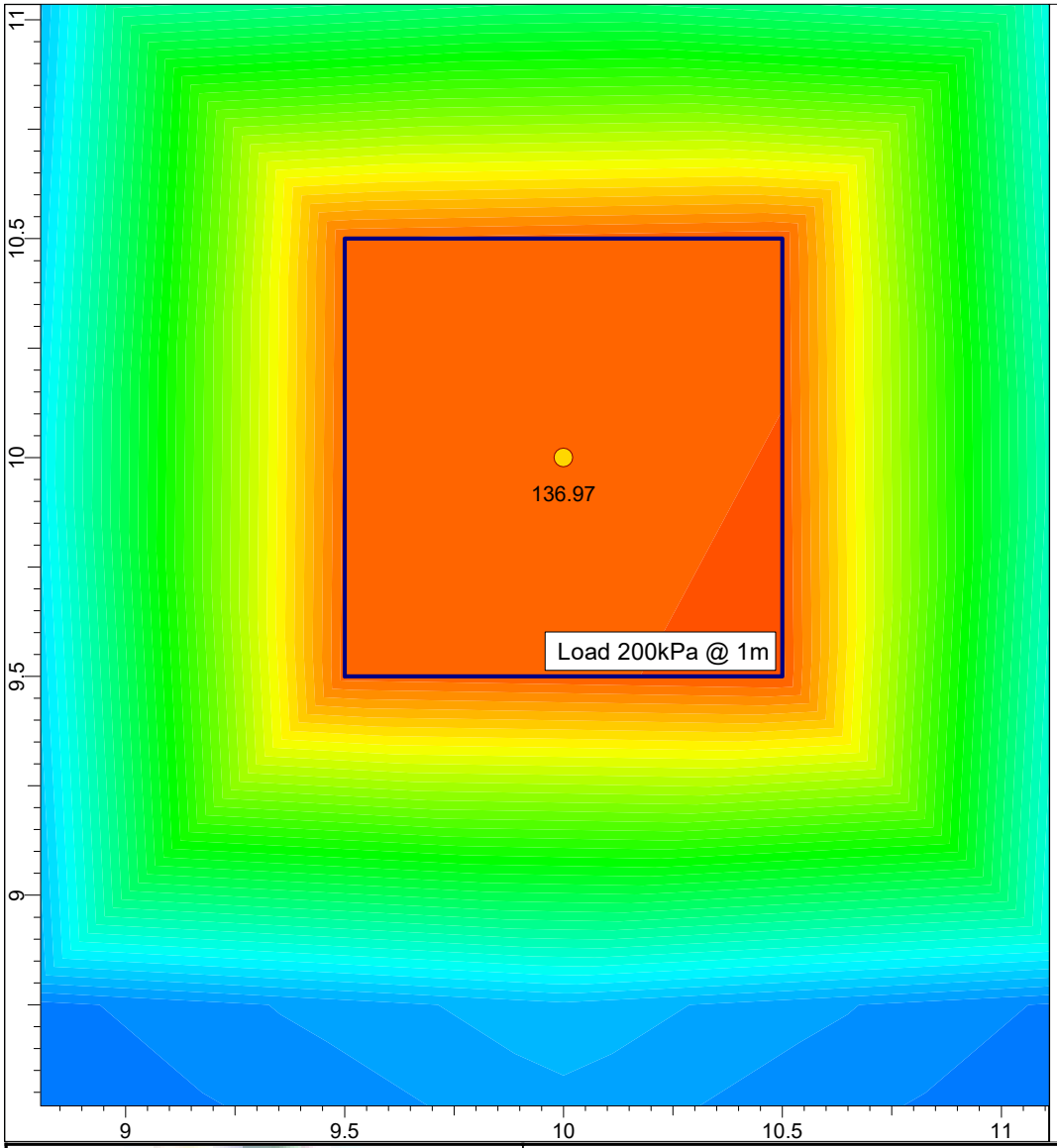
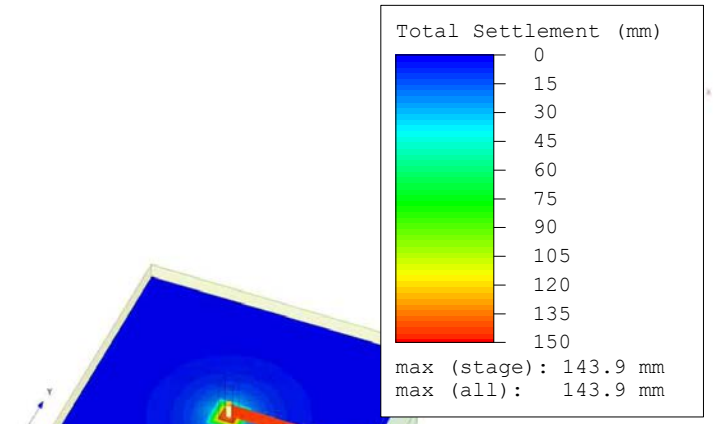
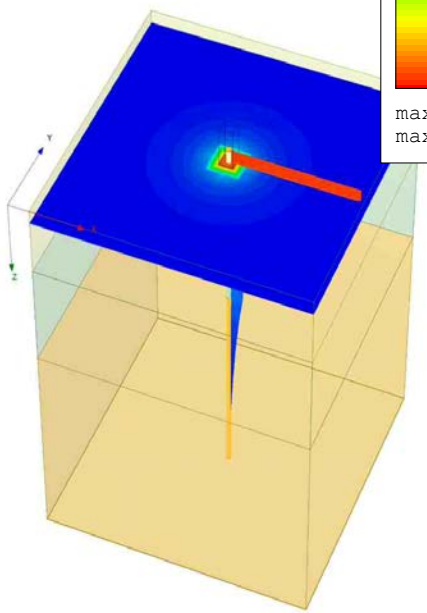
	Date	10 July 2023	*File Name* No WBS.s3z







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	Drawn By	RJE	*Company* TEC
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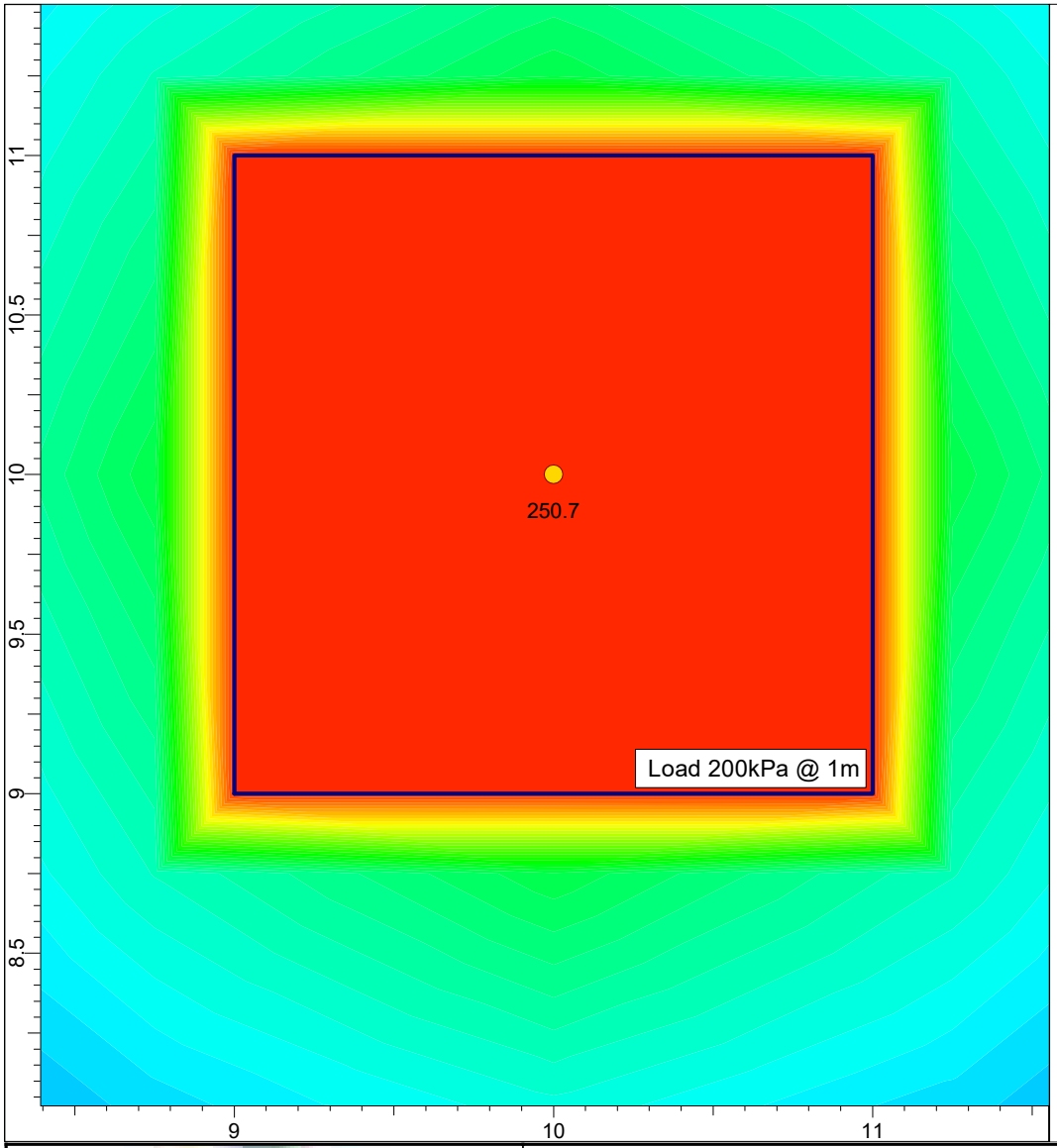

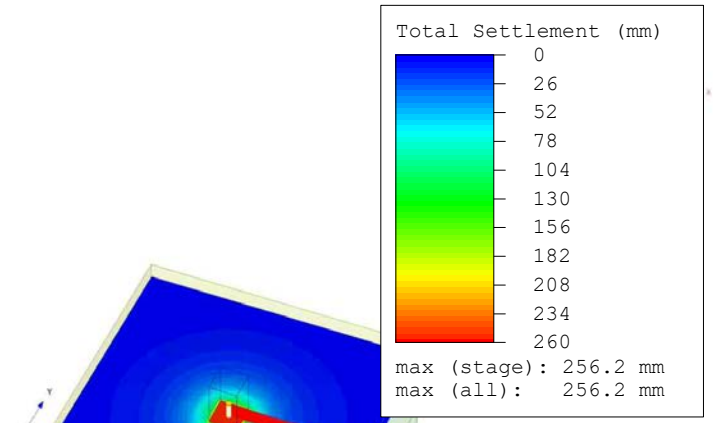

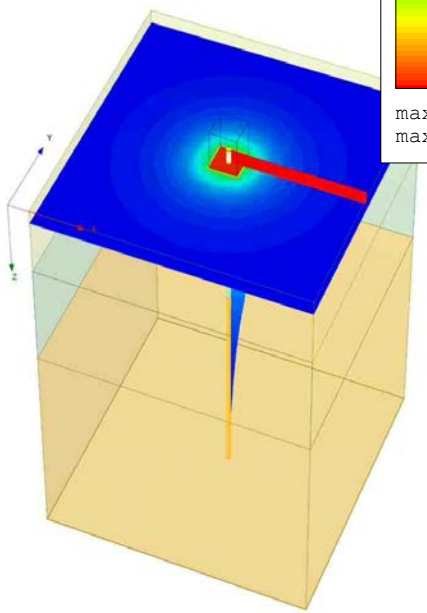

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	Drawn By	RJE	*Company* TEC
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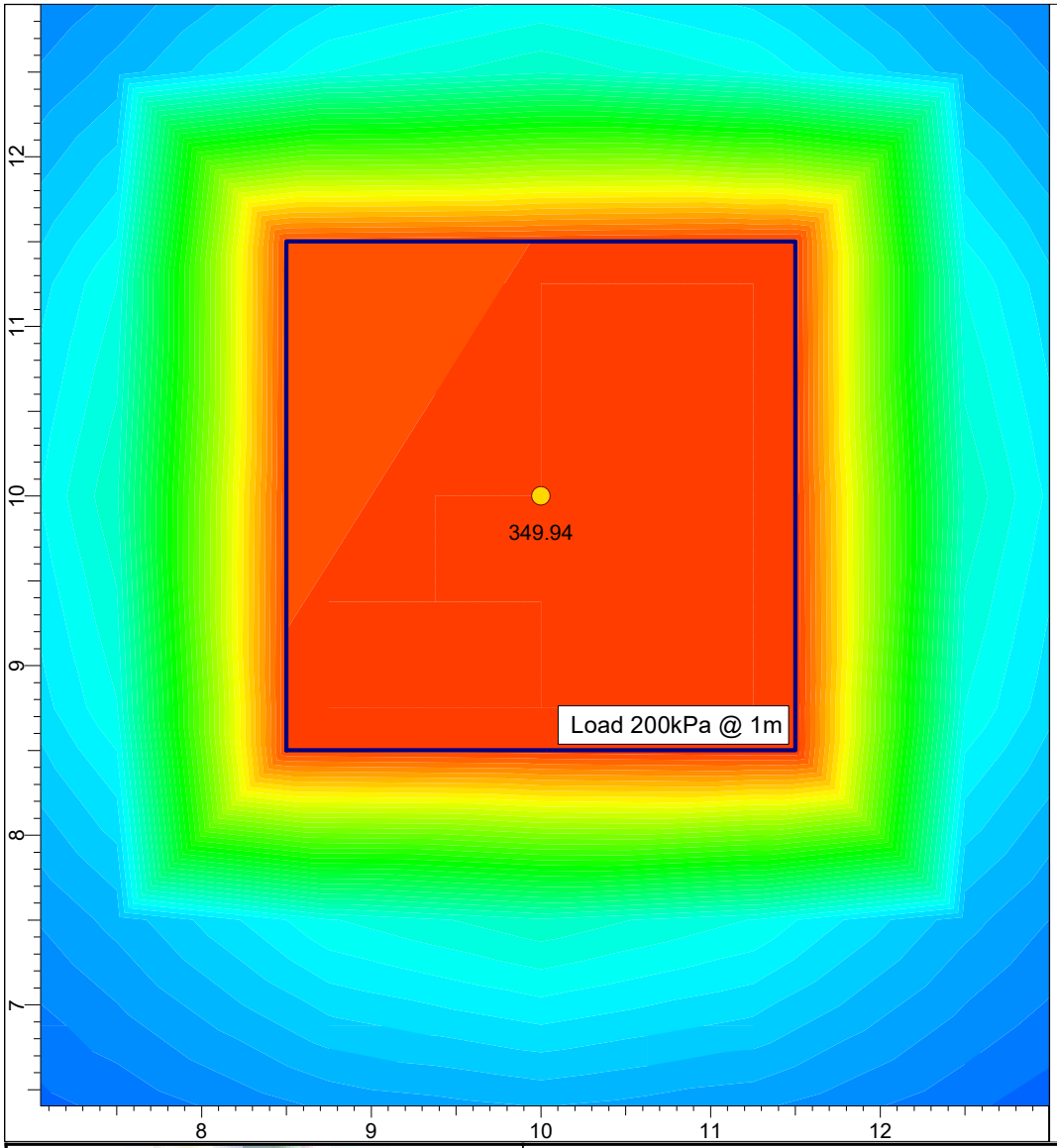

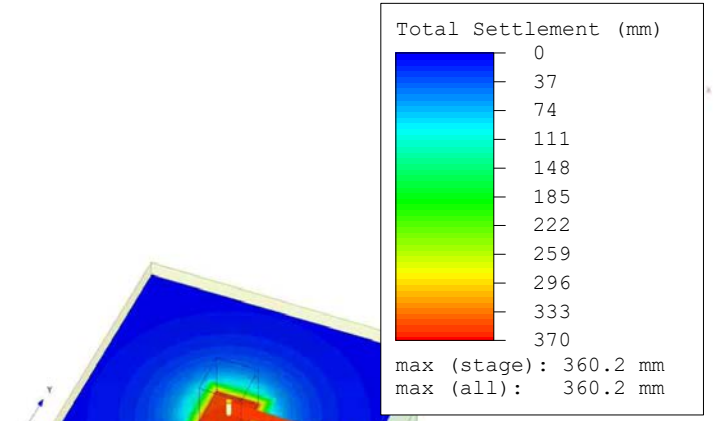

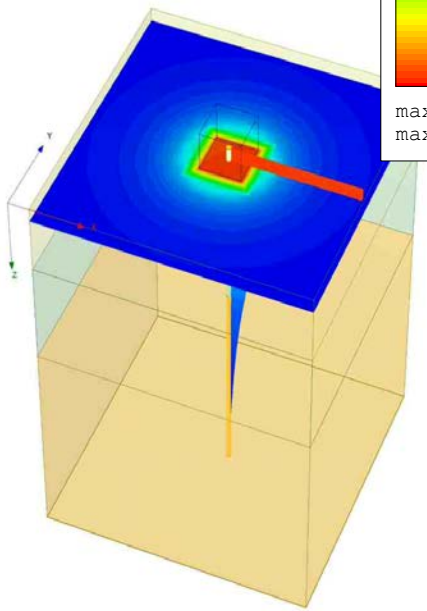

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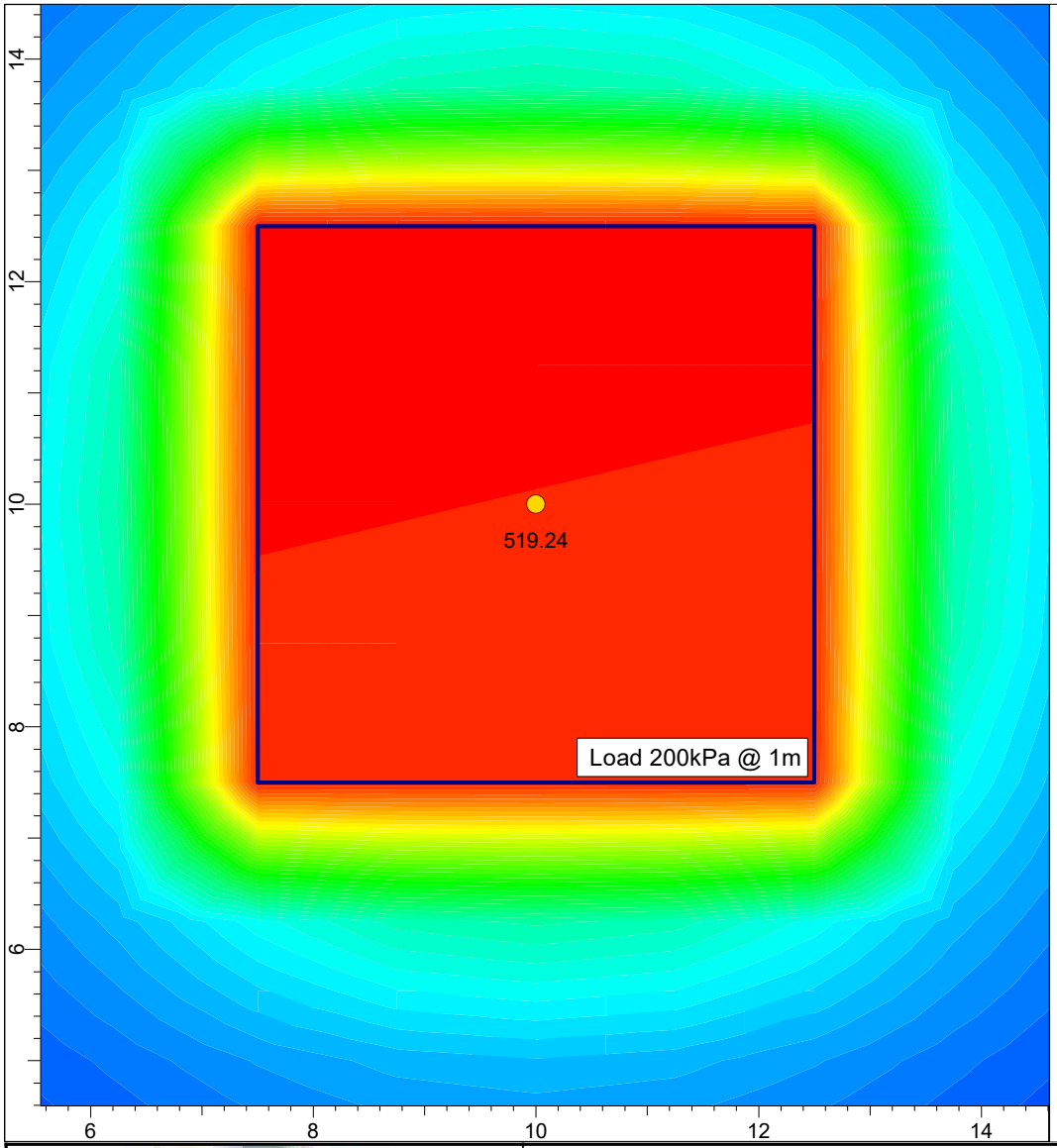
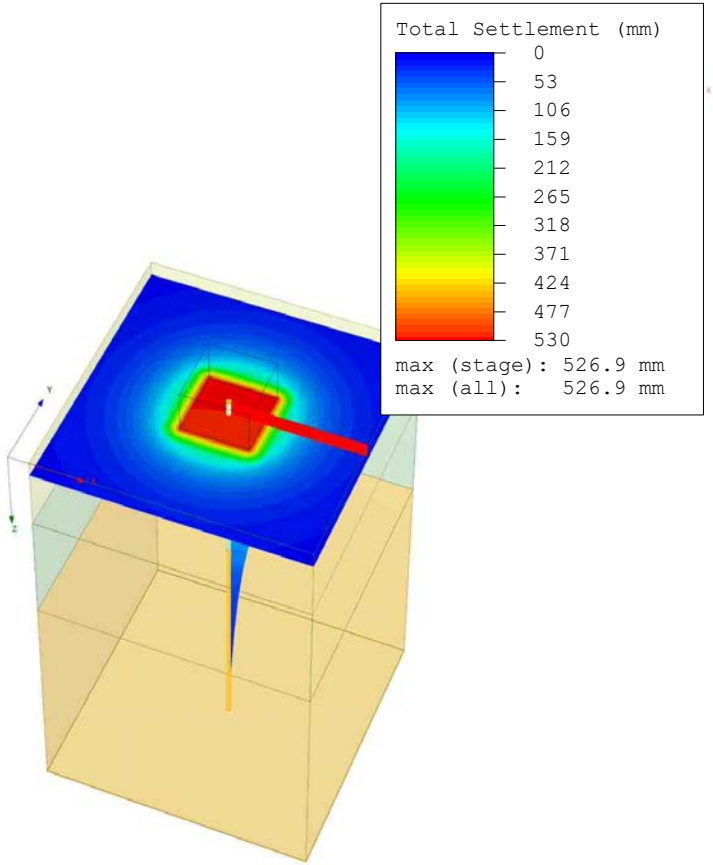
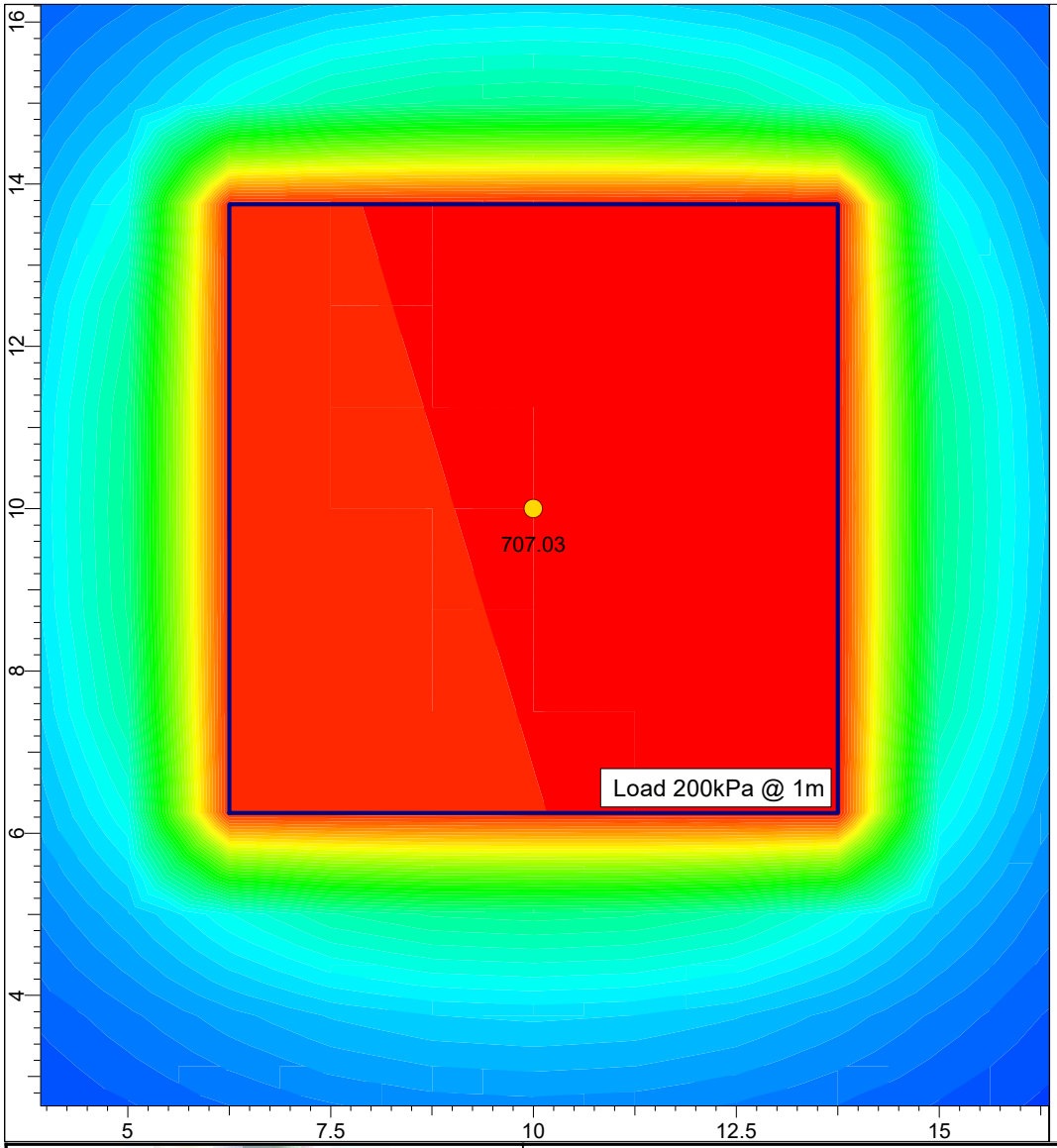
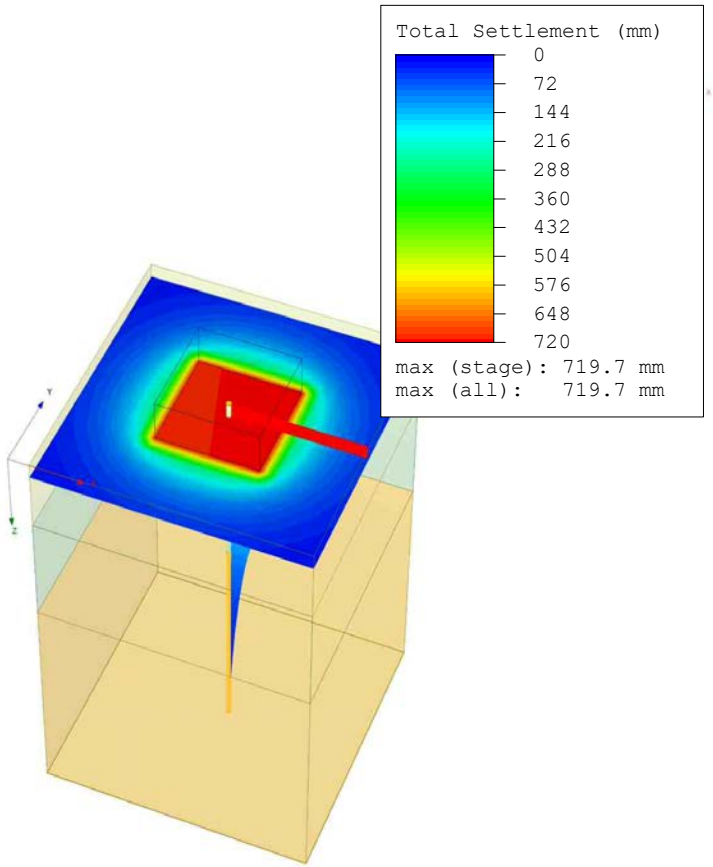
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* No WBS.s3z



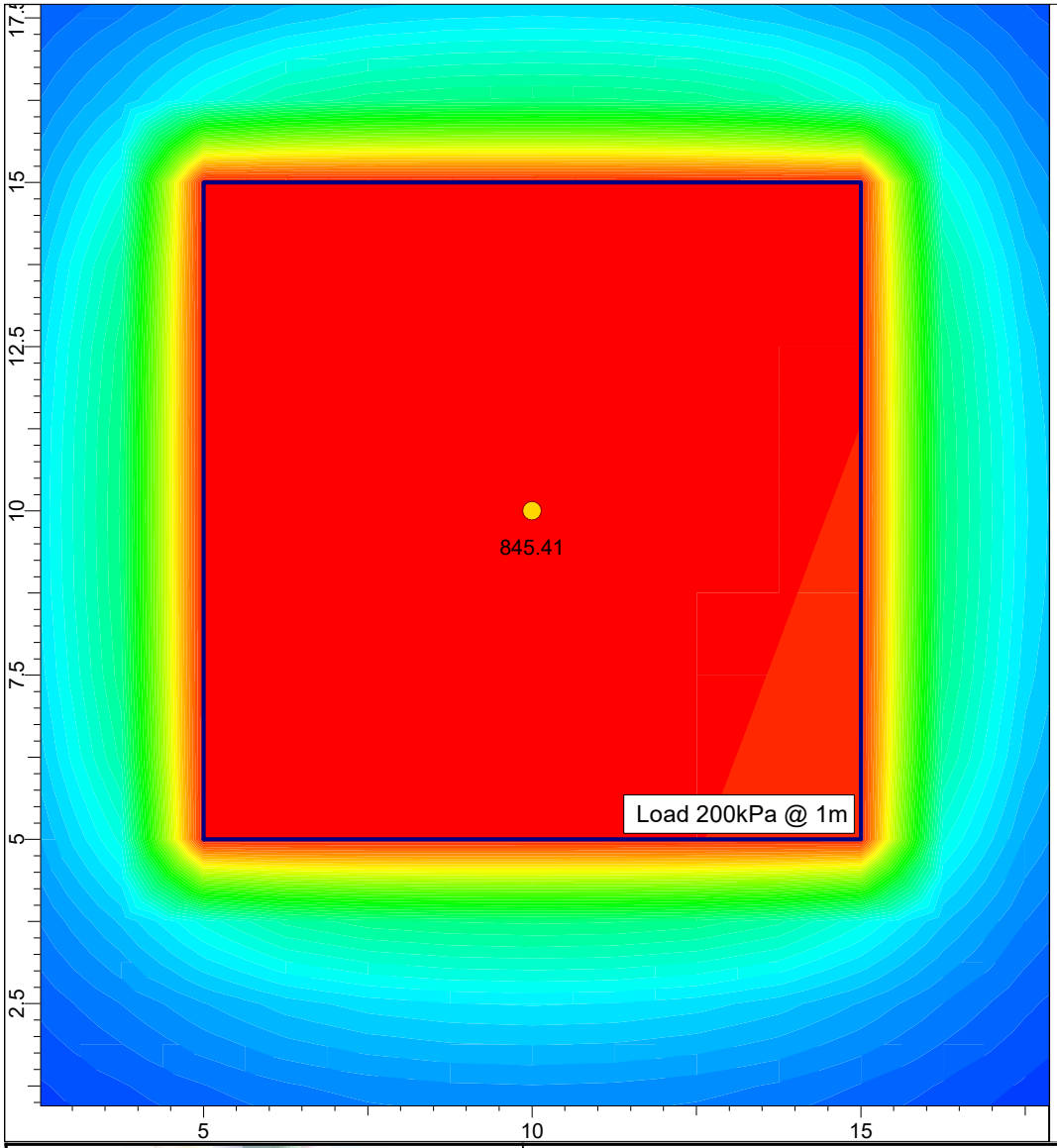


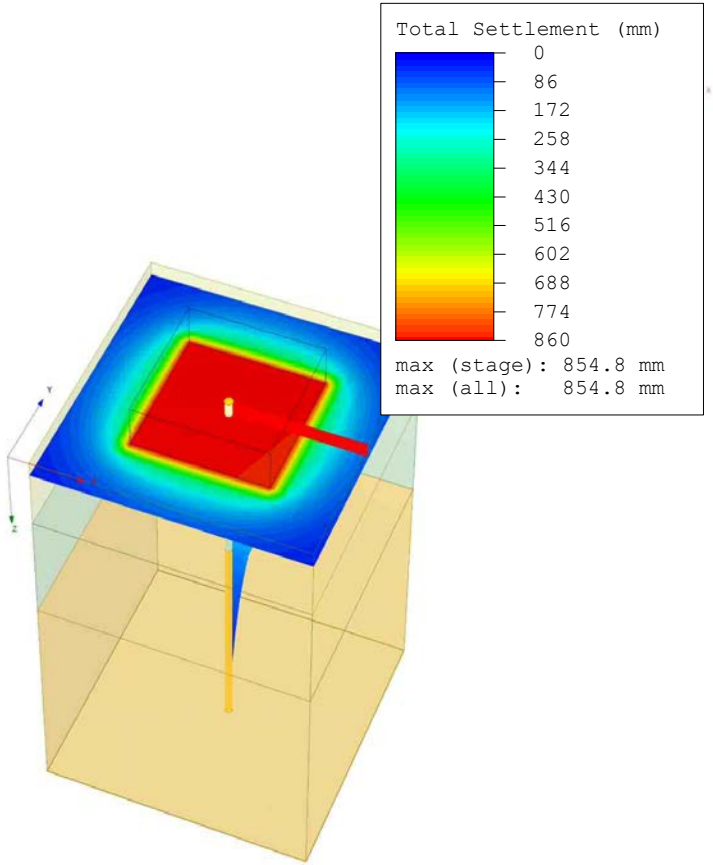
SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Settlement - Typical Ground Conditions (No WBS)	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* No WBS.s3z



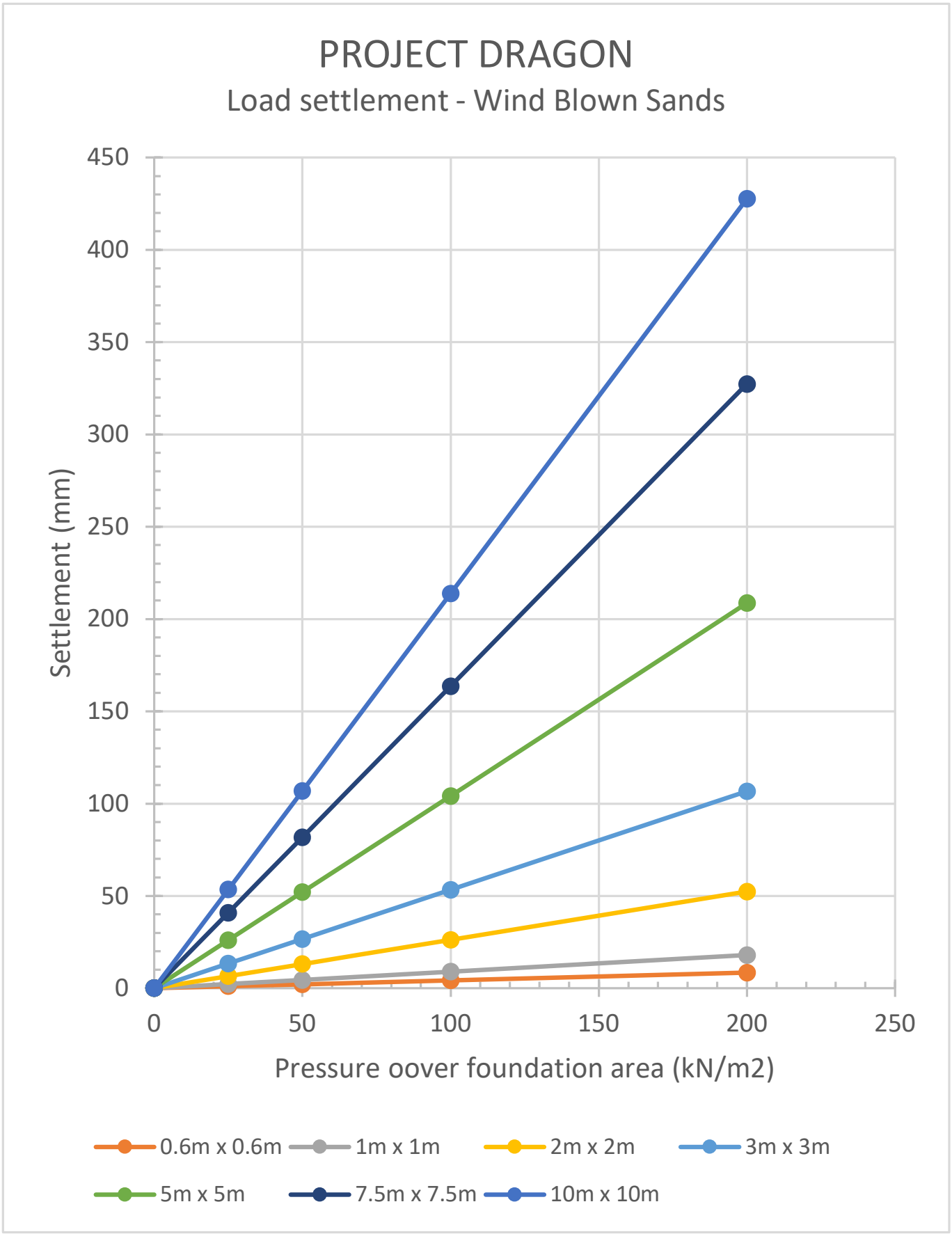


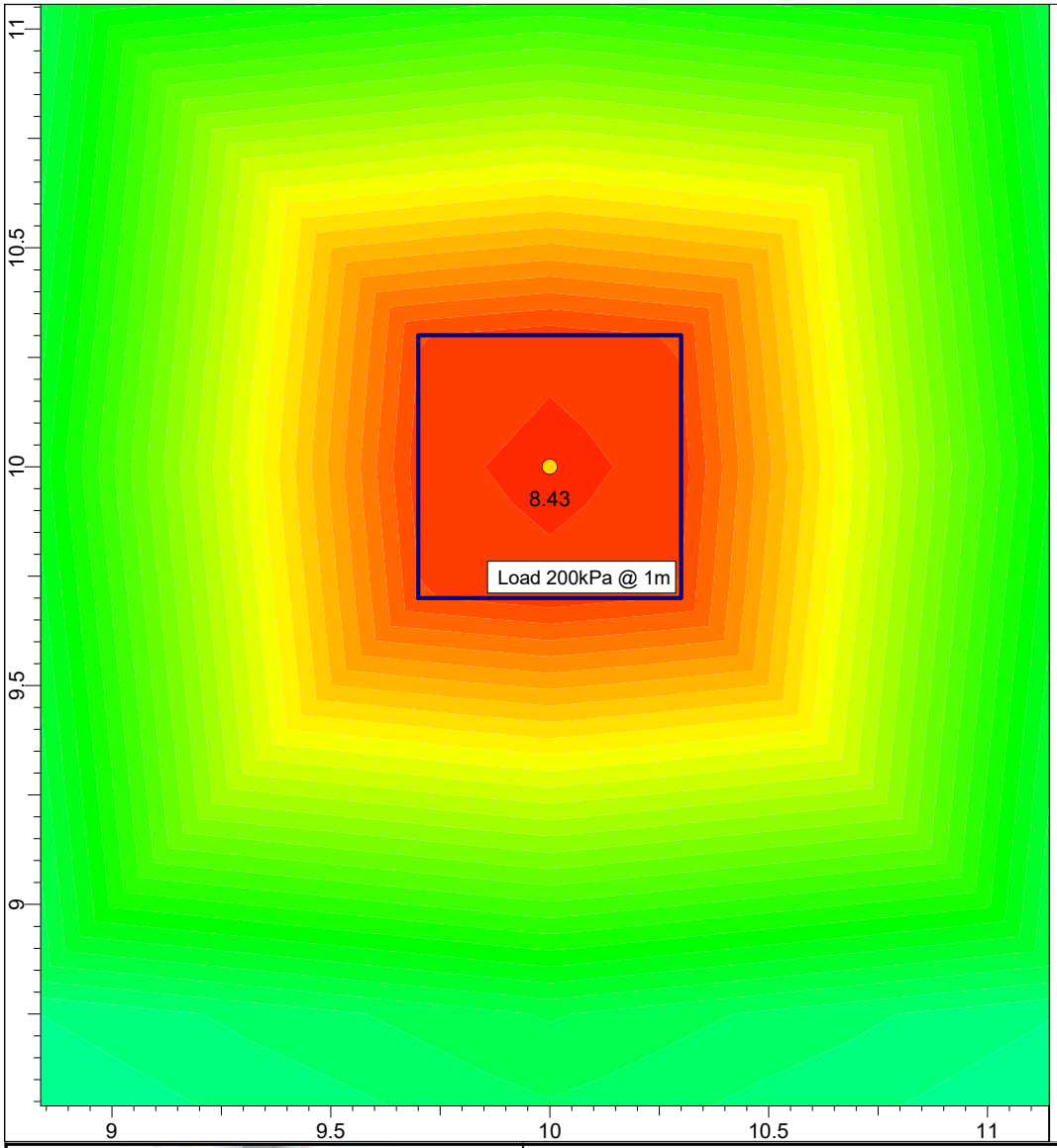
SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Settlement - Typical Ground Conditions (No WBS)	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* No WBS.s3z

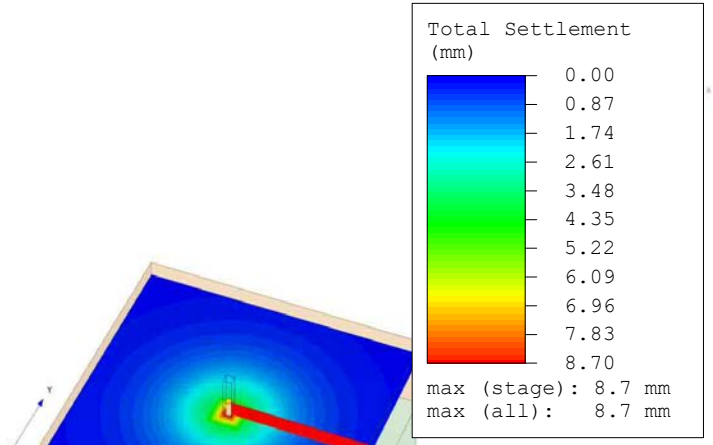


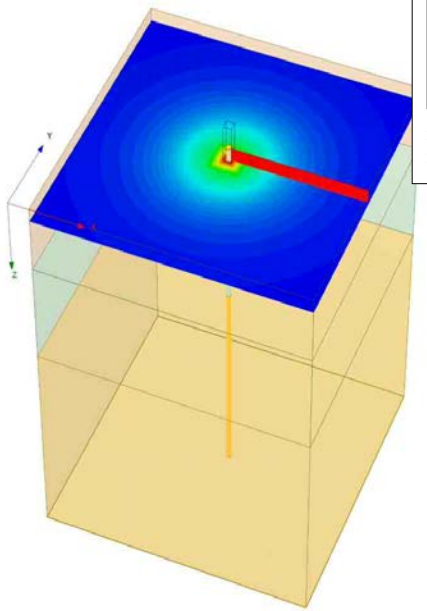


SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Settlement - Typical Ground Conditions (No WBS)	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* No WBS.s3z

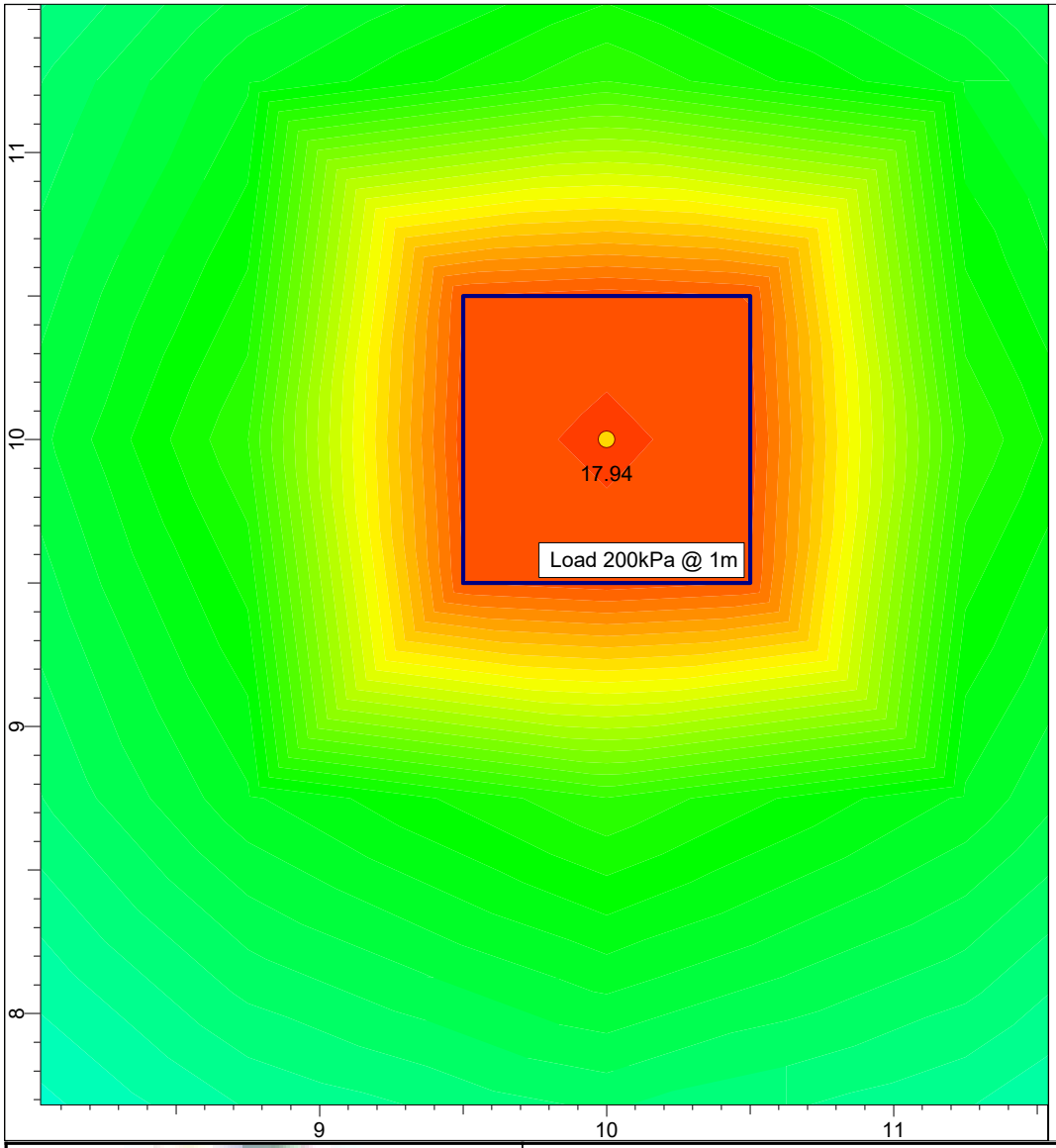

PROJECT DRAGON
Load settlement - Wind Blown Sands
Settlement (mm)
450
400
350
300
250
200
150
100
50
0
0
50
100
150
200
250
Pressure oover foundation area (kN/m2)
0.6m x 0.6m
1m x 1m
2m x 2m
3m x 3m
5m x 5m
7.5m x 7.5m
10m x 10m

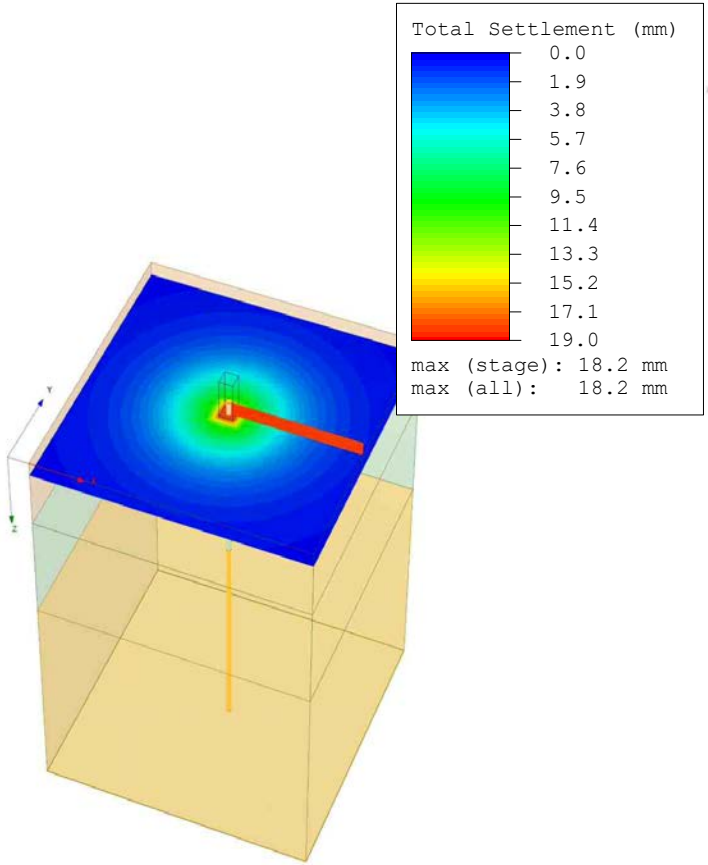




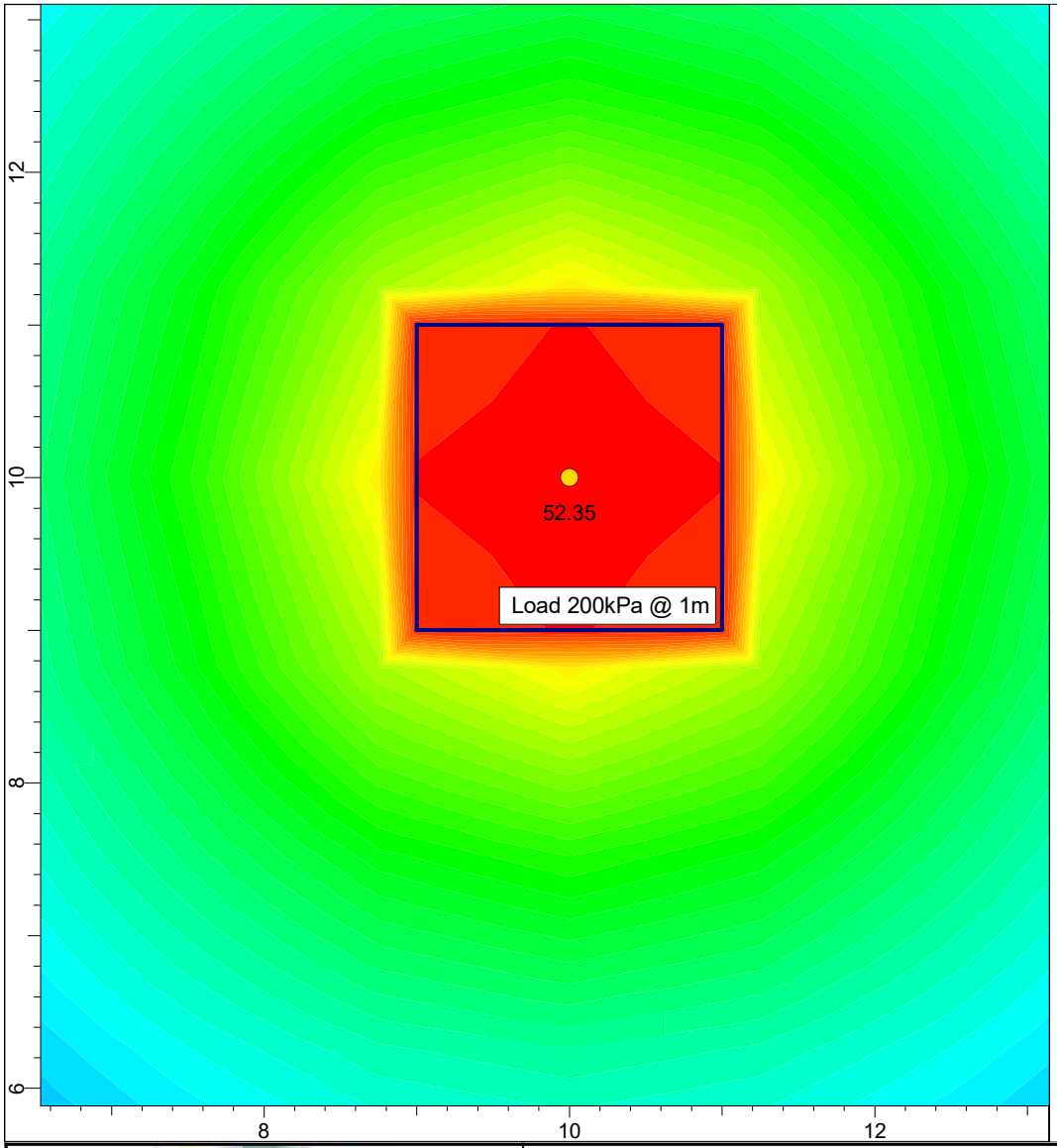


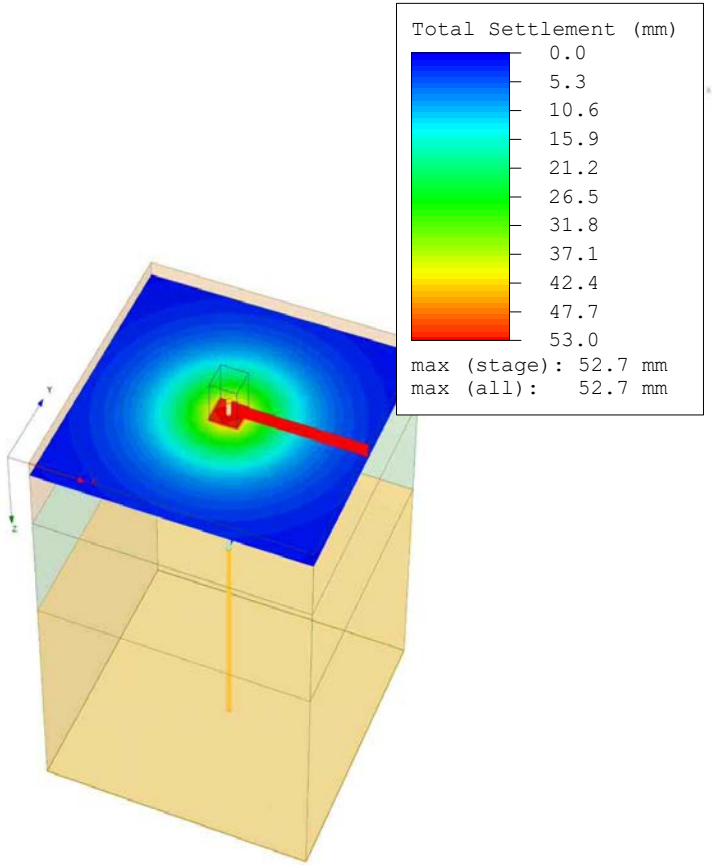
SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Settlement - Typical Ground Conditions (WBS)	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* WBS.s3z



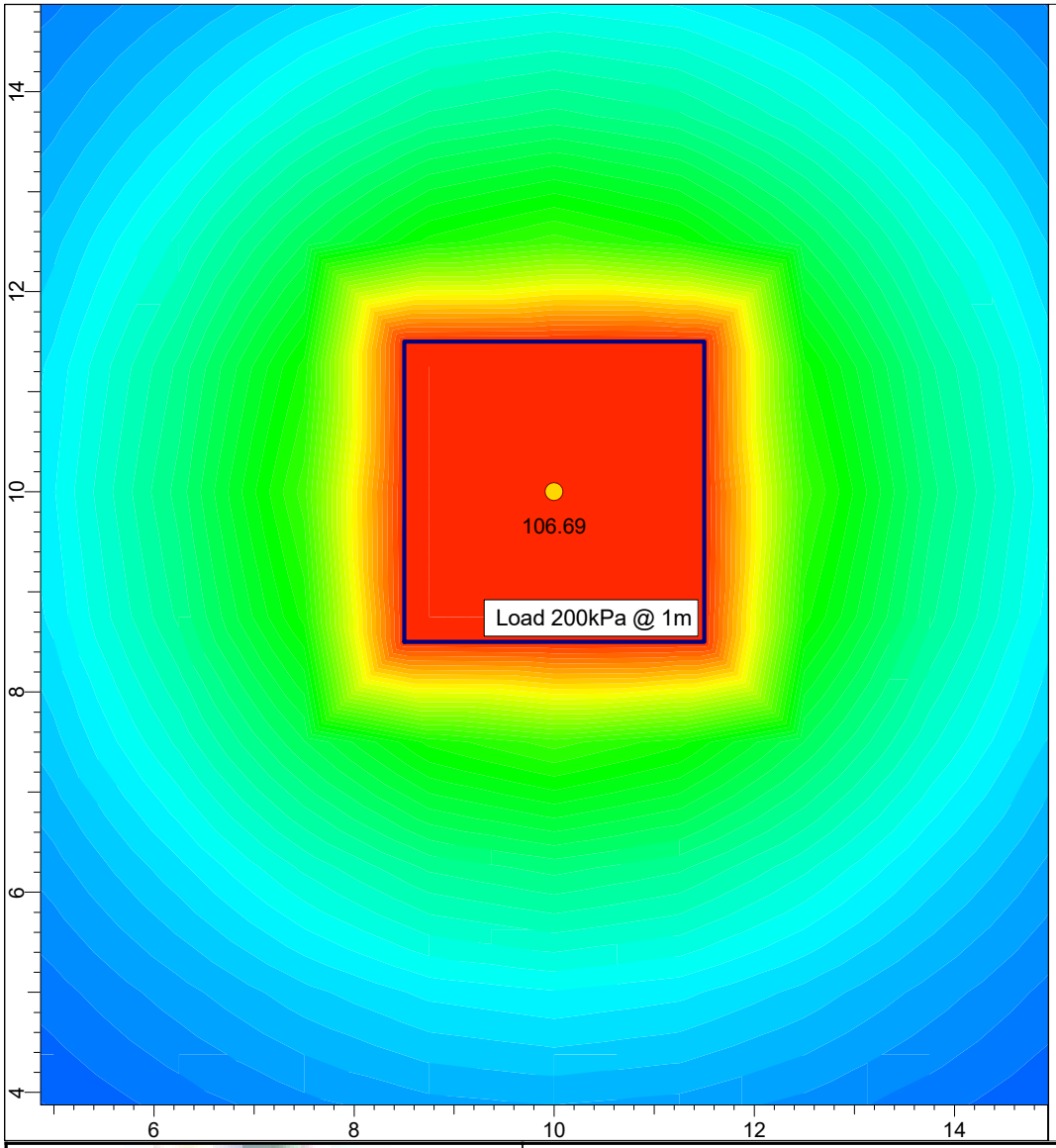


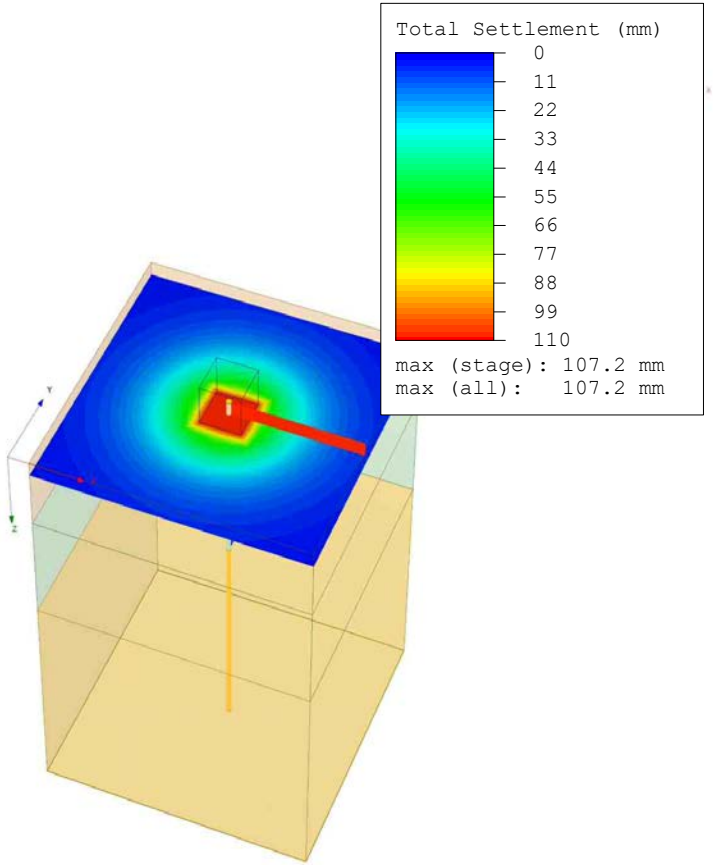
SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Settlement - Typical Ground Conditions (WBS)	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* WBS.s3z



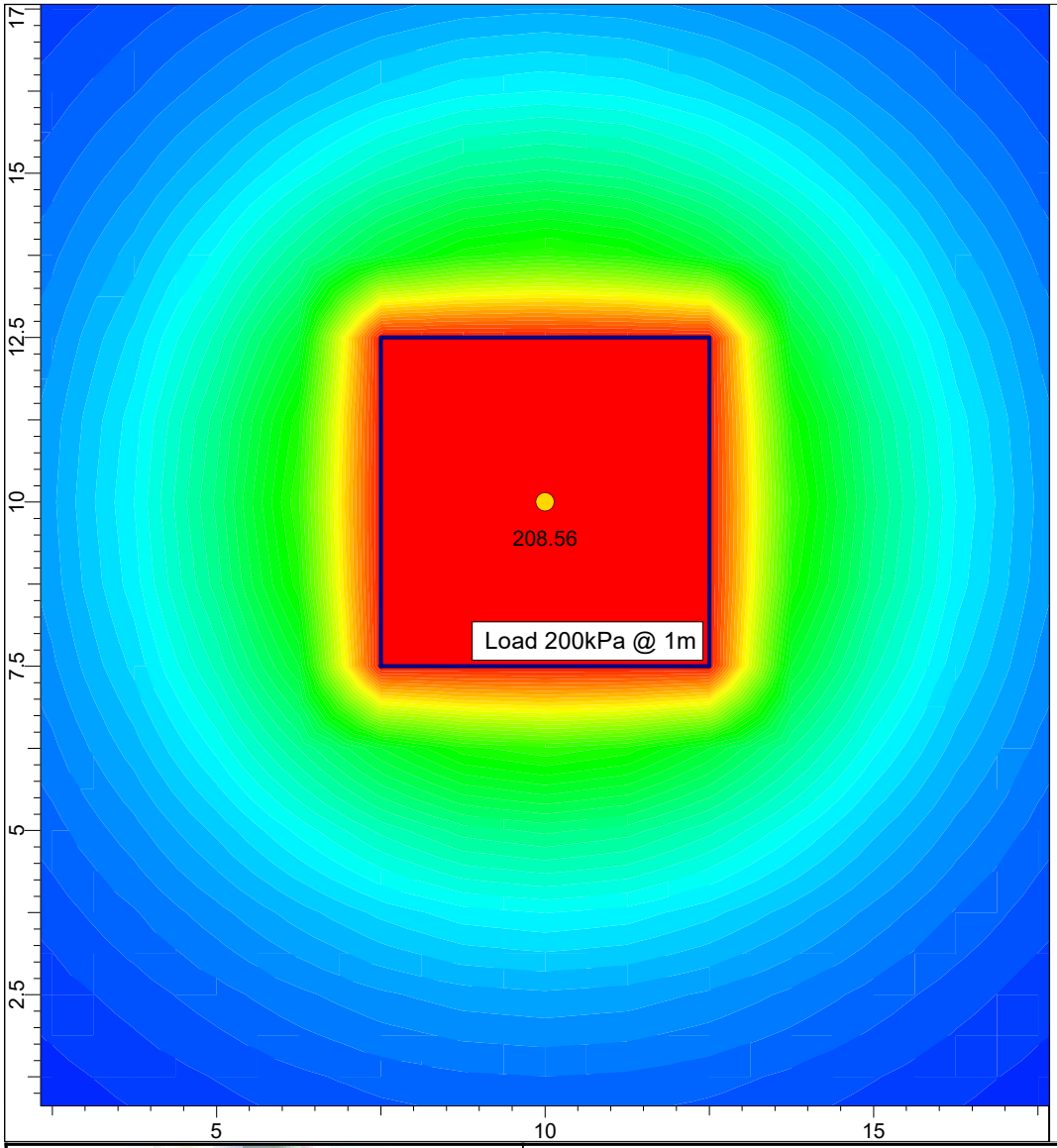


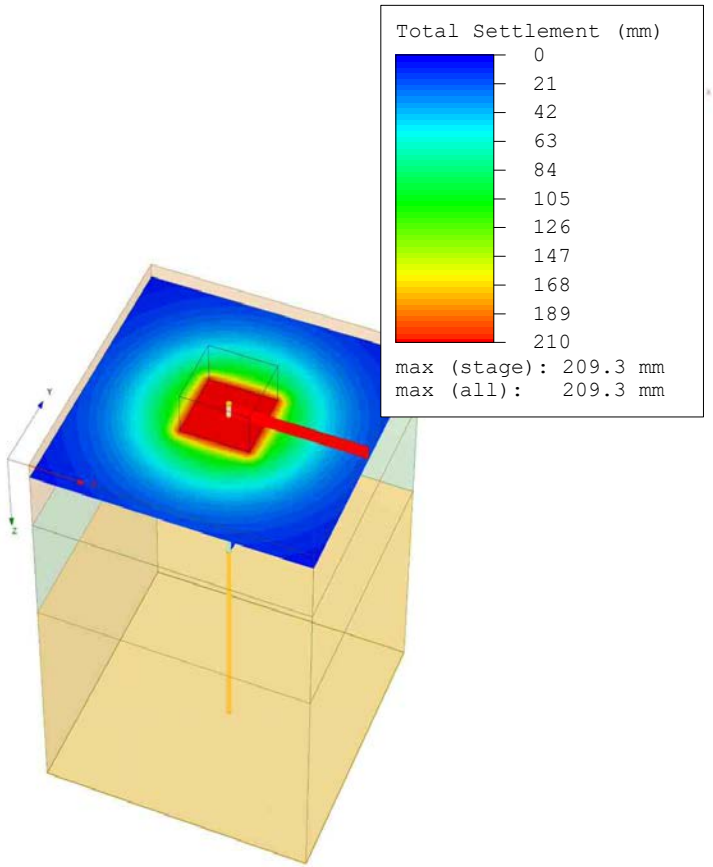
SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Settlement - Typical Ground Conditions (WBS)	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* WBS.s3z



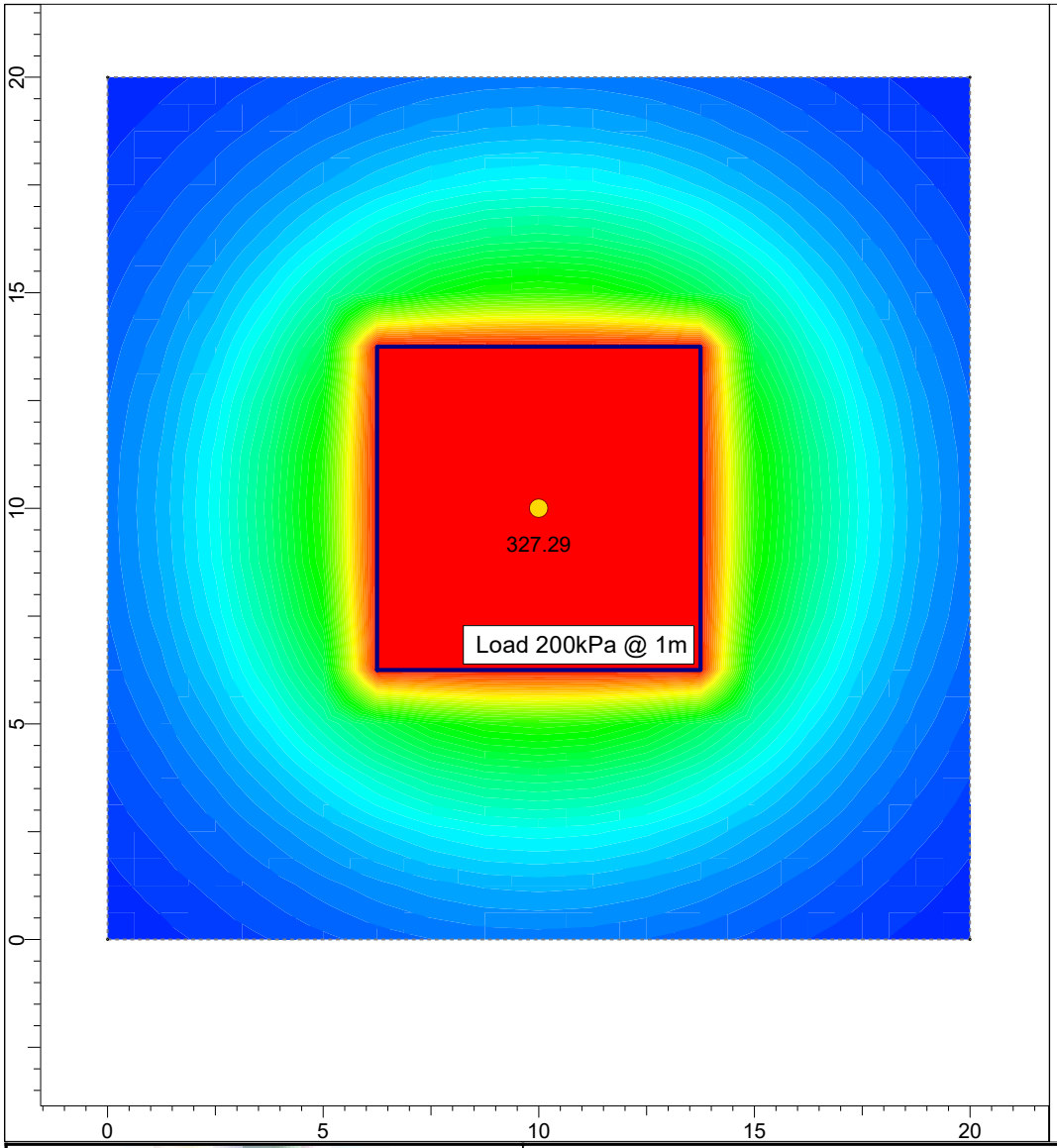


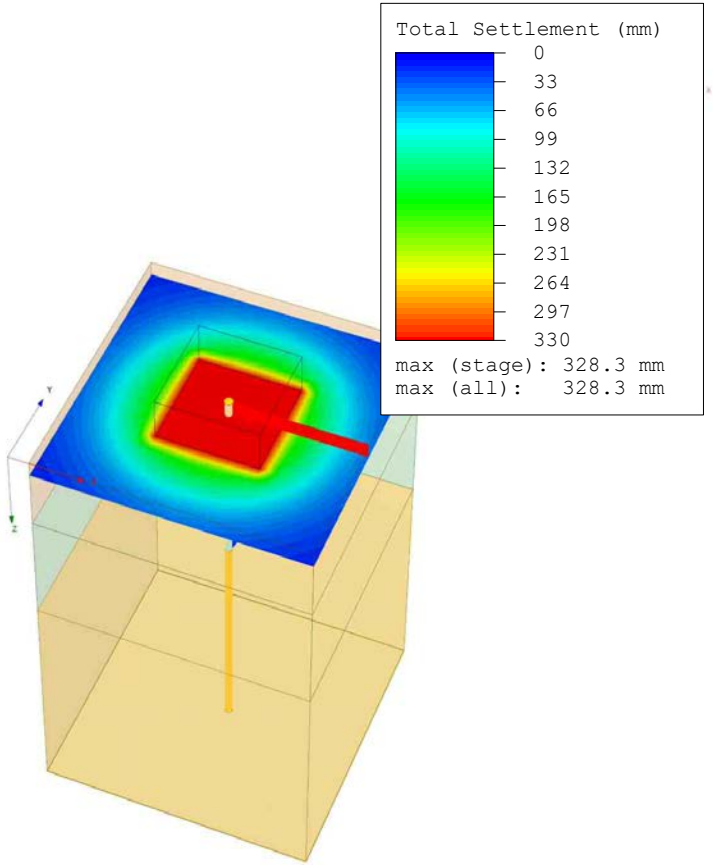
SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Settlement - Typical Ground Conditions (WBS)	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* WBS.s3z



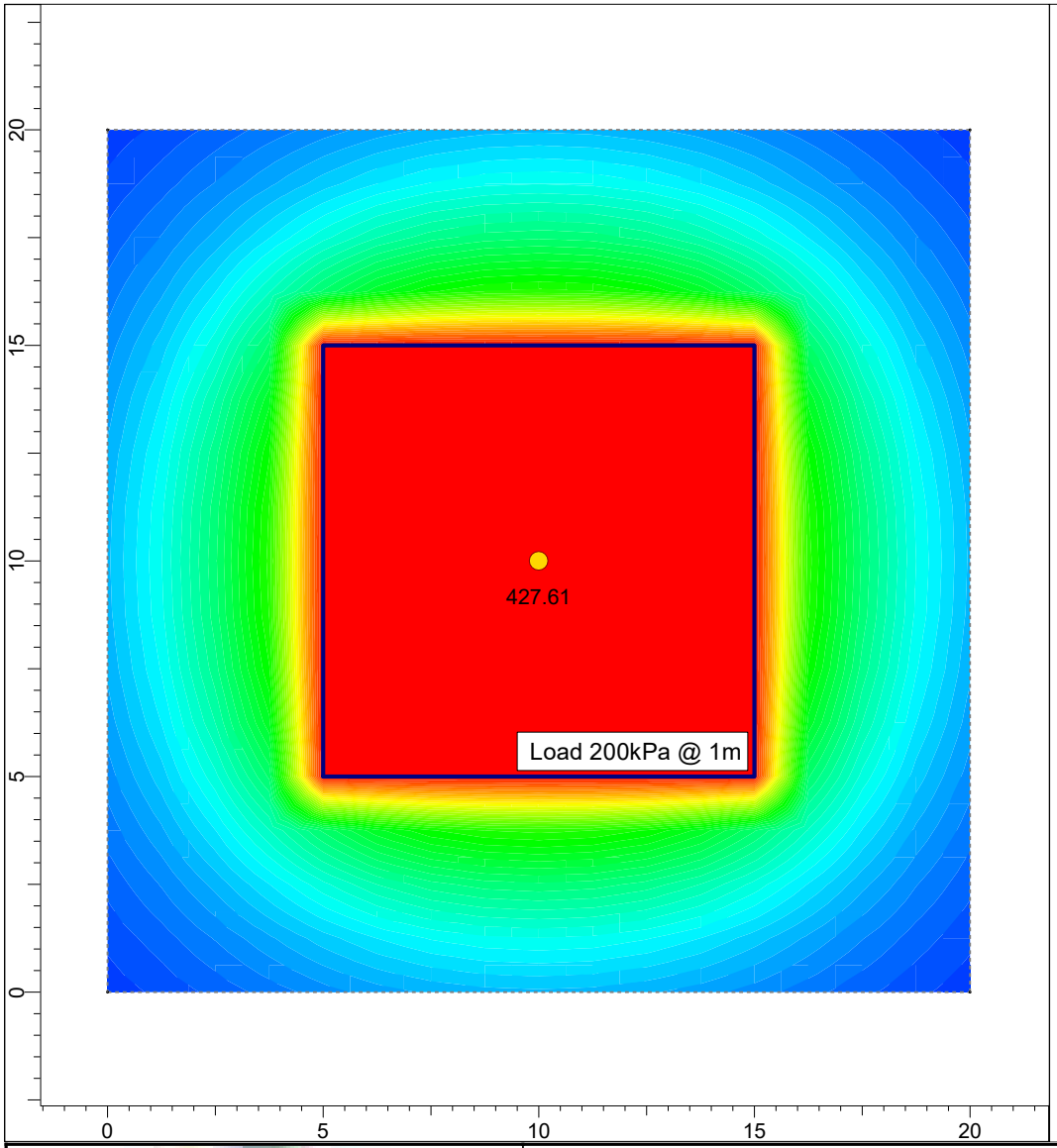


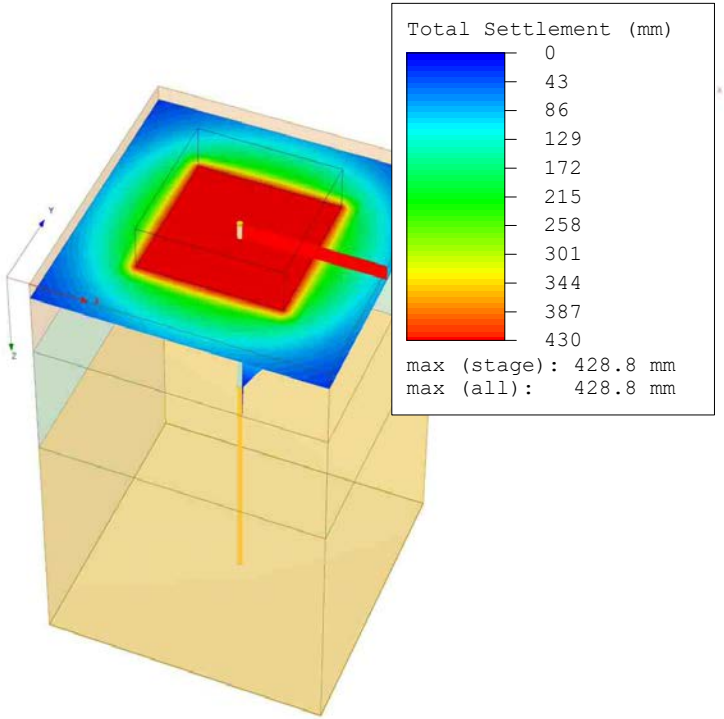
SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Settlement - Typical Ground Conditions (WBS)	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* WBS.s3z



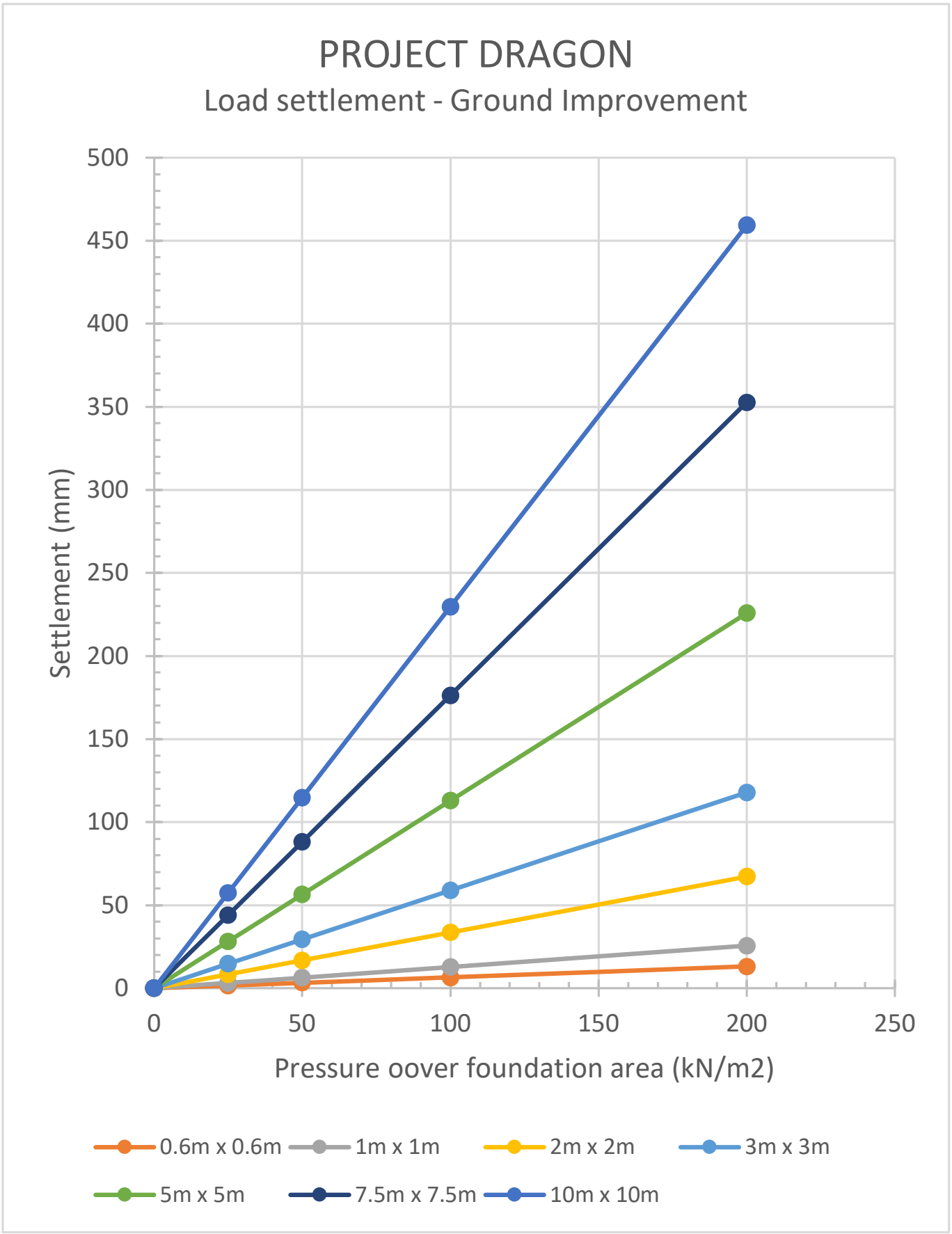


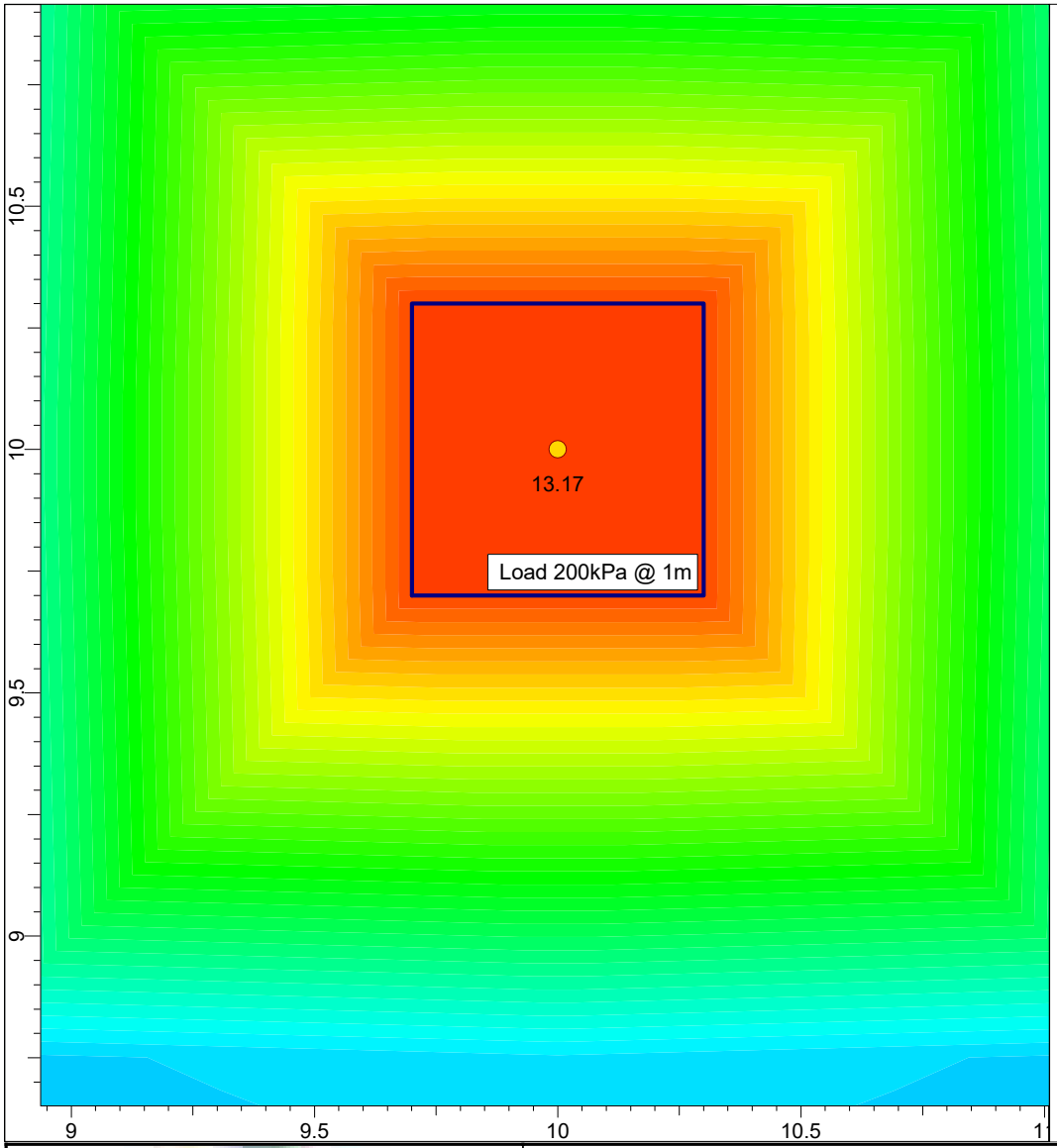
SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Settlement - Typical Ground Conditions (WBS)	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* WBS.s3z

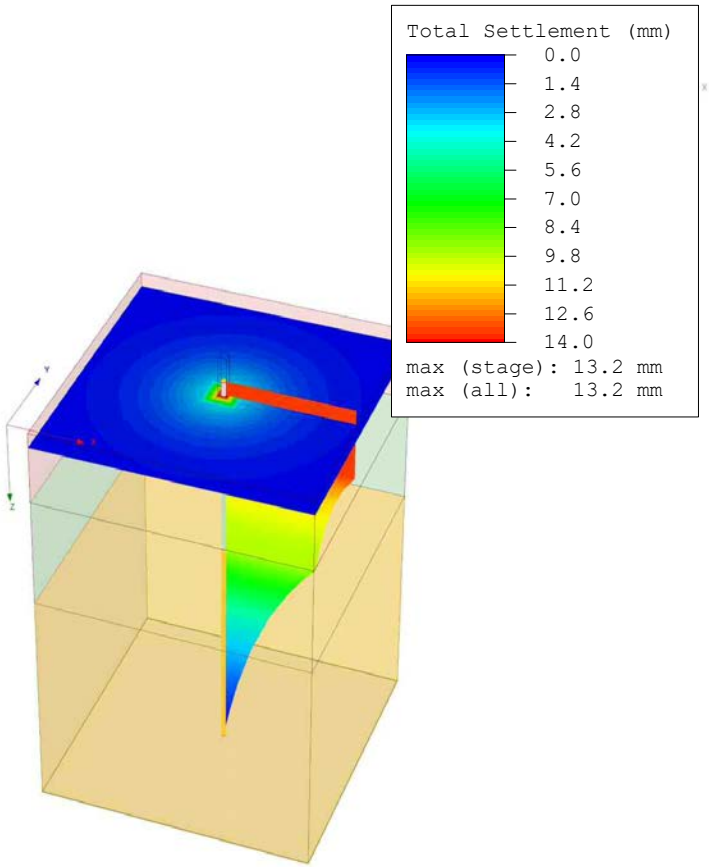




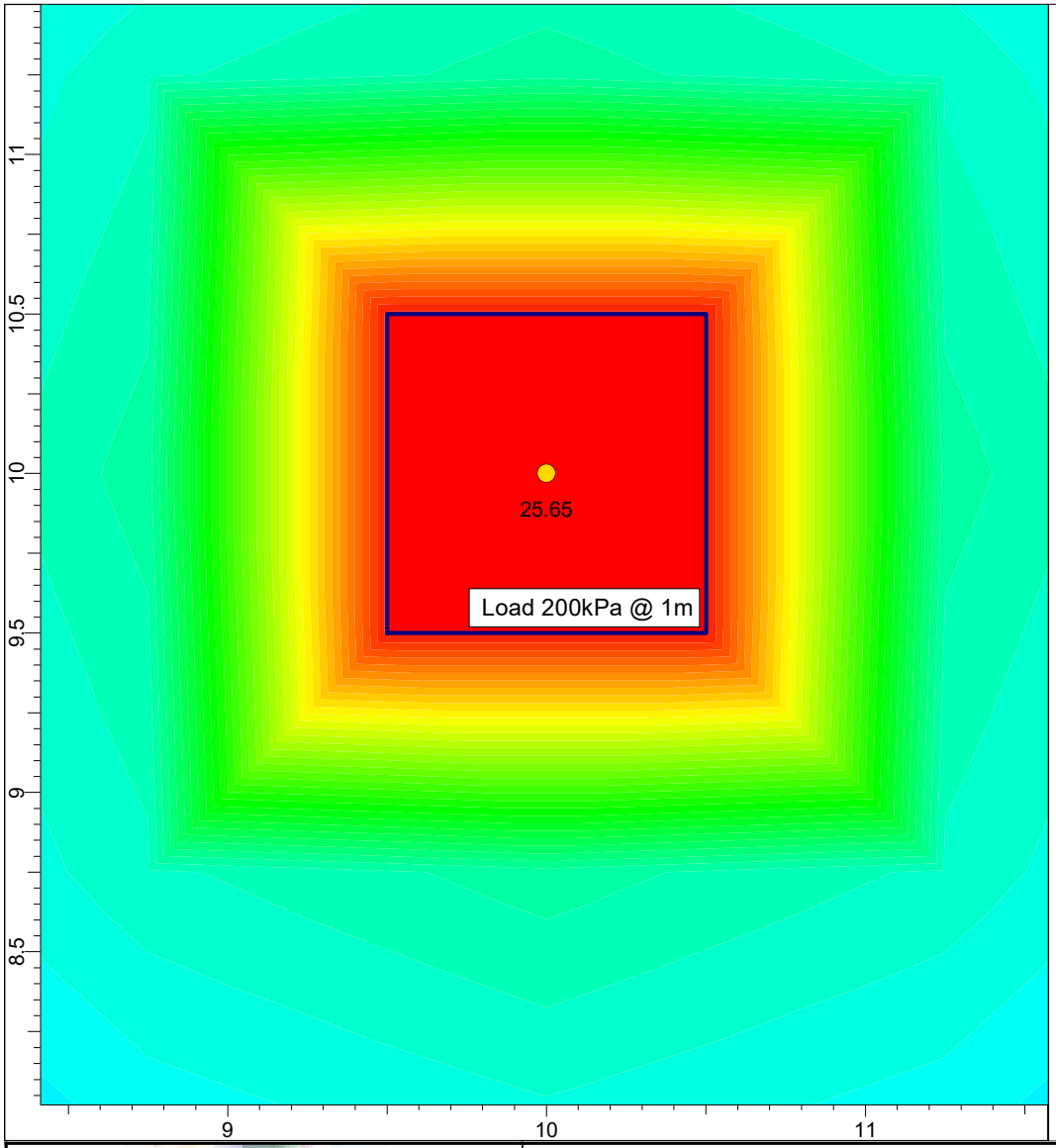
SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Settlement - Typical Ground Conditions (WBS)	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* WBS.s3z

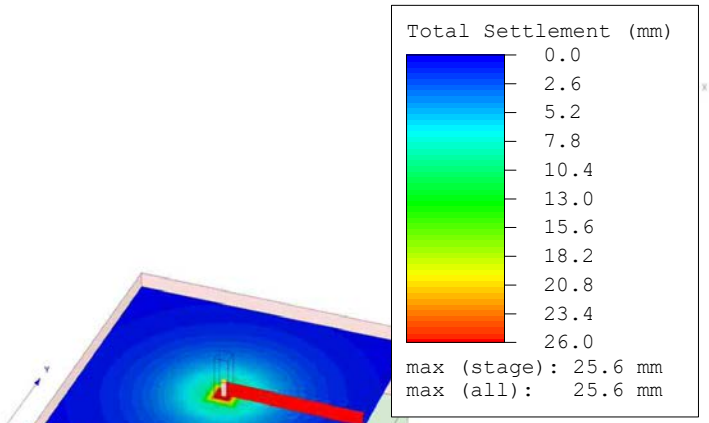

PROJECT DRAGON
Load settlement - Ground Improvement
Settlement (mm)
500
450
400
350
300
250
200
150
100
50
0
0
50
100
150
200
250
Pressure oover foundation area (kN/m2)
0.6m x 0.6m
1m x 1m
2m x 2m
3m x 3m
5m x 5m
7.5m x 7.5m
10m x 10m

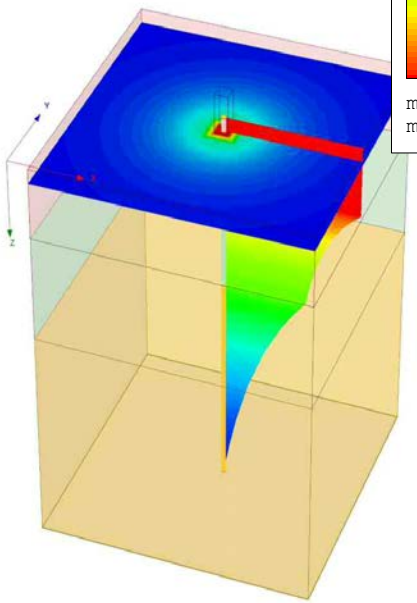




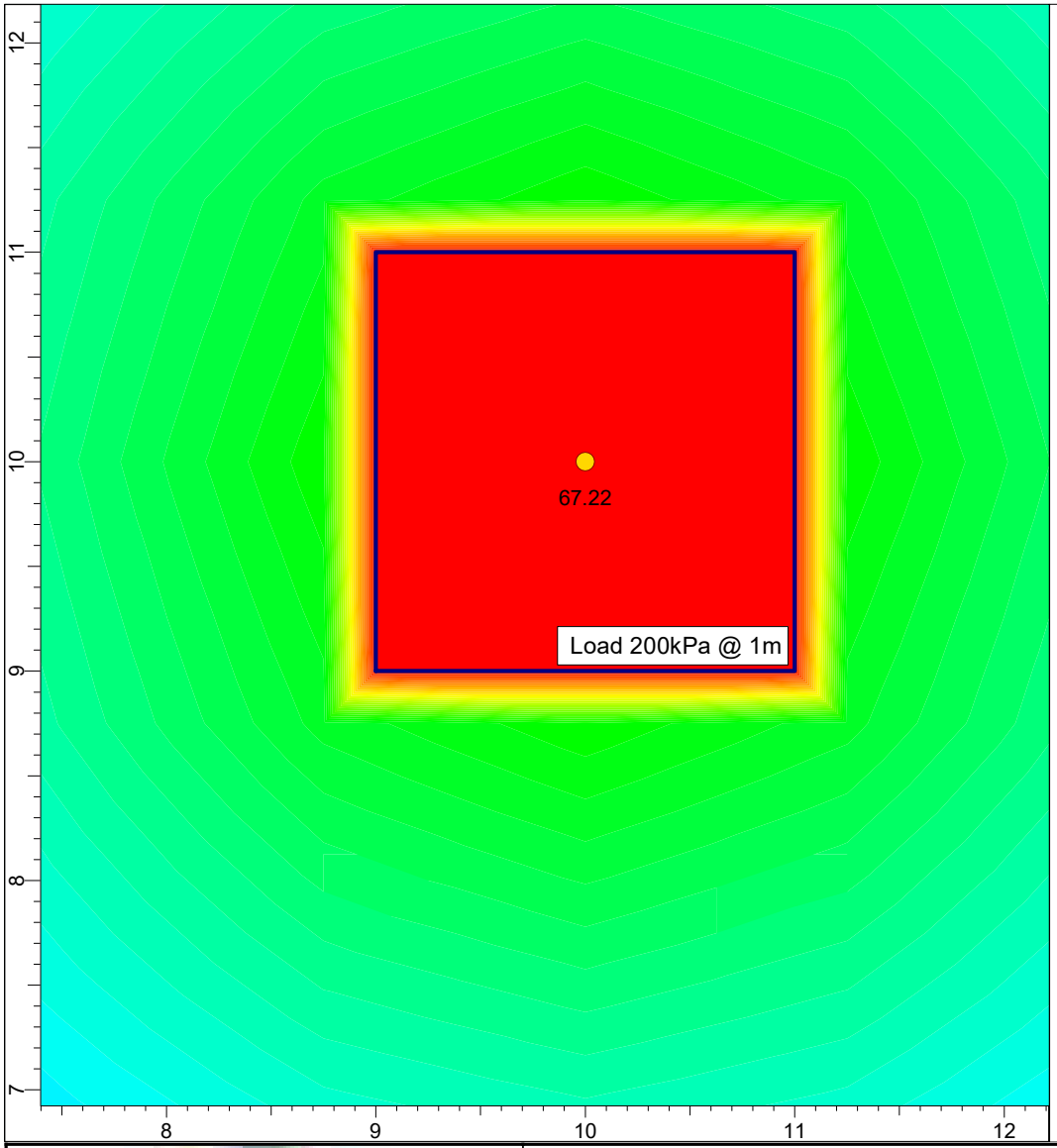
SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Settlement below improved ground	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* Ground improvement to 5m.s3z

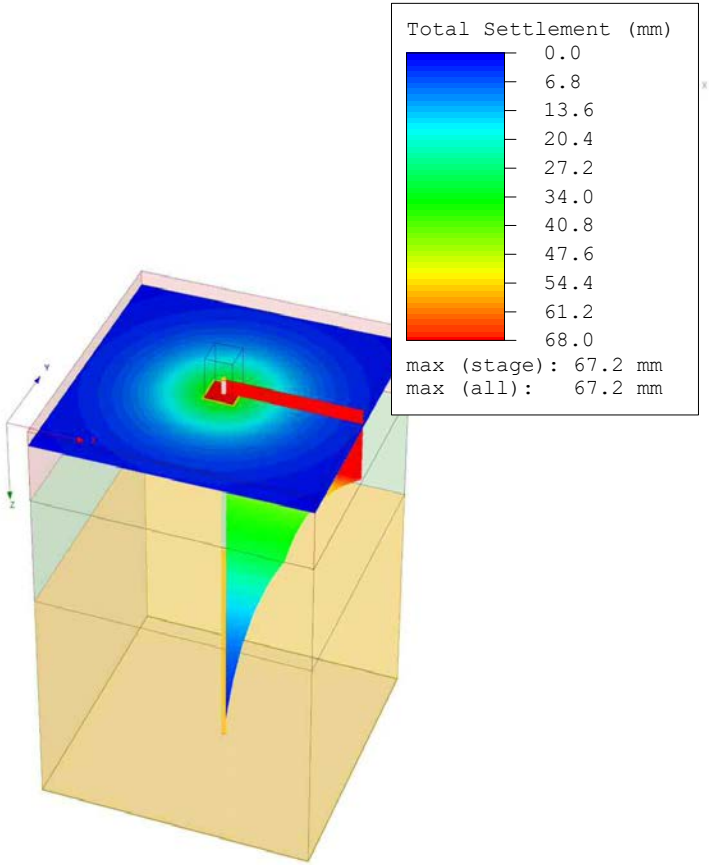




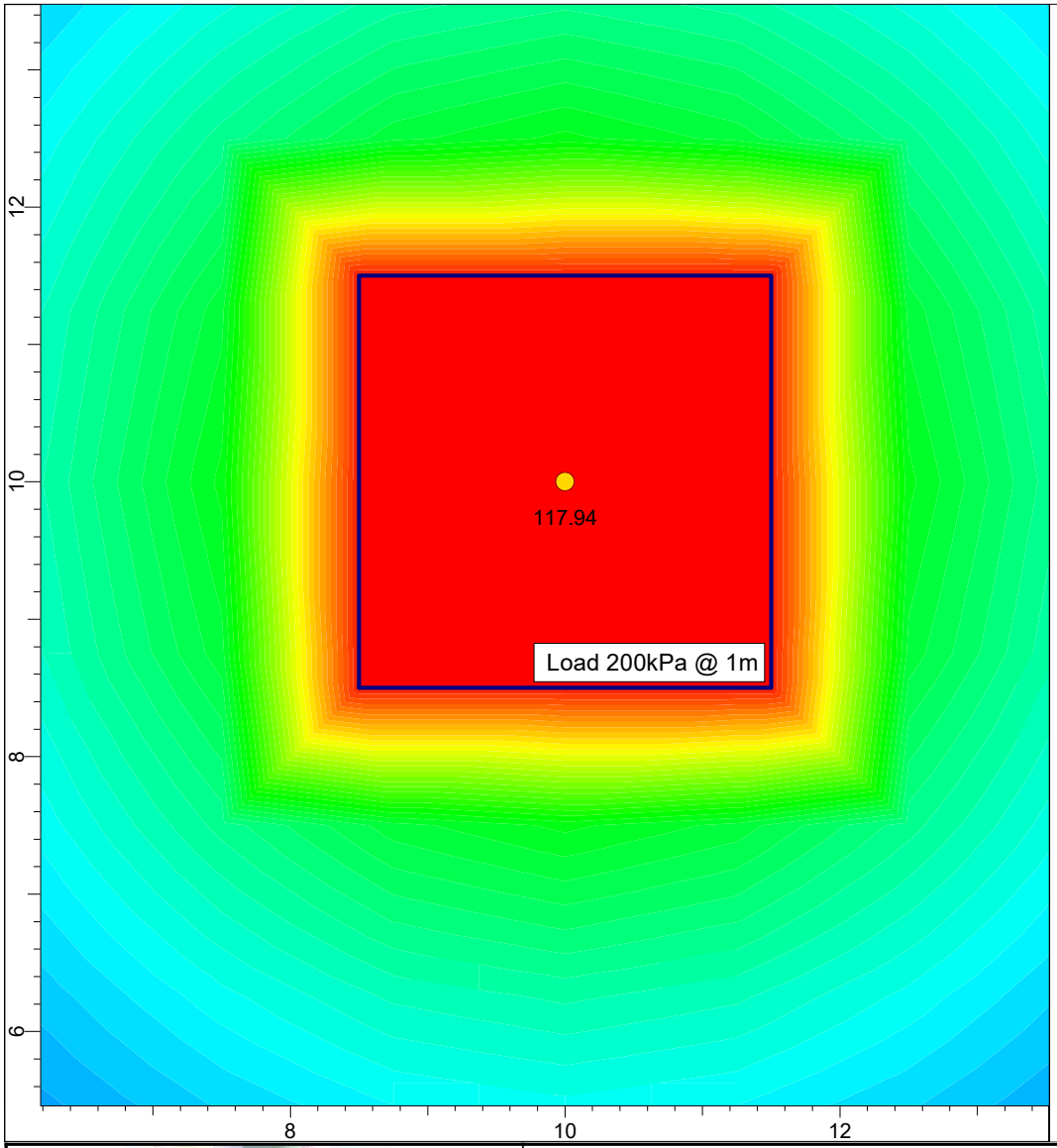


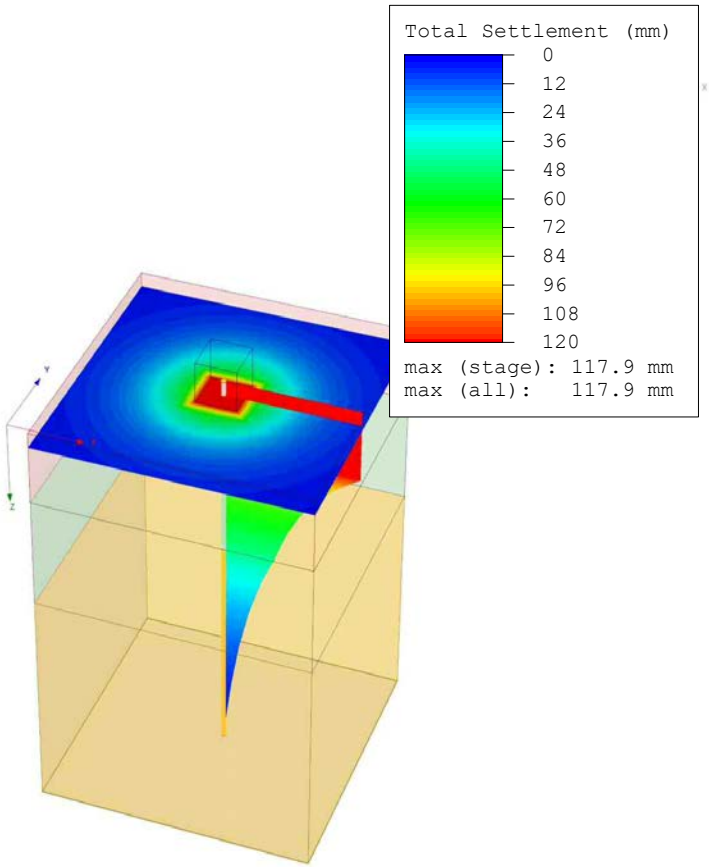
SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Settlement below improved ground	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* Ground improvement to 5m.s3z



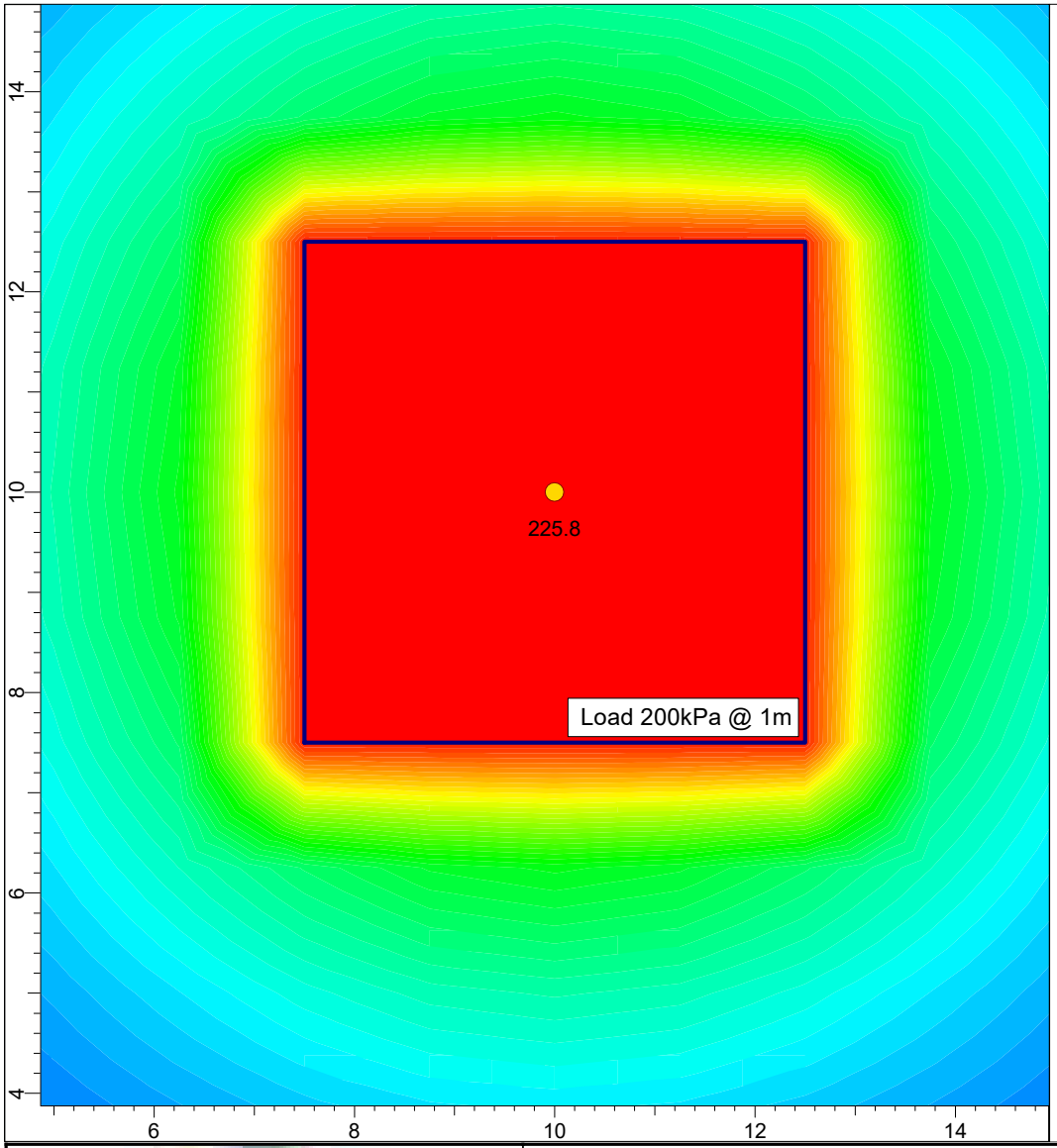


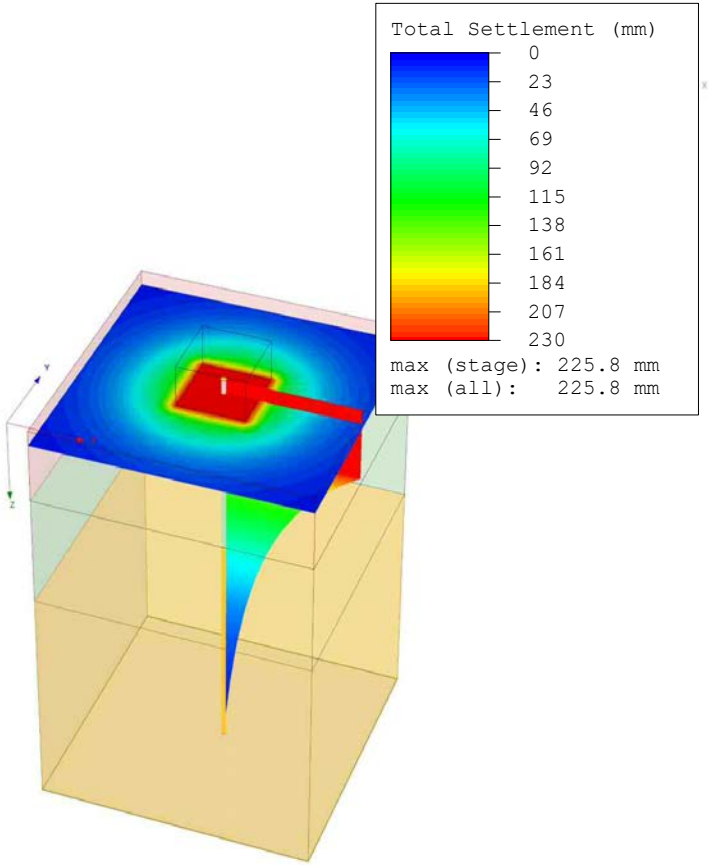
SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Settlement below improved ground	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* Ground improvement to 5m.s3z



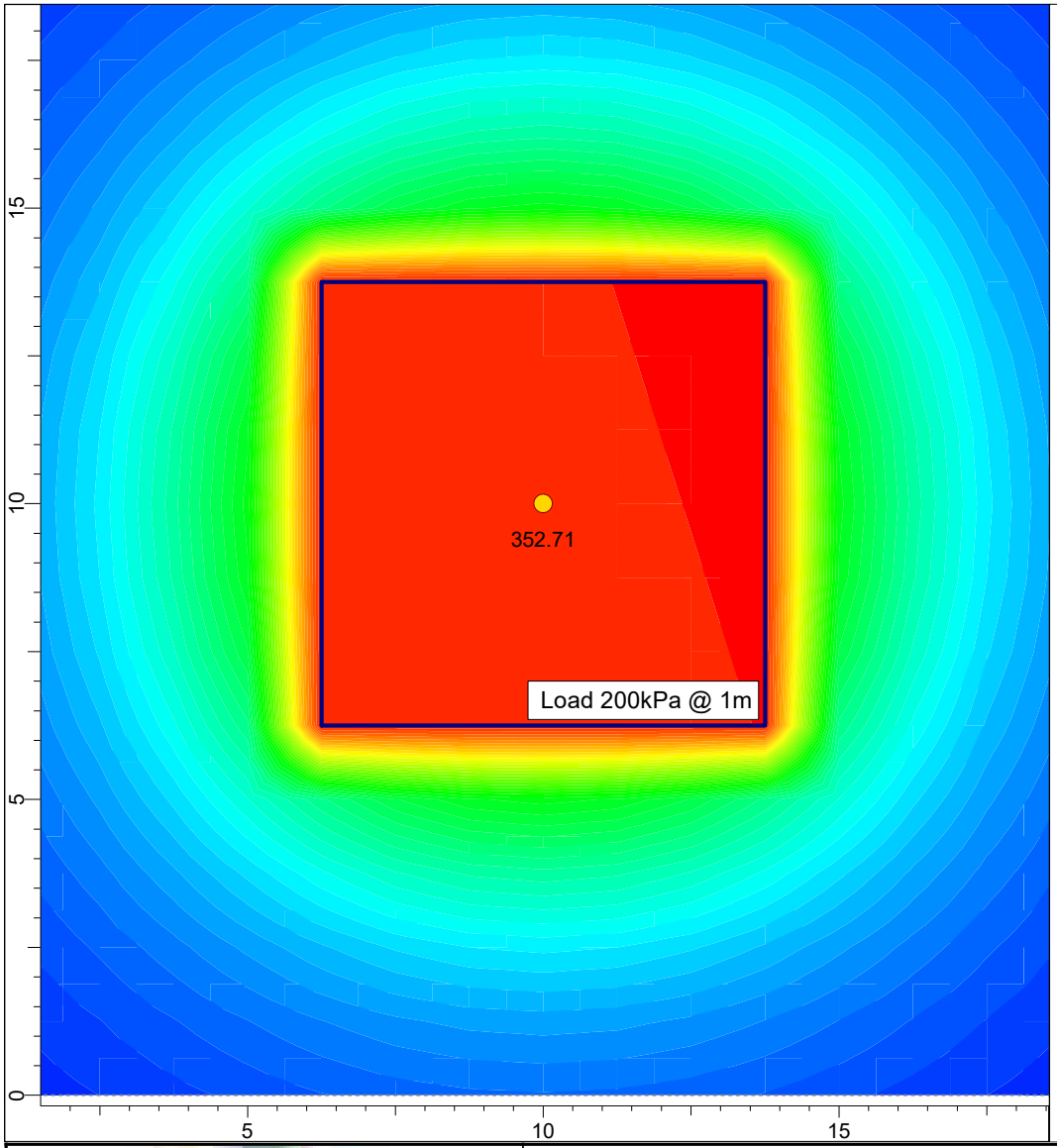


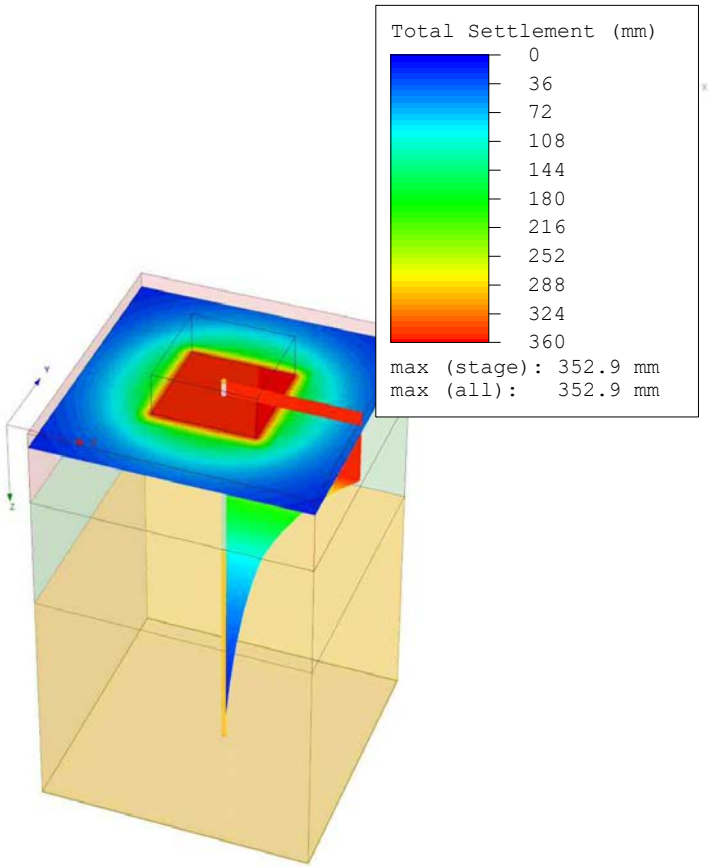
SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Settlement below improved ground	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* Ground improvement to 5m.s3z



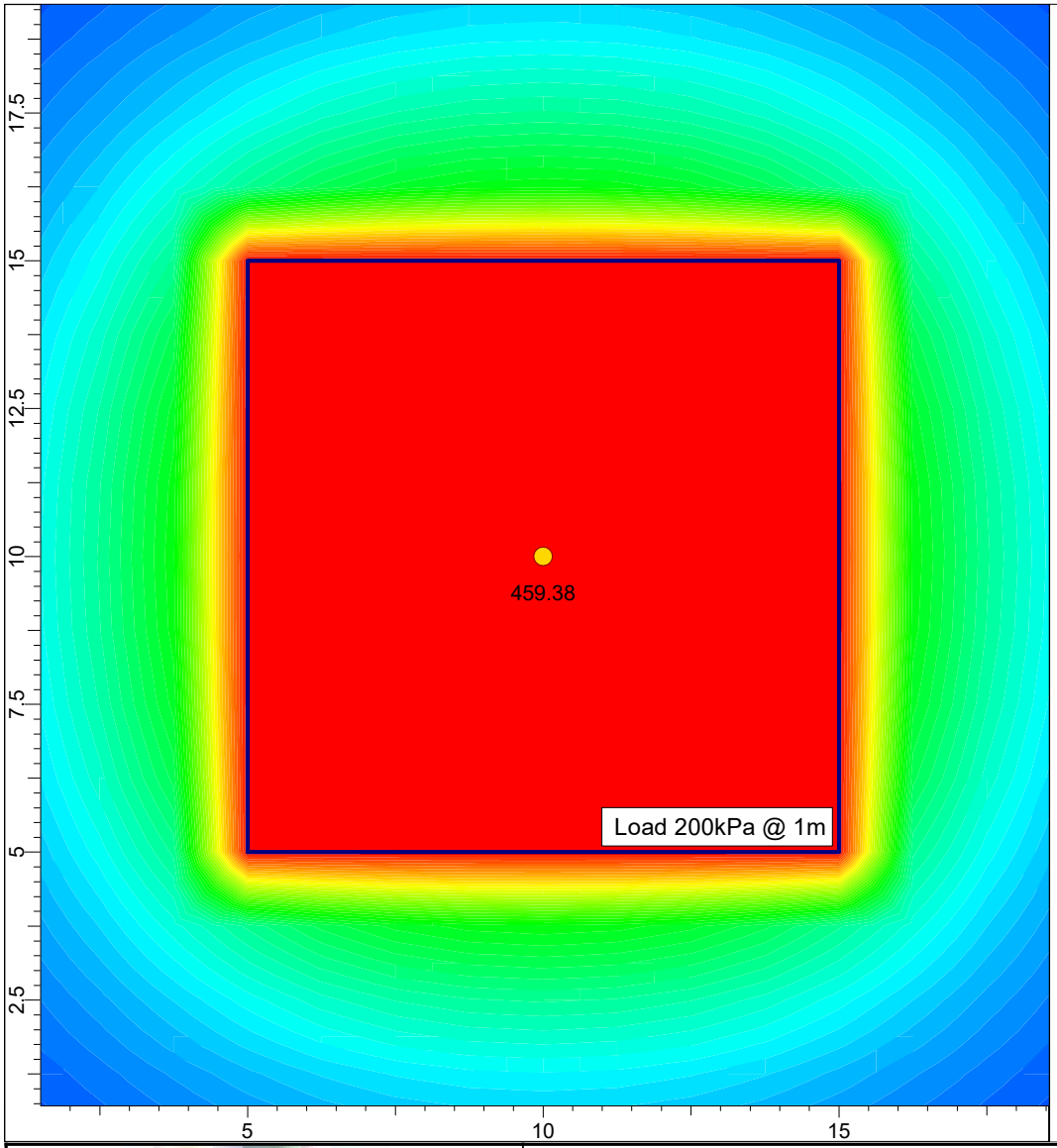


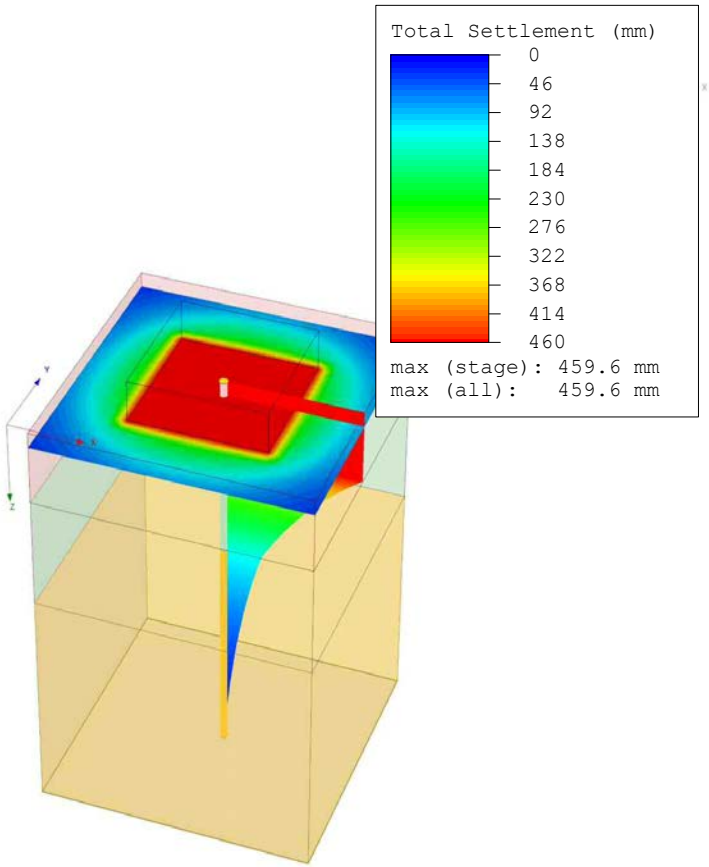
SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Settlement below improved ground	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* Ground improvement to 5m.s3z





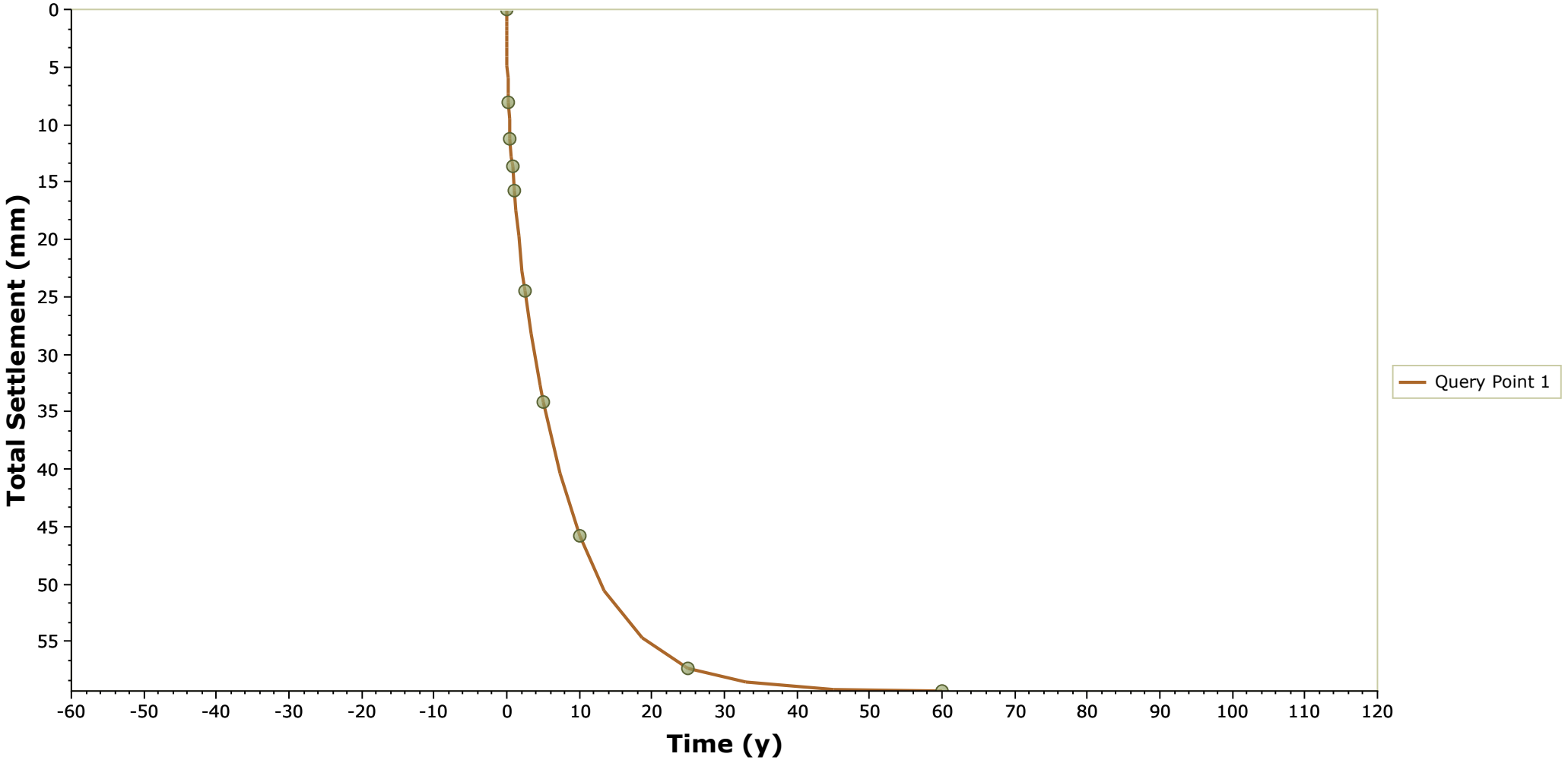
SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Settlement below improved ground	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* Ground improvement to 5m.s3z





SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Settlement below improved ground	
	Drawn By	RJE	*Company* TEC
	Date	10 July 2023	*File Name* Ground improvement to 5m.s3z

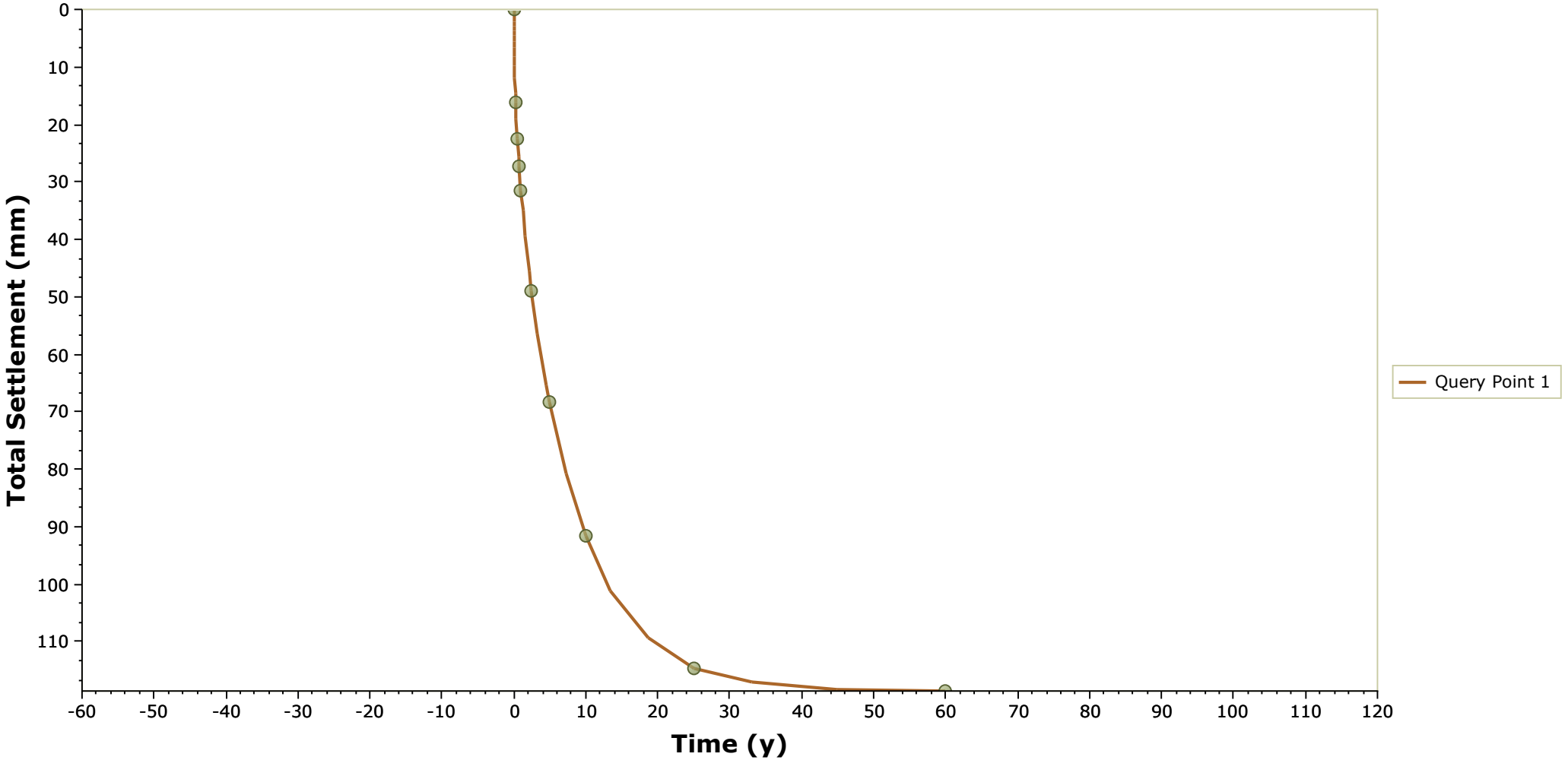
Time vs. Total Settlement



Reference Stage: Stage 1 = 0 y
Total Settlement at Depth = 0 m

SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Bousinesq (10kN/m2 pressure)	
	Drawn By	Richard Evans	*Company* TEC
	Date	07-08-2023	*File Name* General model (No WBS) land raise 2.s3z

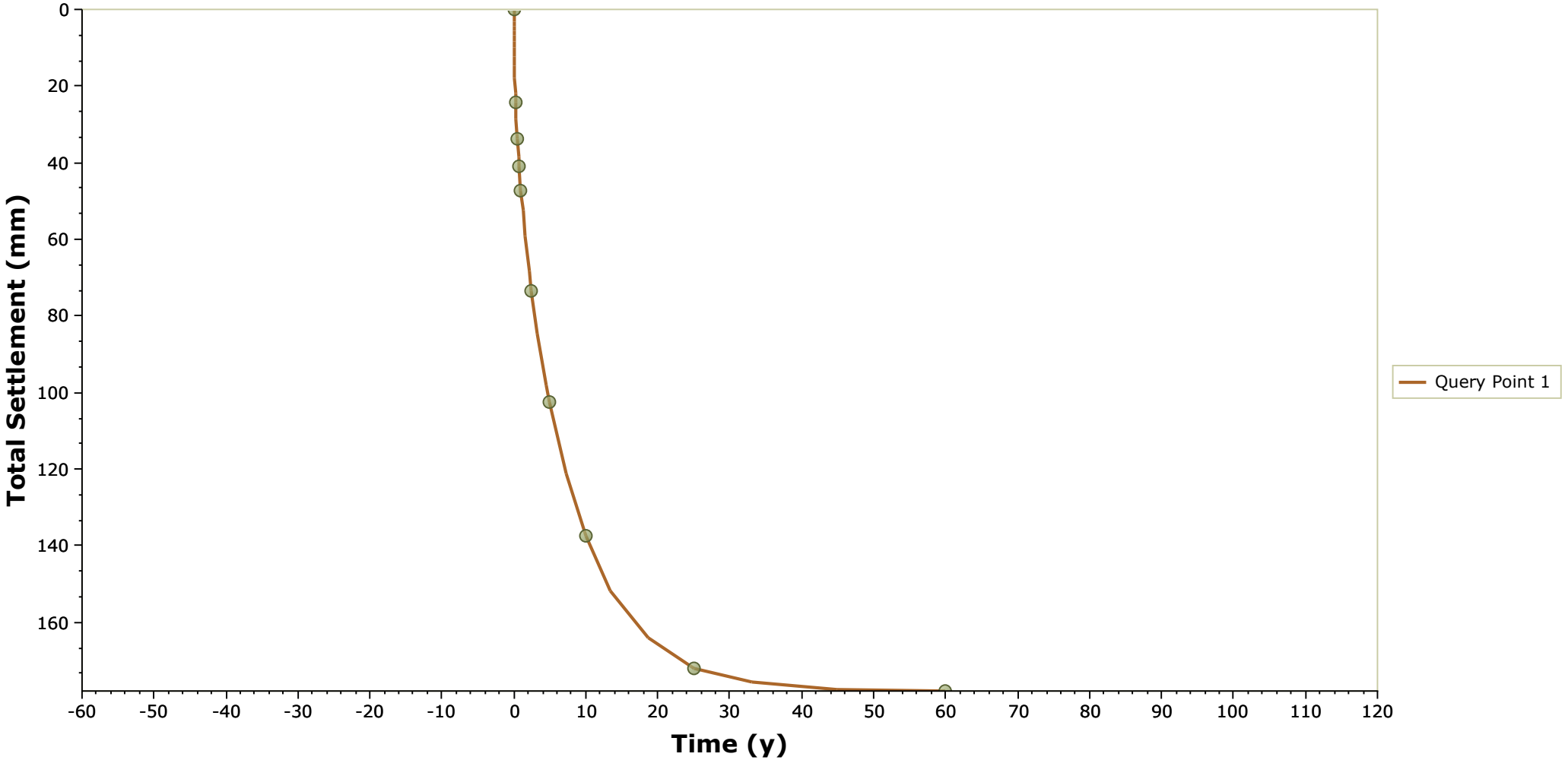
Time vs. Total Settlement



Reference Stage: Stage 1 = 0 y
Total Settlement at Depth = 0 m

SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Bousinesq (20kN/m2 pressure)	
	Drawn By	Richard Evans	*Company* TEC
	Date	07-08-2023	*File Name* General model (No WBS) land raise 2.s3z

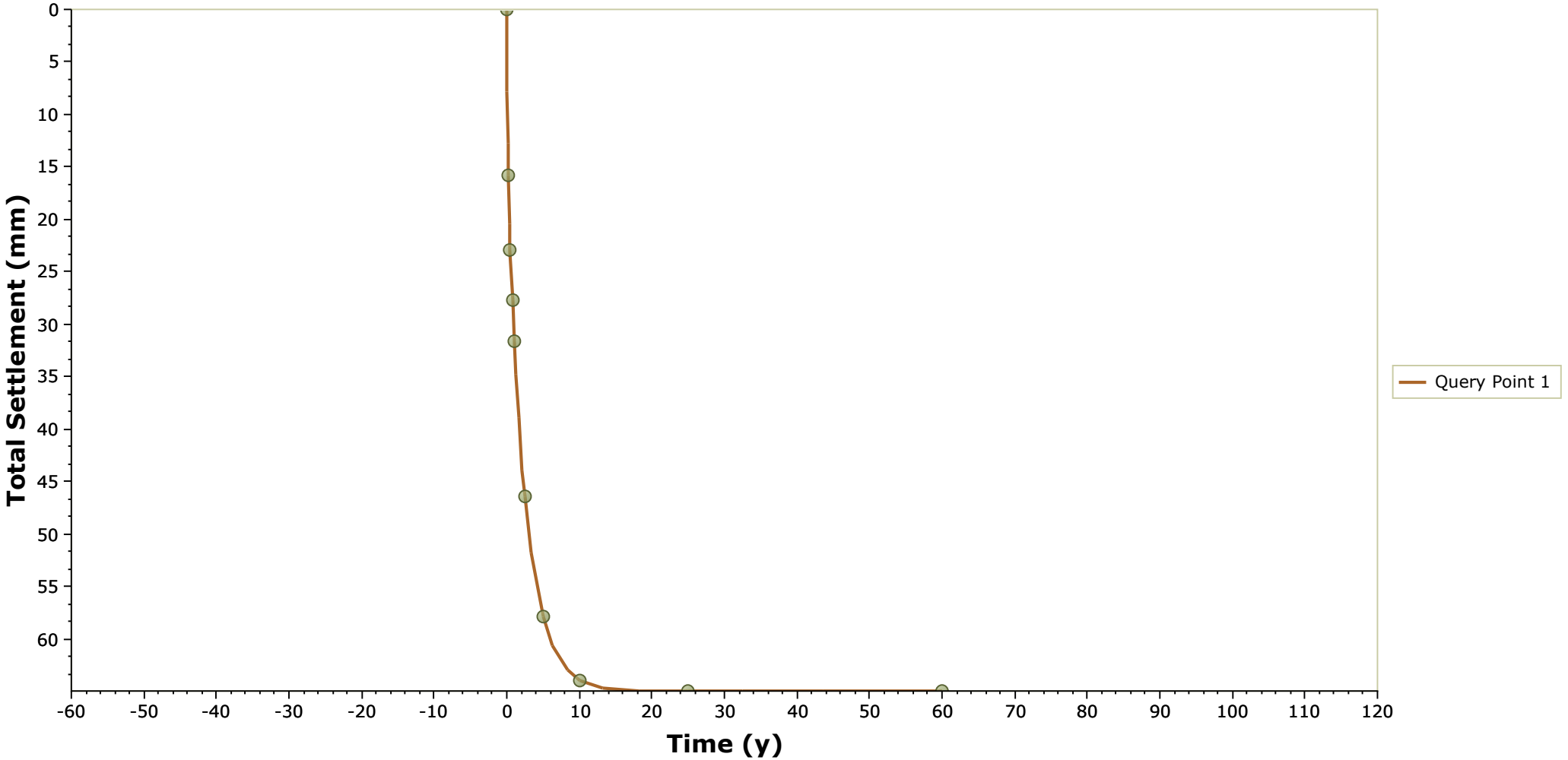
Time vs. Total Settlement



Reference Stage: Stage 1 = 0 y
Total Settlement at Depth = 0 m

SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Bousinesq (30kN/m2 pressure)	
	Drawn By	Richard Evans	*Company* TEC
	Date	07-08-2023	*File Name* General model (No WBS) land raise 2.s3z

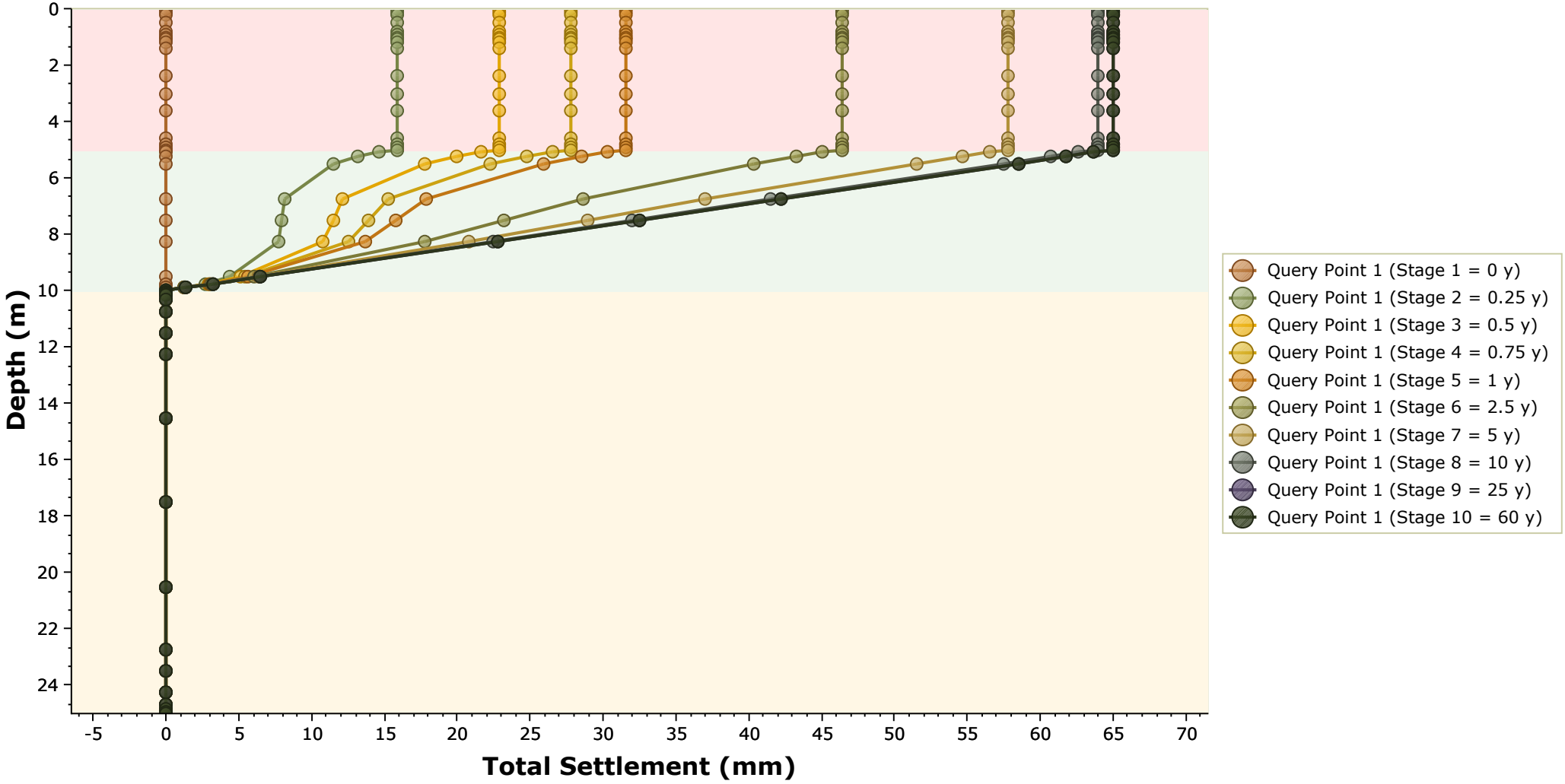
Time vs. Total Settlement



Reference Stage: Stage 1 = 0 y
Total Settlement at Depth = 0 m

SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Bousinesq (20kN/m2 pressure) - 5m deep no settlement zone	
	Drawn By	Richard Evans	*Company* TEC
	Date	07-08-2023	*File Name* General model (No WBS) land raise GI.s3z

Total Settlement vs. Depth



Reference Stage: Stage 1 = 0 y

SETTLE3D 4.023	*Project*	PROJECT DRAGON	
	Analysis Description	Bousinesq (20kN/m2 pressure) - 5m deep no settlement zone	
	Drawn By	Richard Evans	*Company* TEC
	Date	07-08-2023	*File Name* General model (No WBS) land raise GI.s3z

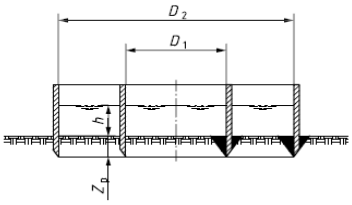
Appendix L

Open Double Ring Infiltrometer Test Results

Open Double Ring Infiltrometer Test

Variable Head Test to BS EN ISO 22282-5

Site:	**Sustainable Aviation Fuel (SAF) Production Facility: PDZ**
Site Reference:	**2111006.005**
Client:	**LanzaTech UK Limited**
Operator:	**RK**
Test Date:	**31 May 2023**
Test Location:	**SA101**



TEST DATA

Test reference	**SA101**
Outer ring diameter, D_2 (cm)	45
Inner ring diameter D_1 (cm)	20
Penetration depth, Z_P (cm)	1

Ring Installation:

Sealing	Pushing	Hammering
	X	X

Test 1

Time (min)	Head (mm)
0	210.0
1	208.0
2	204.0
3	200.0
4	199.0
5	198.0
10	190.0
15	190.0
20	189.0
30	188.0
43	188.0
63	188.0
85	187.0
120	184.0
157	180.0
193	180.0
230	179.0
1173	119.0

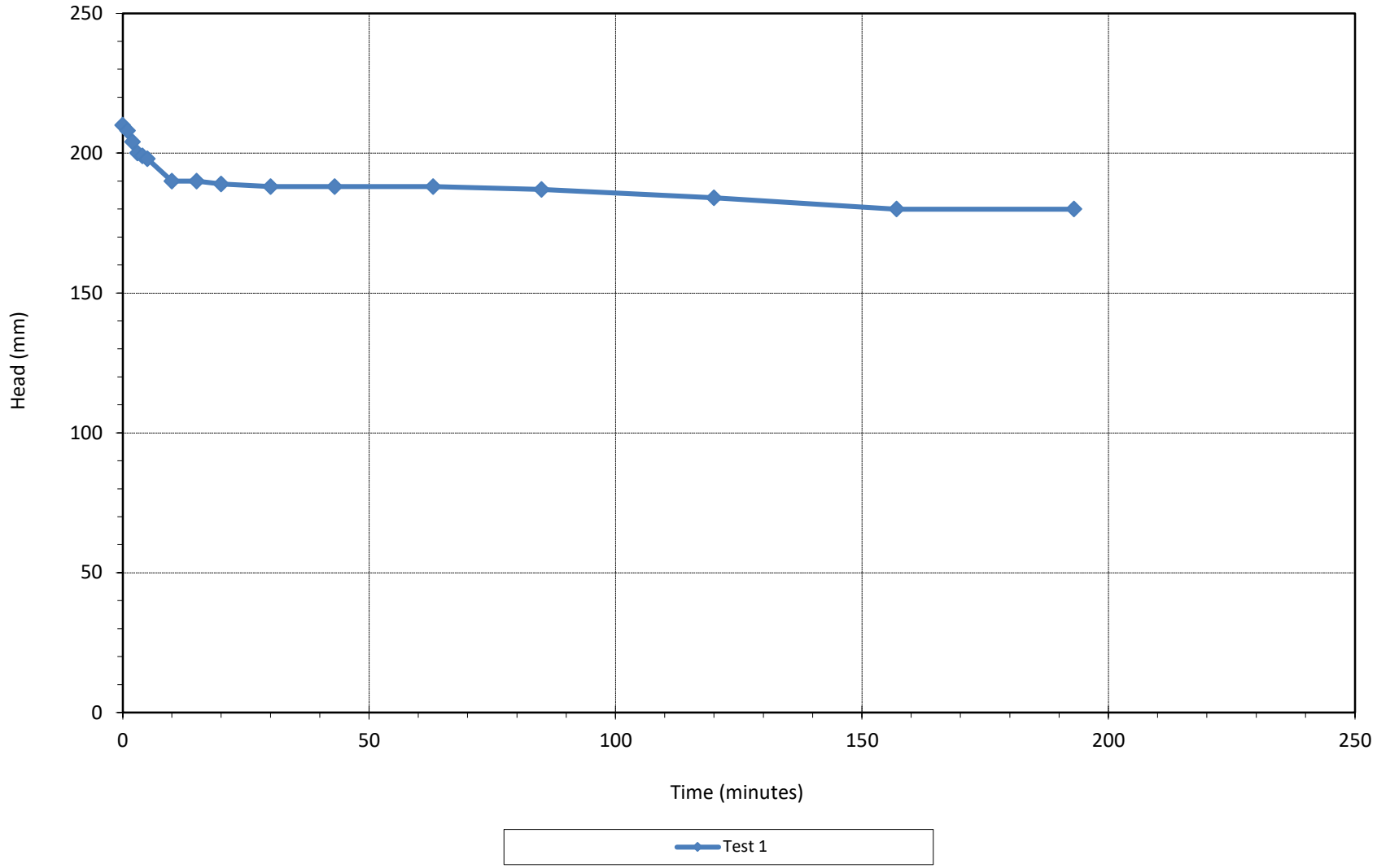
Test 2

Time (min)	Head (mm)

Test 3

Time (min)	Head (mm)

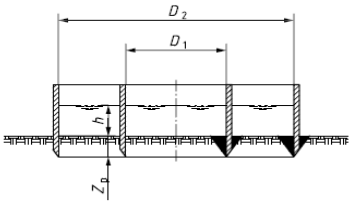
Infiltration Test to BS EN ISI 22282-5:2012 - SA101



Open Double Ring Infiltrometer Test

Variable Head Test to BS EN ISO 22282-5

Site:	**Sustainable Aviation Fuel (SAF) Production Facility: PDZ**
Site Reference:	**2111006.005**
Client:	**LanzaTech UK Limited**
Operator:	**MT**
Test Date:	**31 May 2023**
Test Location:	**SA102**



TEST DATA

Test reference	**SA102**
Outer ring diameter, D_2 (cm)	45
Inner ring diameter D_1 (cm)	20
Penetration depth, Z_P (cm)	1

Ring Installation:

Sealing	Pushing	Hammering
	X	X

Test 1

Time (min)	Head (mm)
0	180
1	178
2	174
3	171
4	168
5	164
6	162
7	159
8	157
9	155
10	152
15	141
20	135
26	127
31	118
36	114
40	110
58	94
72	80
81	75
86	71
116	48
124	40
137	30
156	16

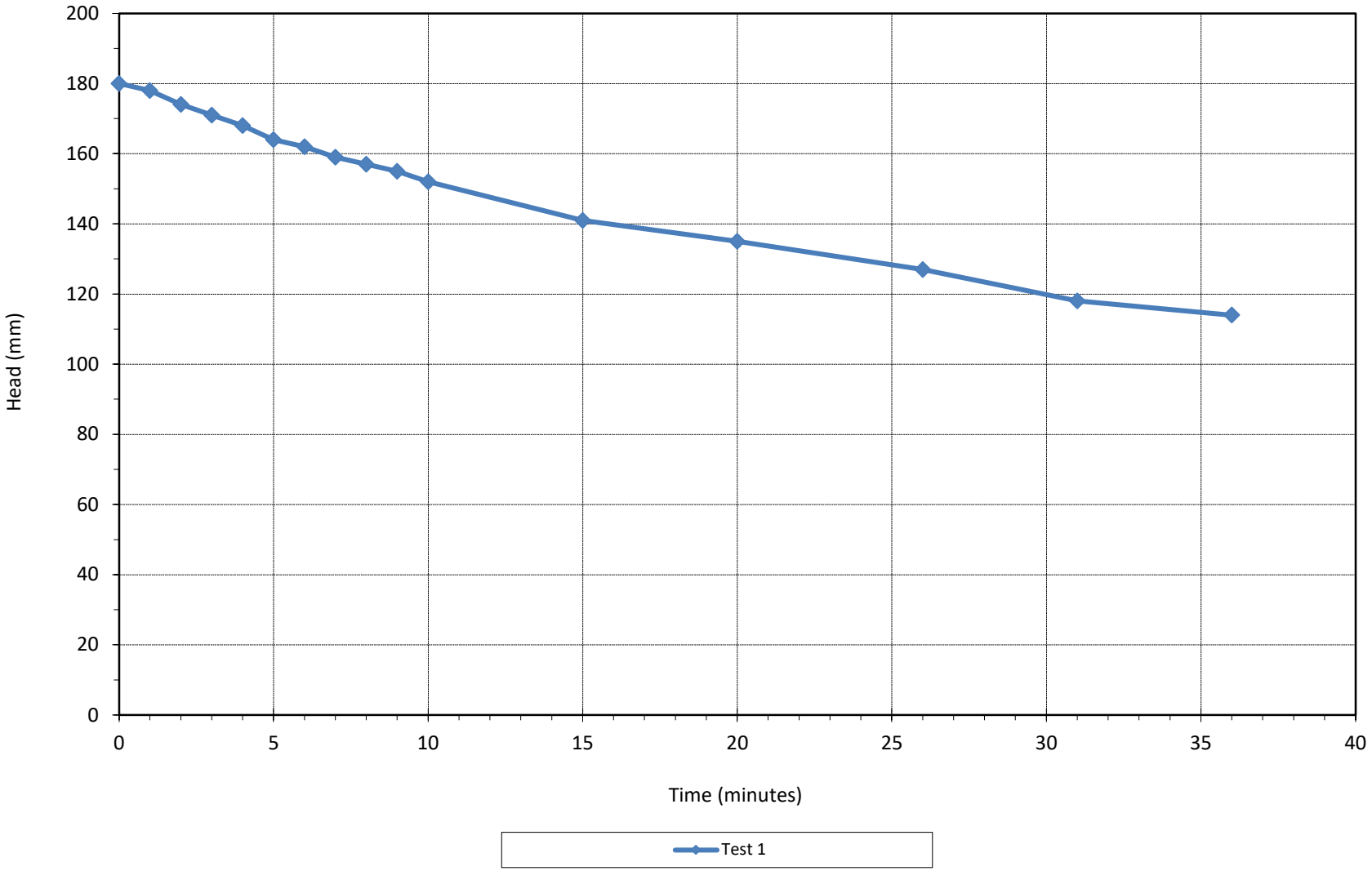
Test 2

Time (min)	Head (mm)

Test 3

Time (min)	Head (mm)

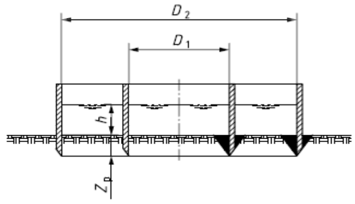
Infiltration Test to BS EN ISI 22282-5:2012 - SA102



Open Double Ring Infiltrometer Test

Variable Head Test to BS EN ISO 22282-5

Site:	**Sustainable Aviation Fuel (SAF) Production Facility: PDZ**
Site Reference:	**2111006.005**
Client:	**LanzaTech UK Limited**
Operator:	**RK**
Test Date:	**01 June 2023**
Test Location:	**SA103**



TEST DATA

Test reference	**SA103**
Outer ring diameter, D_2 (cm)	45
Inner ring diameter D_1 (cm)	20
Penetration depth, Z_p (cm)	1

Ring Installation:

Sealing	Pushing	Hammering
	X	X

Test 1

Time (min)	Head (mm)
0	170
1	165
2	159
3	152
4	146
5	141
6	134
7	130
8	128
9	126
10	125
12	123
15	120
18	117
21	110
26	105
36	97
46	87
56	74
66	69
77	58
87	49
97	39
117	25
127	11

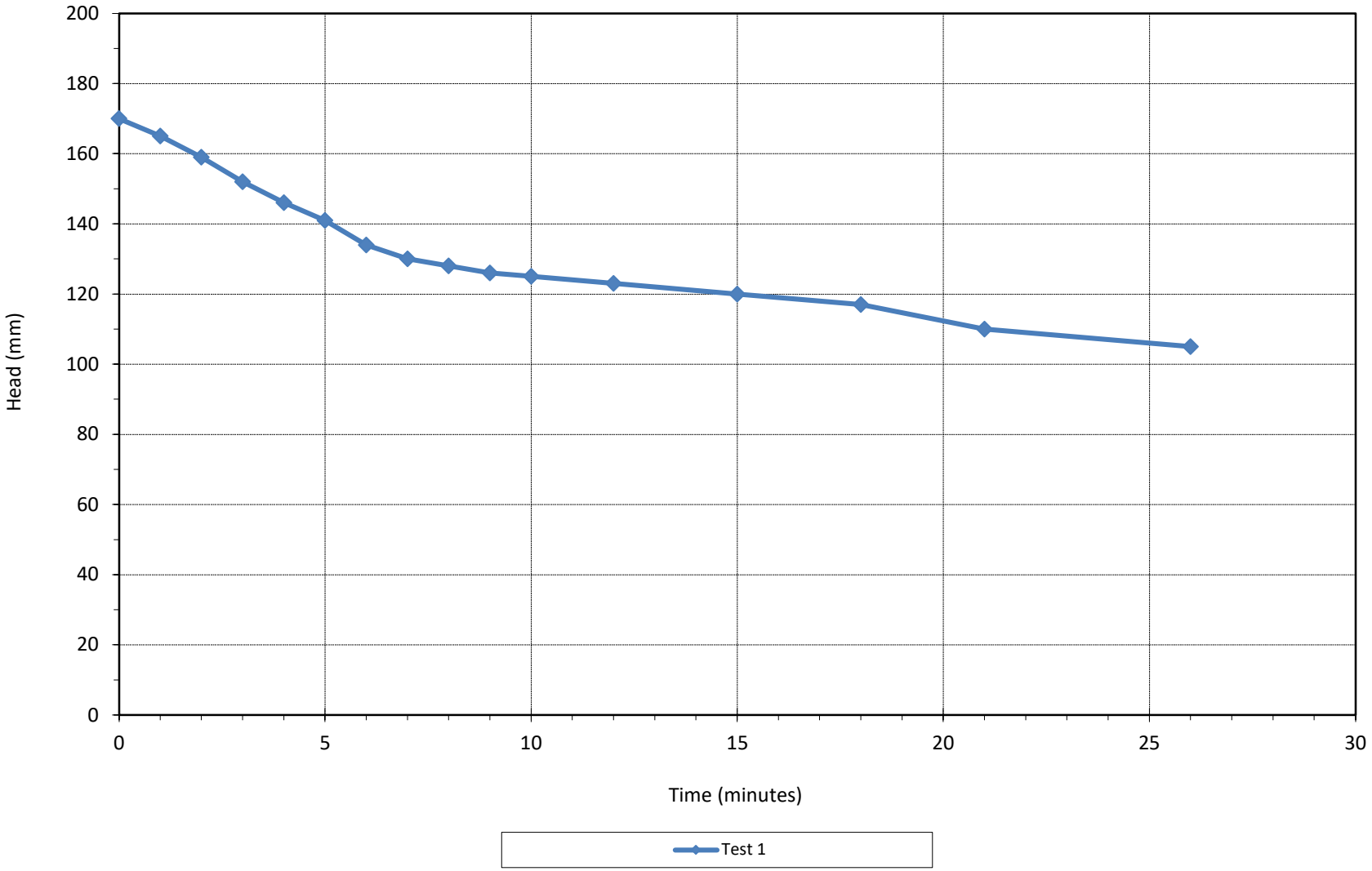
Test 2

Time (min)	Head (mm)

Test 3

Time (min)	Head (mm)

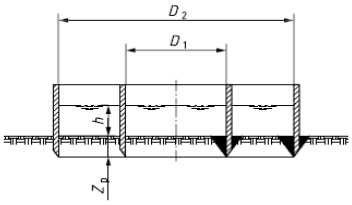
Infiltration Test to BS EN ISI 22282-5:2012 - SA103



Open Double Ring Infiltrometer Test

Variable Head Test to BS EN ISO 22282-5

Site:	**Sustainable Aviation Fuel (SAF) Production Facility: PDZ**
Site Reference:	**2111006.005**
Client:	**LanzaTech UK Limited**
Operator:	**MT**
Test Date:	**01 June 2023**
Test Location:	**SA104**



TEST DATA

Test reference	**SA104**
Outer ring diameter, D_2 (cm)	45
Inner ring diameter D_1 (cm)	20
Penetration depth, Z_P (cm)	1

Ring Installation:

Sealing	Pushing	Hammering
	X	X

Test 1

Time (min)	Head (mm)
0	179
1	178
2	175
3	174
4	172
5	171
6	170
7	169
8	168
9	167
11	166
15	161
18	155
25	152
30	145
37	140
40	136
45	133
50	129
60	115
70	110
80	106
90	96
100	88
110	79
120	76
130	70
140	63
150	54
160	48
180	45.0
195	40.0
210	32.0

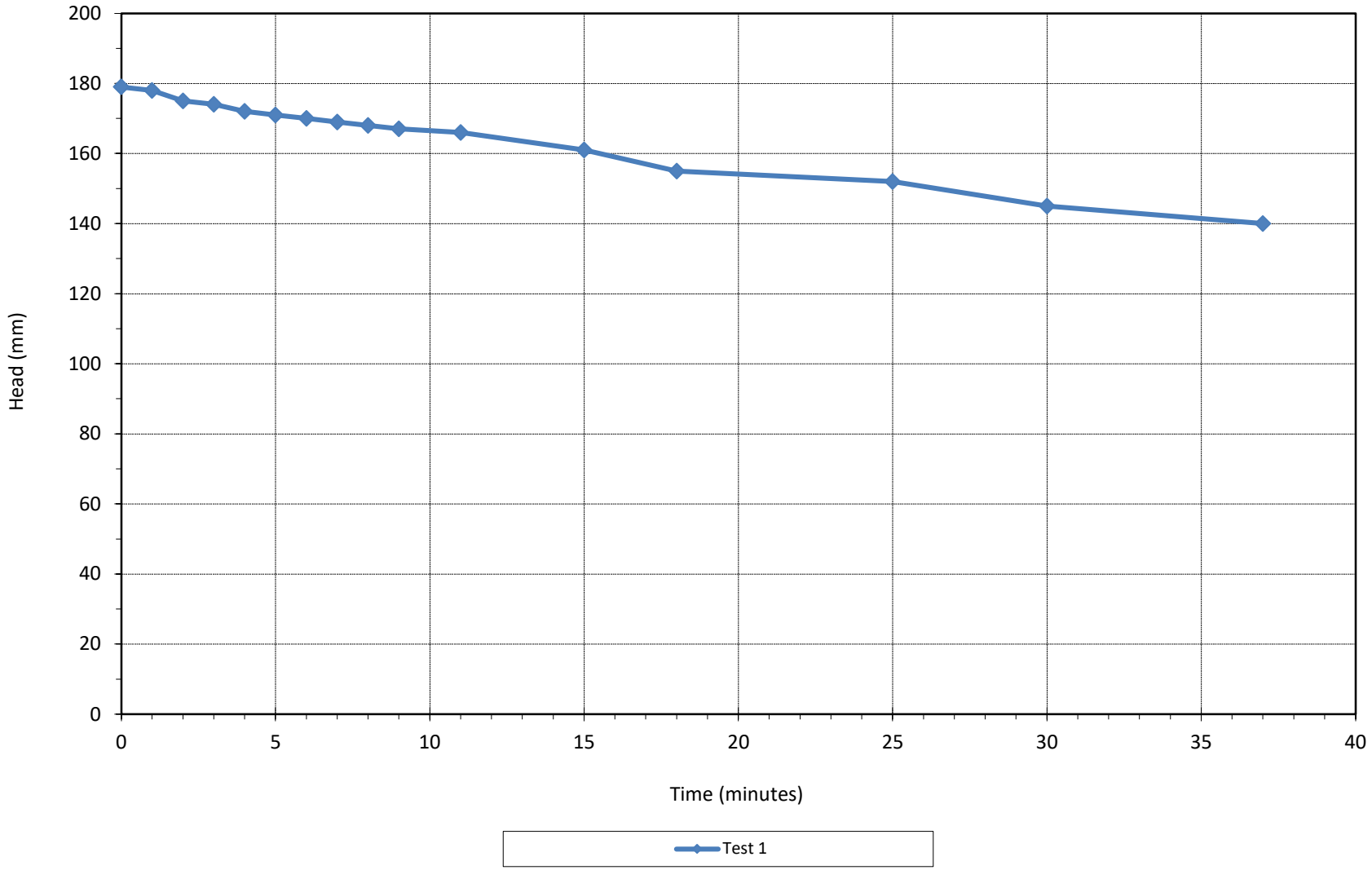
Test 2

Time (min)	Head (mm)

Test 3

Time (min)	Head (mm)

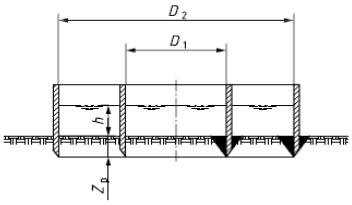
Infiltration Test to BS EN ISI 22282-5:2012 - SA104



Open Double Ring Infiltrometer Test

Variable Head Test to BS EN ISO 22282-5

Site:	**Sustainable Aviation Fuel (SAF) Production Facility: PDZ**
Site Reference:	**2111006.005**
Client:	**LanzaTech UK Limited**
Operator:	**RK**
Test Date:	**31 May 2023**
Test Location:	**SA105**



TEST DATA

Test reference	**SA105**
Outer ring diameter, D_2 (cm)	45
Inner ring diameter D_1 (cm)	20
Penetration depth, Z_P (cm)	1

Ring Installation:

Sealing	Pushing	Hammering
	X	X

Test 1

Time (min)	Head (mm)
0	168
1	165
2	163
3	162
4	161
5	160
10	159
30	158
40	156
50	156
60	155
70	154
80	150
96	149
104	145
120	145
1064	97

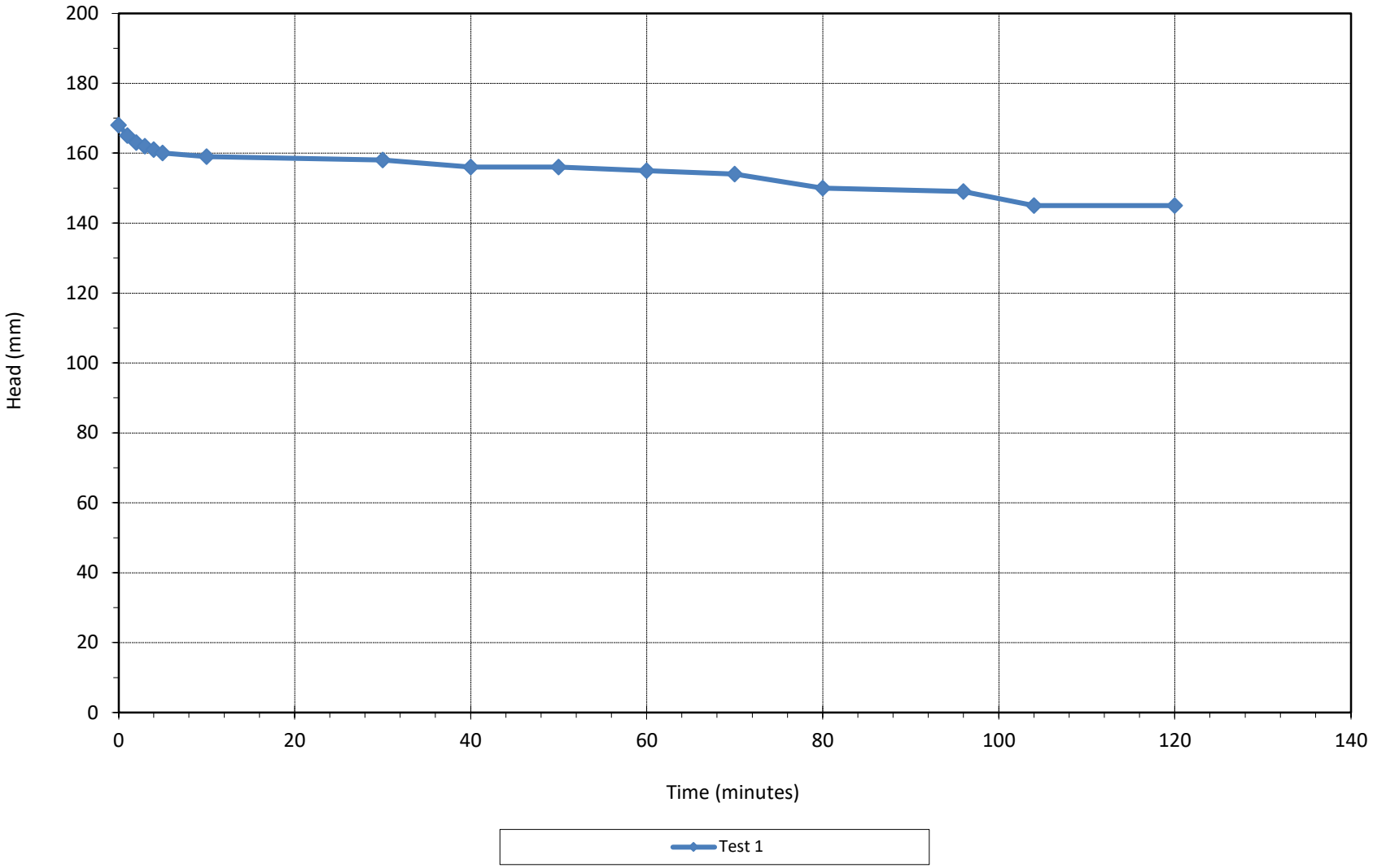
Test 2

Time (min)	Head (mm)

Test 3

Time (min)	Head (mm)

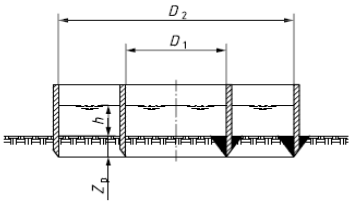
Infiltration Test to BS EN ISI 22282-5:2012 - SA105



Open Double Ring Infiltrometer Test

Variable Head Test to BS EN ISO 22282-5

Site:	**Sustainable Aviation Fuel (SAF) Production Facility: PDZ**
Site Reference:	**2111006.005**
Client:	**LanzaTech UK Limited**
Operator:	**RK**
Test Date:	**31 May 2023**
Test Location:	**SA106**



TEST DATA

Test reference	**SA106**
Outer ring diameter, D_2 (cm)	45
Inner ring diameter D_1 (cm)	20
Penetration depth, Z_P (cm)	1

Ring Installation:

Sealing	Pushing	Hammering
	X	X

Test 1

Time (min)	Head (mm)
0	160
1	132
2	119
3	99
4	85
5	66
6	52
7	38
8	23
9	Dry

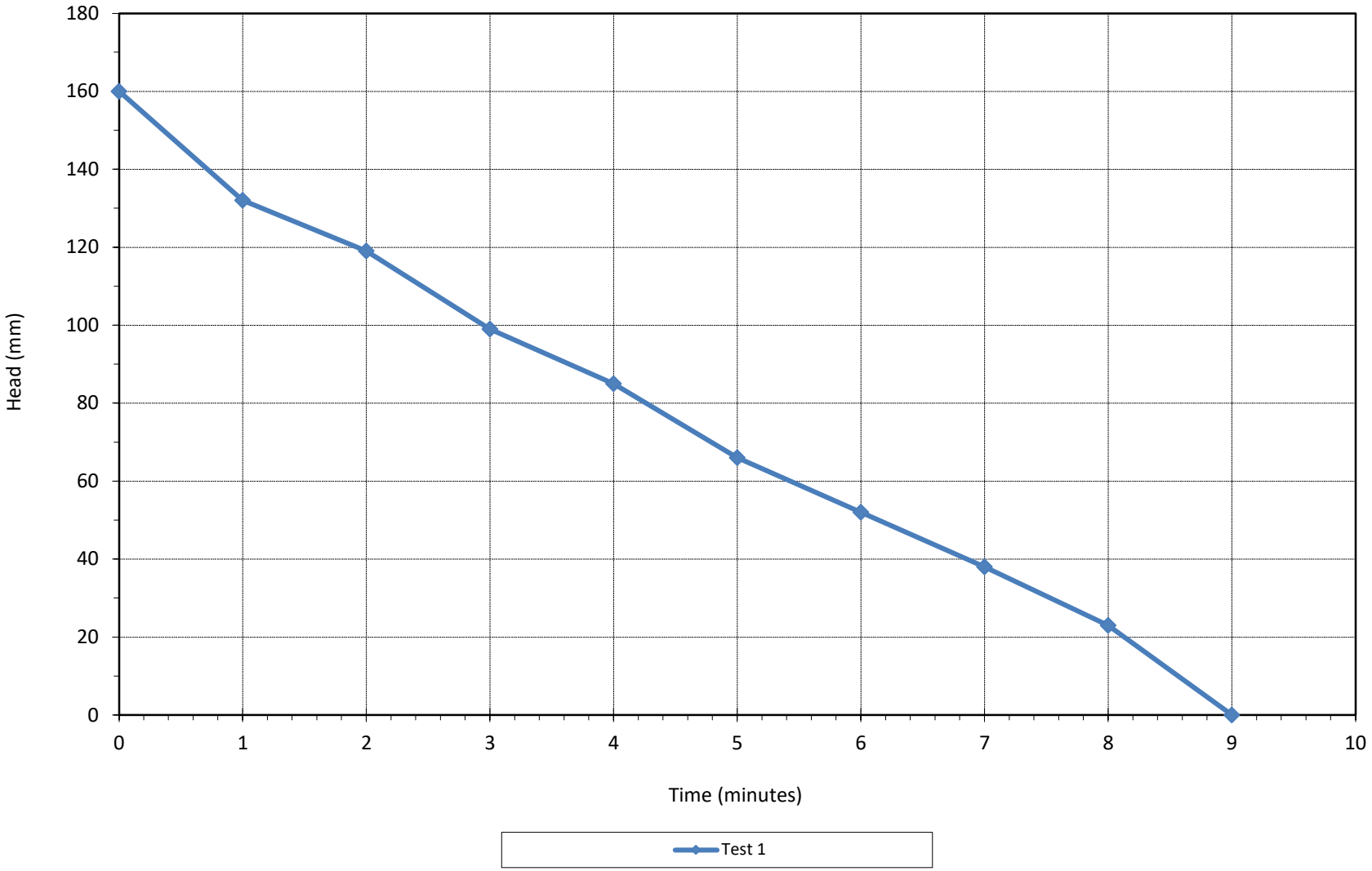
Test 2

Time (min)	Head (mm)

Test 3

Time (min)	Head (mm)

Infiltration Test to BS EN ISI 22282-5:2012 - SA106



Appendix M

Plate Load Bearing Test Results

Apex Testing Solutions
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Village Farm Industrial Estate
Pyle
Bridgend
CF33 6BZ
Telephone :01656 746762
Facsimile :01656 749096
Email andrew.grogan@apex-drilling.com

REPORT No.	:	**D23234**
CLIENT	:	T.E.C.
SITE	:	Phoenix Wharf
MATERIAL DESCRIPTION	:	See Individual Tests Results
DATE TESTED	:	19 May 2023
TESTING REQUIRED	:	8 No. Plate Load Bearing Tests
RELEVANT SPECIFICATION	:	BS 1377 : Part 9 : 1990 In House Method / Clients Specification CD 225 Rev 1 (Supersedes IAN 73/06 rev 1)
TEST METHOD	:	Clause 4.1.6.4.2
TEST RESULTS	:	See Pages 3 – 10

Apex Testing Solutions
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REPORT No. : **D23234**

CLIENT : T.E.C.

SITE : Phoenix Wharf

TEST LOCATION : 8 No. Locations as instructed by Client

DEPTH (m) : See Individual Test Results

Reaction Load : 8T JCB

Plate Diameter : 300 mm

TEST RESULTS

Test No.	1	2	3	4	5	6	7	8		
CBR%	44	51	12	4.7	2.1	2.8	14	U		

Test No.										
CBR%										

COMMENTS U = Undetermined
Unable to apply preload pressure on CBR 8: TP106@0.3m. Too soft to test.

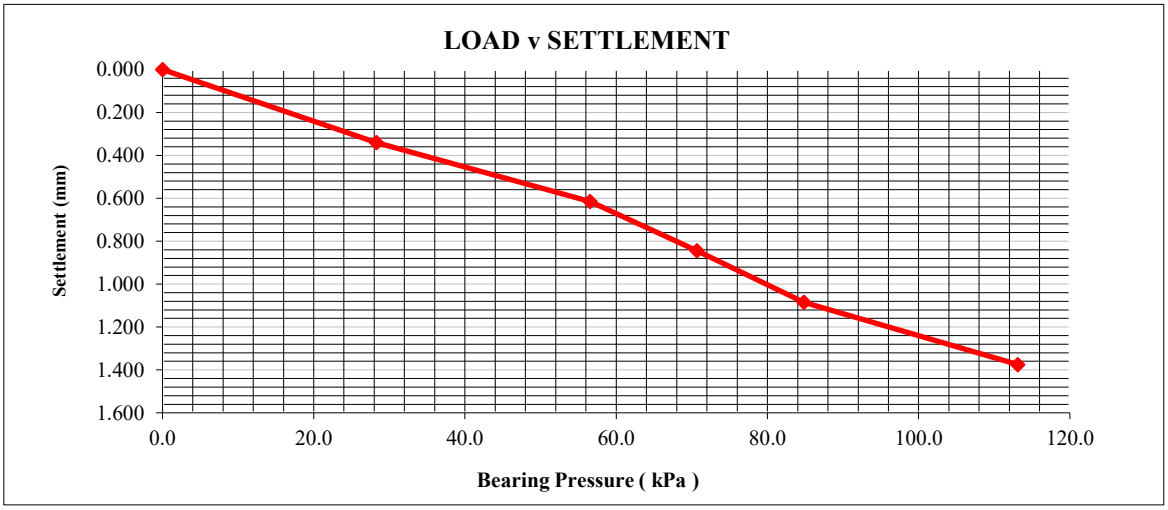
Weather - Overcast

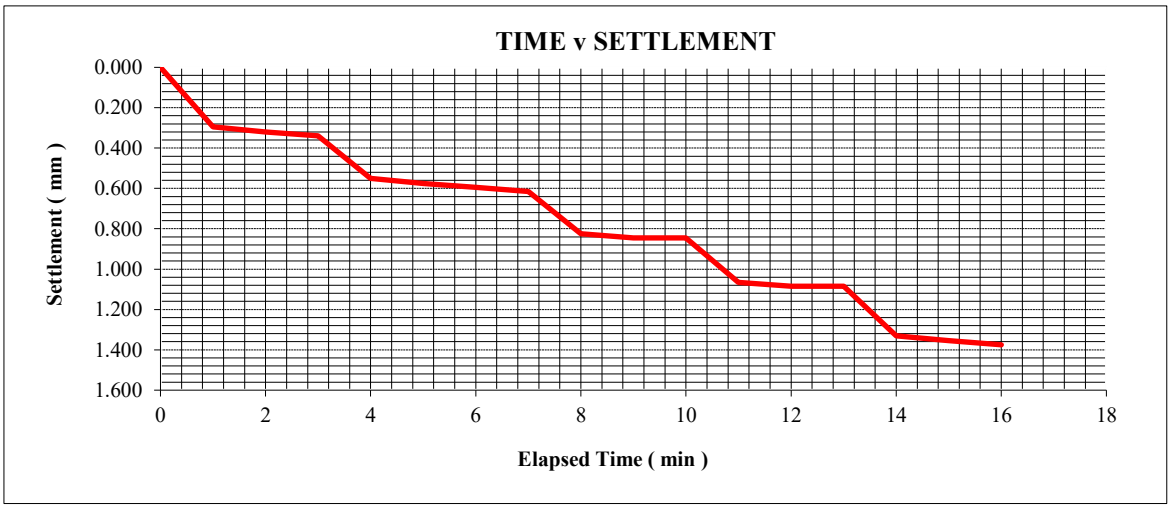
CHECKED BY: **G Llewellyn** **DATE :** **22/05/2023**

REPORT No : D23234
CLIENT : T.E.C.
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **4**	
DATE TESTED	: 19 May 2023	
SAMPLE TYPE	: Recompacted	
DEPTH (m)	: 300mm b.e.g.l.	
SAMPLE DESCRIPTION	: Brown mottled grey slightly clayey SAND	
LOCATION	: **TP102**	
Plate Size	: 300 mm	
LOAD TO ACHIEVE 1.25mm SETTLEMENT >	:	**100.93 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >	:	**35665 kN/m2/m**
Equivalent CBR VALUE >	:	**4.7 %**

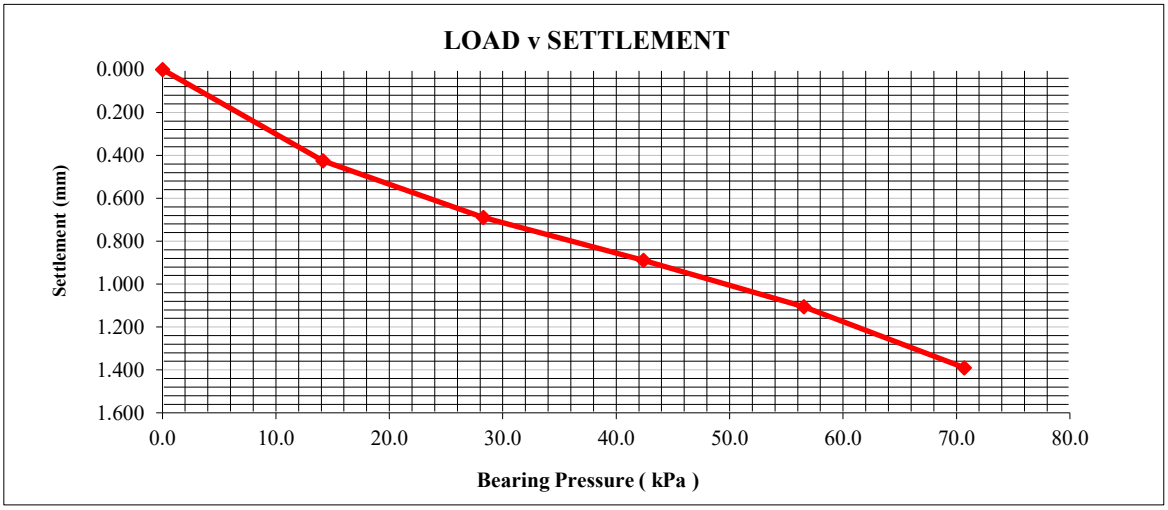


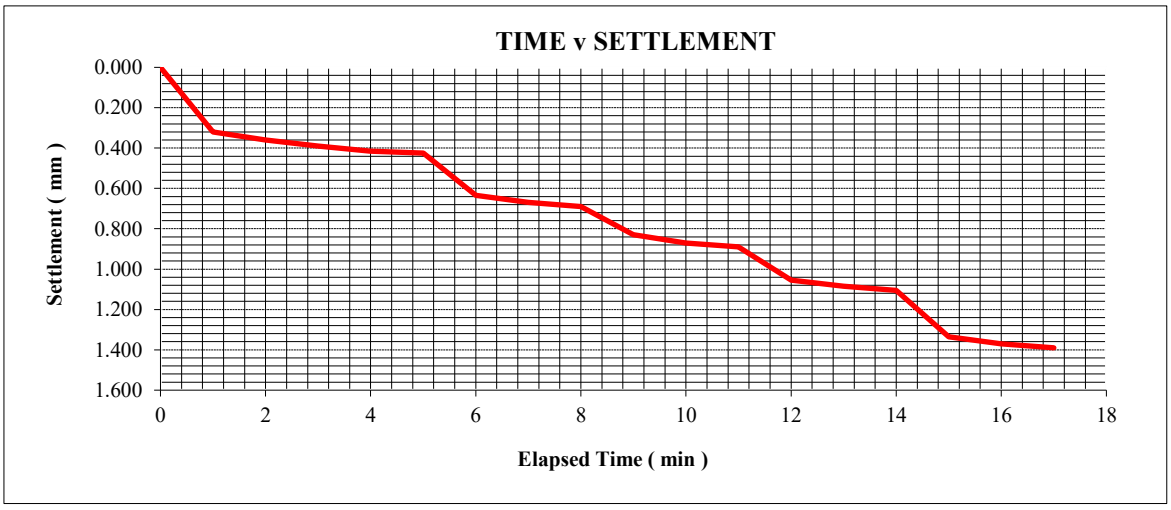


REPORT No : D23234
CLIENT : T.E.C.
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **5**	
DATE TESTED	: 19 May 2023	
SAMPLE TYPE	: Recompacted	
DEPTH (m)	: 300mm b.e.g.l.	
SAMPLE DESCRIPTION	: Black clayey SAND	
LOCATION	: **TP104**	
Plate Size	: 300 mm	
LOAD TO ACHIEVE 1.25mm SETTLEMENT >	:	**63.75 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >	:	**22528 kN/m2/m**
Equivalent CBR VALUE >	:	**2.1 %**

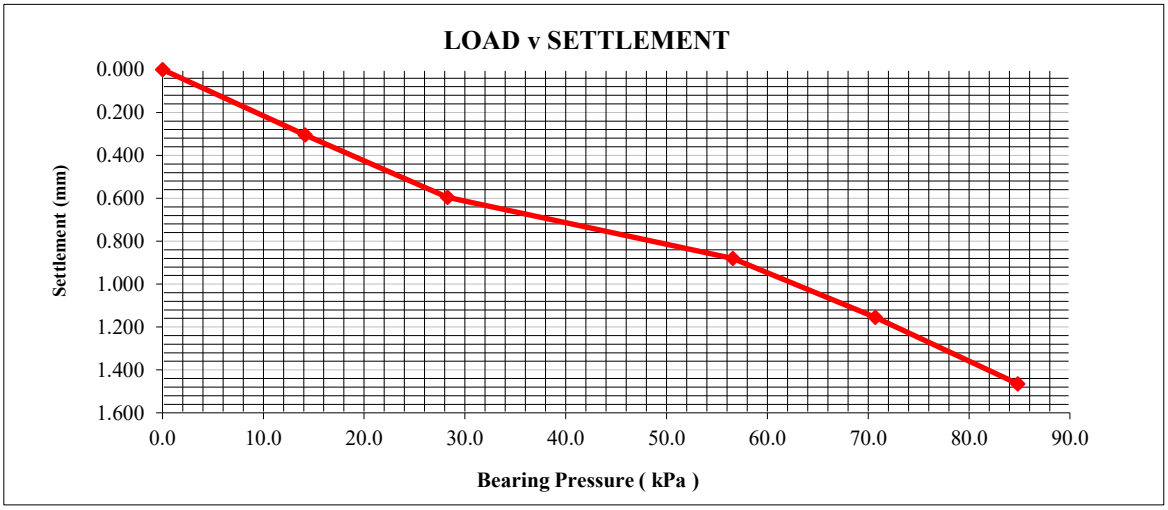


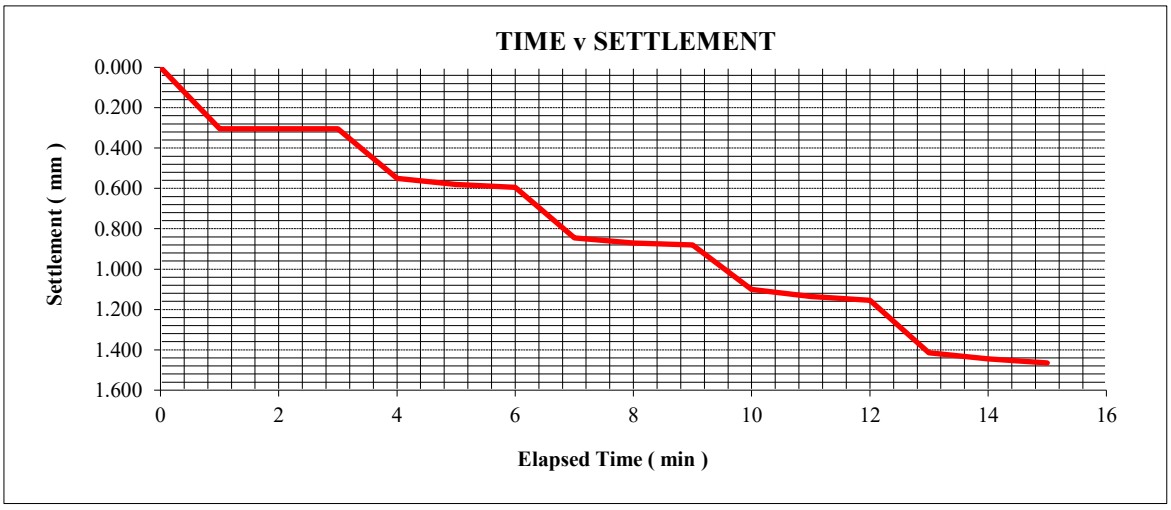


REPORT No : D23234
CLIENT : T.E.C.
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **6**		
DATE TESTED	: 19 May 2023		
SAMPLE TYPE	: Recompacted		
DEPTH (m)	: 300mm b.e.g.l.		
SAMPLE DESCRIPTION	: Black gravelly CLAY		
LOCATION	: **TP101**		
Plate Size	: 300 mm		
LOAD TO ACHIEVE 1.25mm SETTLEMENT >		:	**75.03 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >		:	**26514 kN/m2/m**
Equivalent CBR VALUE >		:	**2.8 %**

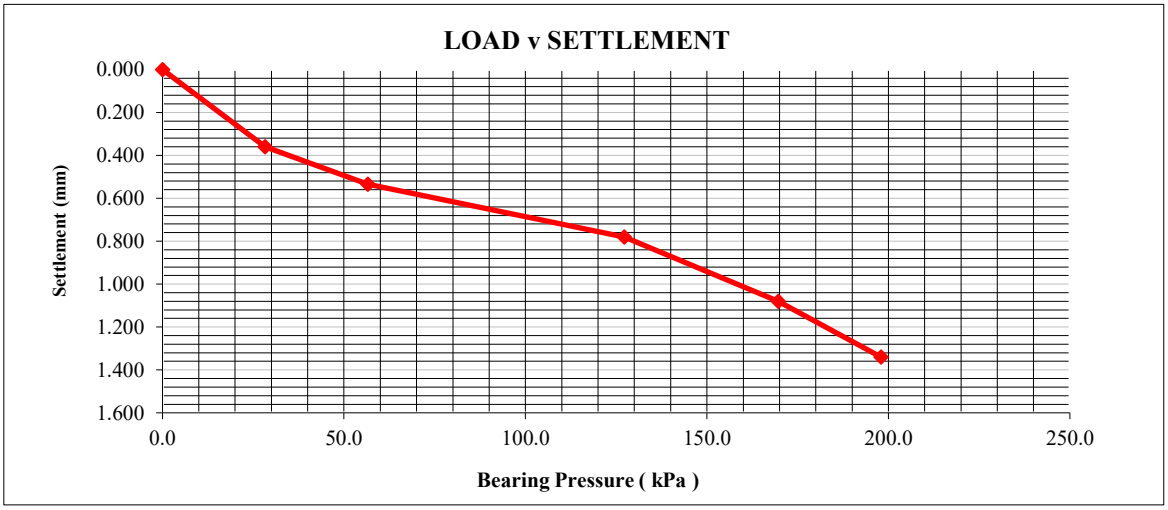


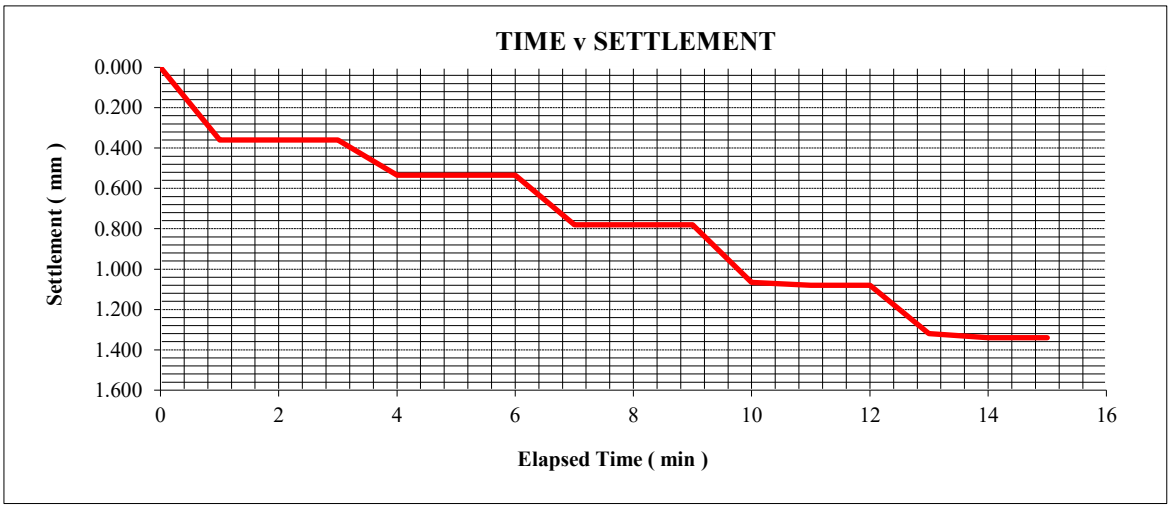


REPORT No : D23234
CLIENT : T.E.C.
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **7**		
DATE TESTED	: 19 May 2023		
SAMPLE TYPE	: Recompacted		
DEPTH (m)	: 300mm b.e.g.l		
SAMPLE DESCRIPTION	: Black gravelly CLAY		
LOCATION	: **TP105**		
Plate Size	: 300 mm		
LOAD TO ACHIEVE 1.25mm SETTLEMENT >		:	**188.17 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >		:	**66492 kN/m2/m**
Equivalent CBR VALUE >		:	**14 %**

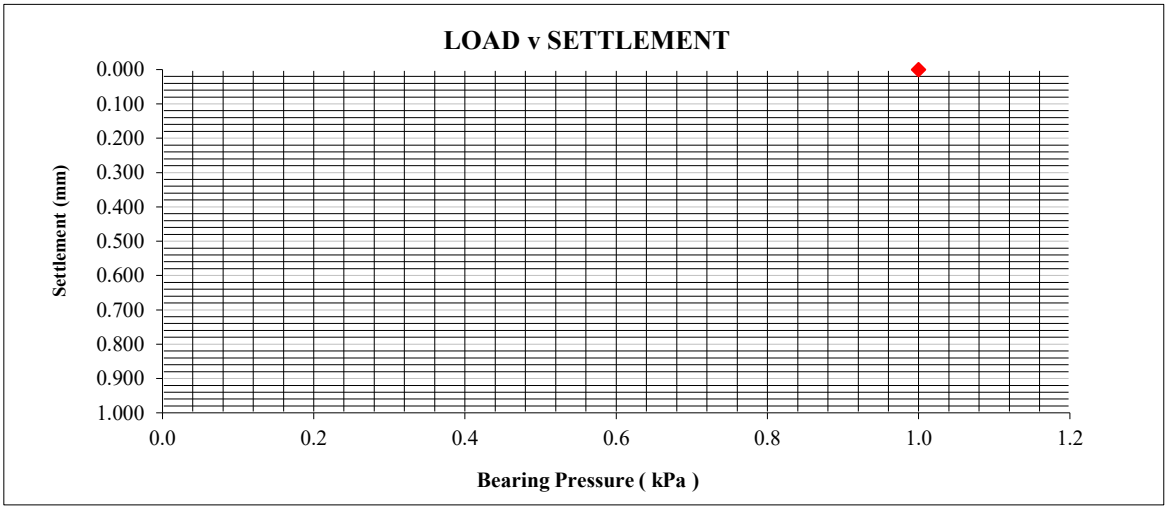


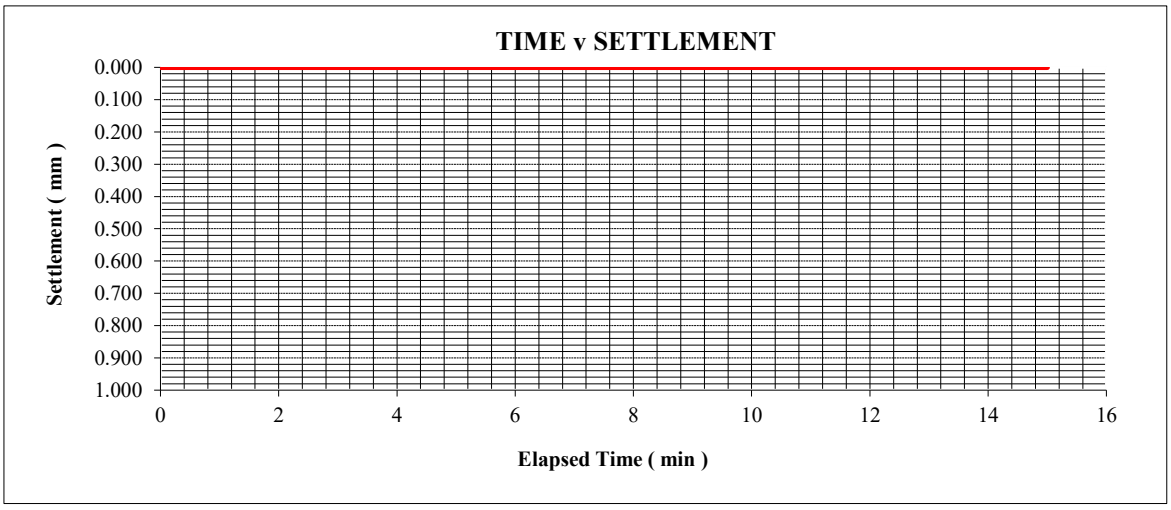


REPORT No : D23234
CLIENT : T.E.C.
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **8**	
DATE TESTED	: 19 May 2023	
SAMPLE TYPE	: Recompacted	
DEPTH (m)	: 300mm b.e.g.l	
SAMPLE DESCRIPTION	: Black PEAT	
LOCATION	: **TP106**	
Plate Size	: 300 mm	
LOAD TO ACHIEVE 1.25mm SETTLEMENT >	:	**N/A kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >	:	**N/A kN/m2/m**
Equivalent CBR VALUE >	:	**Undetermine %**





Apex Testing Solutions
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REPORT No.	:	**D23234**
CLIENT	:	T.E.C.
SITE	:	Phoenix Wharf
MATERIAL DESCRIPTION	:	See Individual Tests Results
DATE TESTED	:	22 May 2023
TESTING REQUIRED	:	11 No. Plate Load Bearing Tests
RELEVANT SPECIFICATION	:	BS 1377 : Part 9 : 1990 In House Method / Clients Specification CD 225 Rev 1 (Supersedes IAN 73/06 rev 1)
TEST METHOD	:	Clause 4.1.6.4.2
TEST RESULTS	:	See Pages 3 – 13

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REPORT No. : **D23234**

CLIENT : T.E.C.

SITE : Phoenix Wharf

TEST LOCATION : 11 No. Locations as instructed by Client

DEPTH (m) : See Individual Test Results

Reaction Load : 8T JCB

Plate Diameter : 300 mm

TEST RESULTS

Test No.	1	2	3	4	5	6	7	8	9	10
CBR%	3.1	1.5	0.8	2.3	2.4	31	>100	81	>100	1.5

Test No.	11									
CBR%	2									

COMMENTS

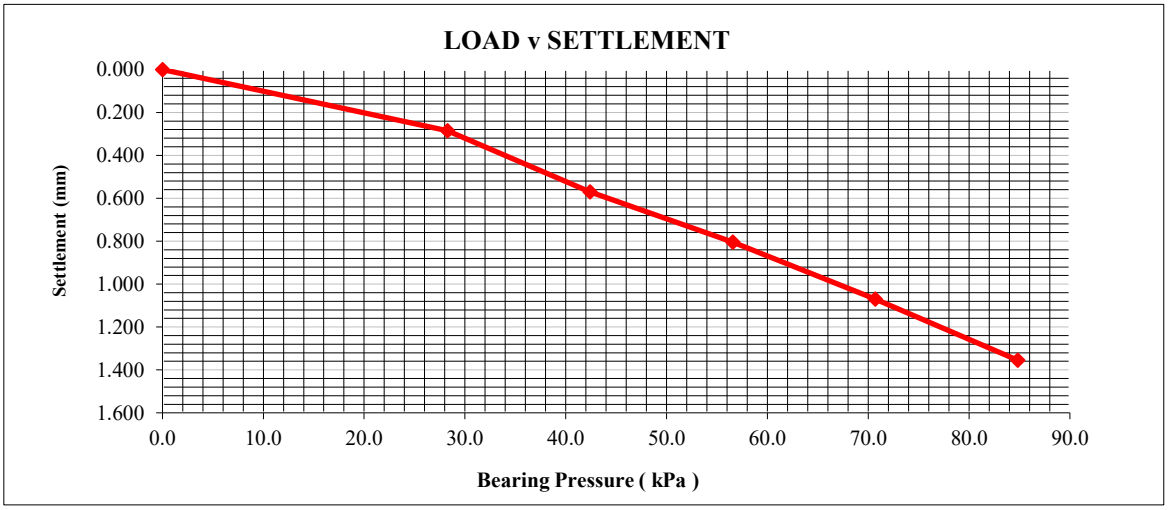
Weather - Suny

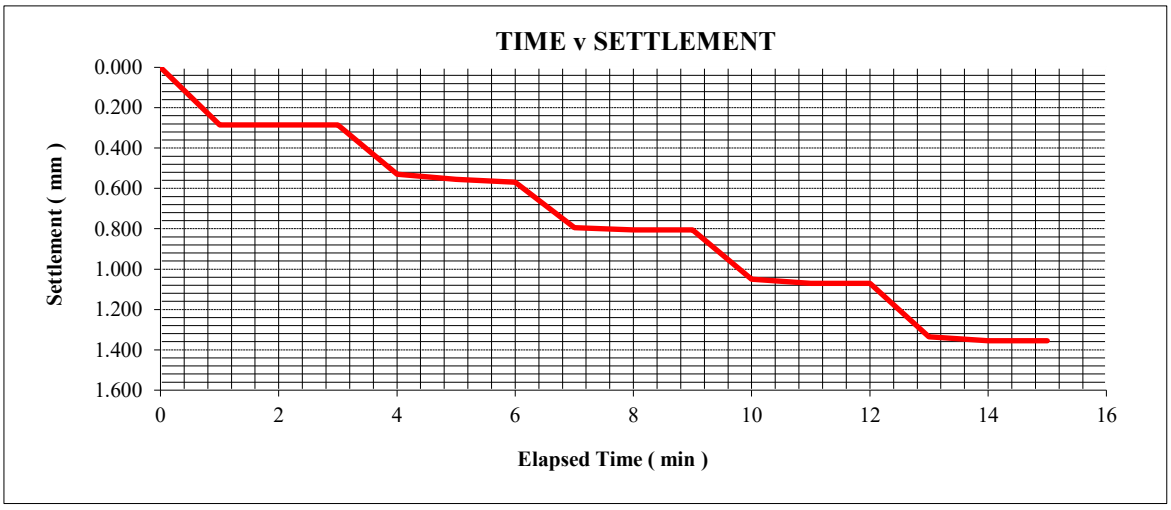
CHECKED BY: **G Llewellyn** **DATE :** **22/05/2023**

REPORT No : D23234
CLIENT : T.E.C.
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **1**		
DATE TESTED	: 22 May 2023		
SAMPLE TYPE	: Recompacted		
DEPTH (m)	: 300mm b.e.g.l		
SAMPLE DESCRIPTION	: Black PEAT		
LOCATION	: **TP106**		
Plate Size	: 300 mm		
LOAD TO ACHIEVE 1.25mm SETTLEMENT >		:	**79.63 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >		:	**28138 kN/m2/m**
Equivalent CBR VALUE >		:	**3.1 %**

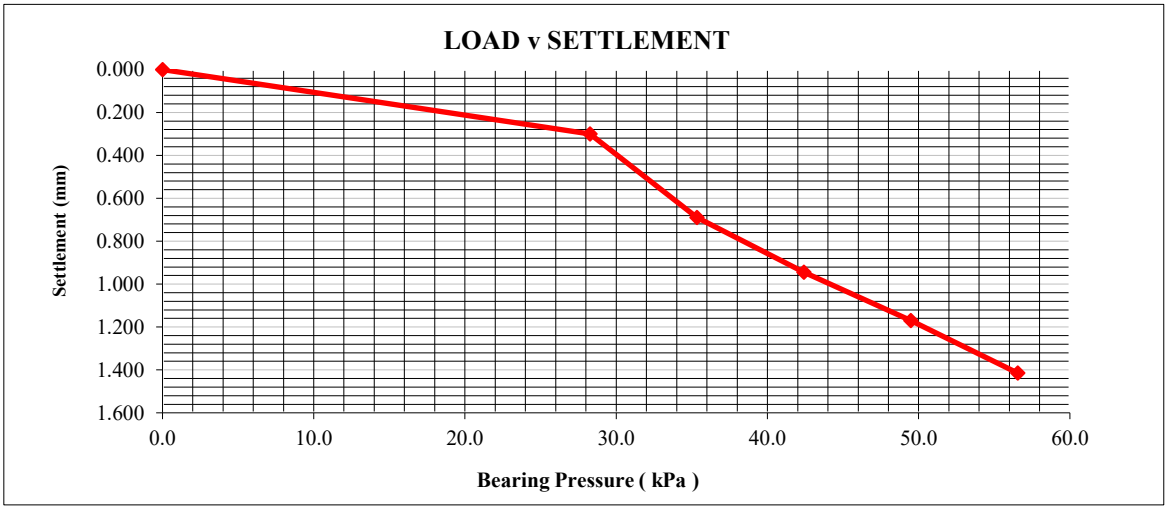


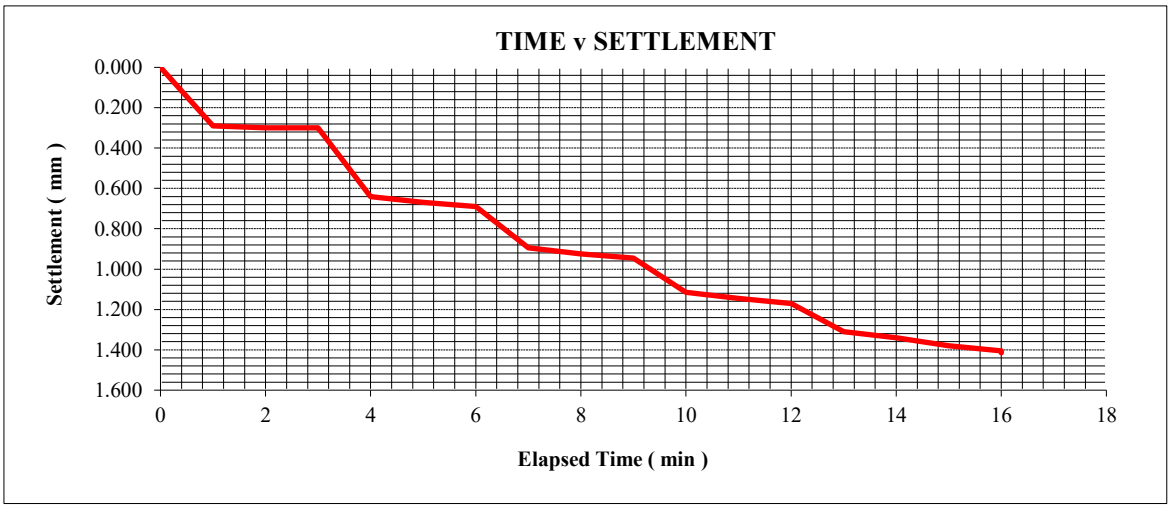


REPORT No : D23234
CLIENT : T.E.C.
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **2**	
DATE TESTED	: 22 May 2023	
SAMPLE TYPE	: Recompacted	
DEPTH (m)	: 600mm b.e.g.l	
SAMPLE DESCRIPTION	: Light brown clayey SAND	
LOCATION	: **TP102**	
Plate Size	: 300 mm	
LOAD TO ACHIEVE 1.25mm SETTLEMENT >	:	**51.80 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >	:	**18304 kN/m2/m**
Equivalent CBR VALUE >	:	**1.5 %**

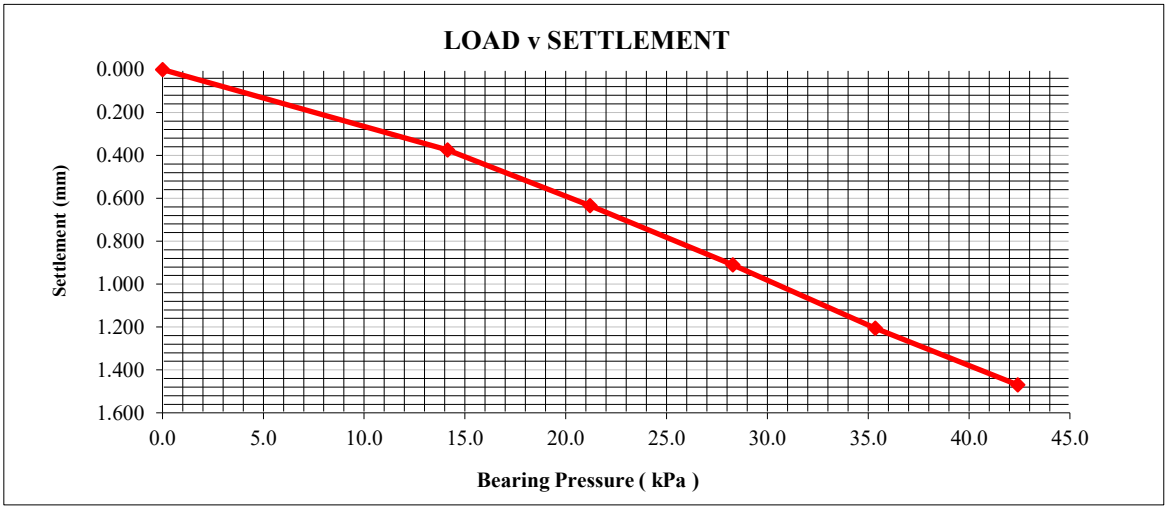


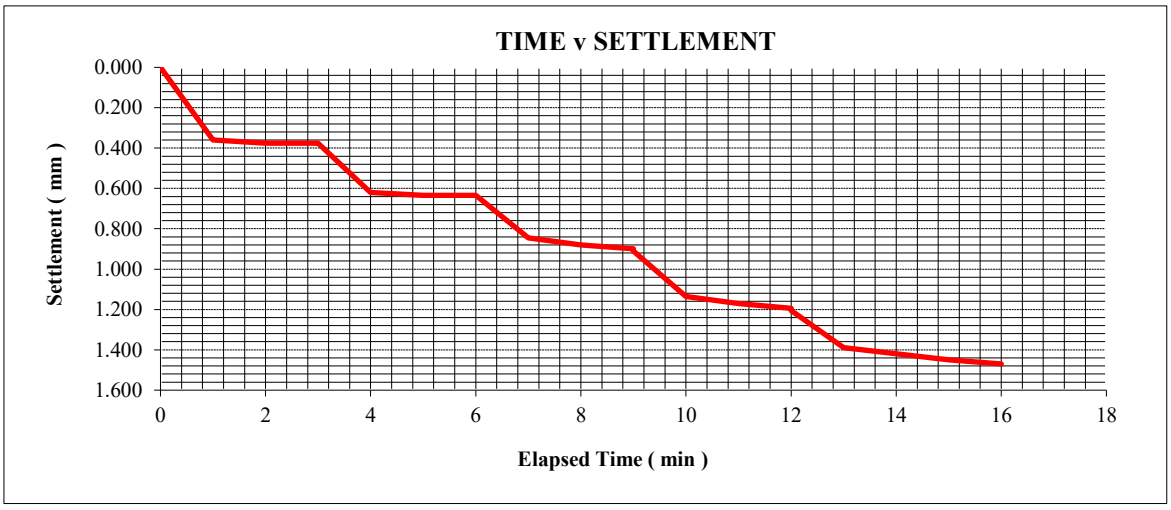


REPORT No : D23234
CLIENT : T.E.C.
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **3**		
DATE TESTED	: 22 May 2023		
SAMPLE TYPE	: Recompacted		
DEPTH (m)	: 900mm b.e.g.l		
SAMPLE DESCRIPTION	: Light brown sandy CLAY		
LOCATION	: **TP102**		
Plate Size	: 300 mm		
LOAD TO ACHIEVE 1.25mm SETTLEMENT >		:	**36.55 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >		:	**12916 kN/m2/m**
Equivalent CBR VALUE >		:	**0.8 %**

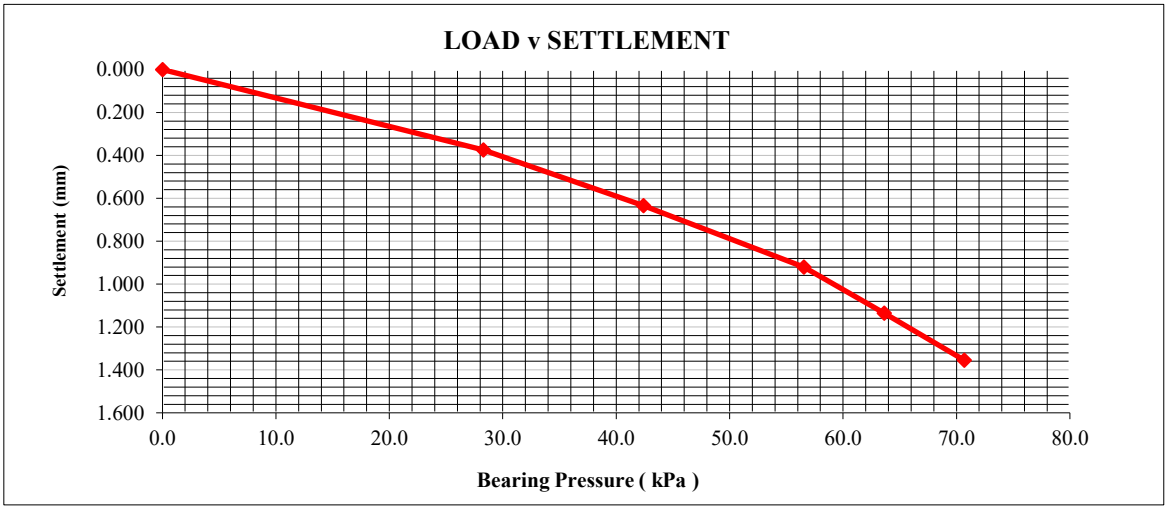


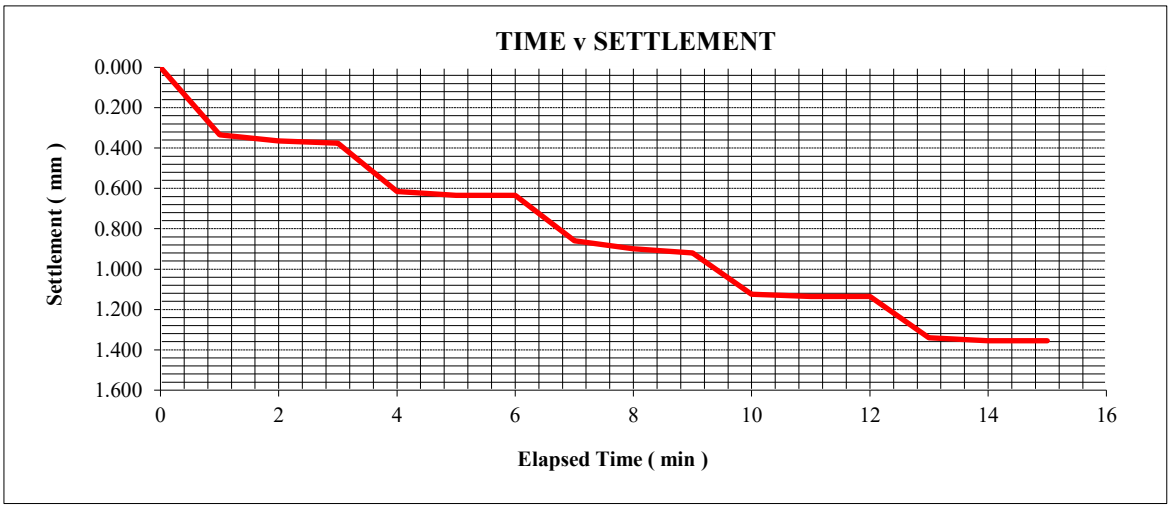


REPORT No : D23234
CLIENT : T.E.C.
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **4**		
DATE TESTED	: 22 May 2023		
SAMPLE TYPE	: Recompacted		
DEPTH (m)	: 600mm b.e.g.l		
SAMPLE DESCRIPTION	: Grey mottled brown slightly gravelly sandy CLAY		
LOCATION	: **TP104**		
Plate Size	: 300 mm		
LOAD TO ACHIEVE 1.25mm SETTLEMENT >		:	**67.33 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >		:	**23790 kN/m2/m**
Equivalent CBR VALUE >		:	**2.3 %**

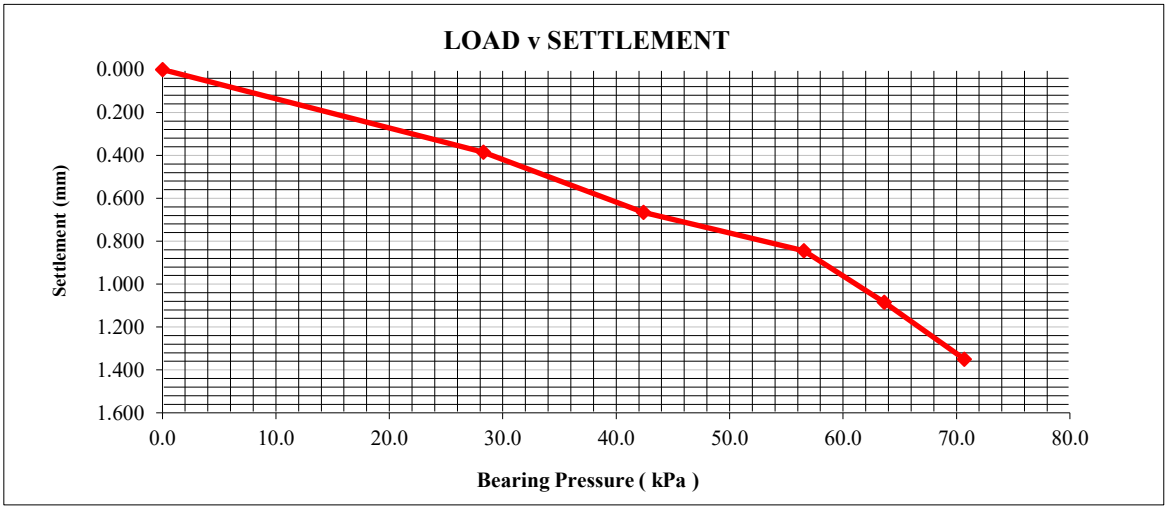


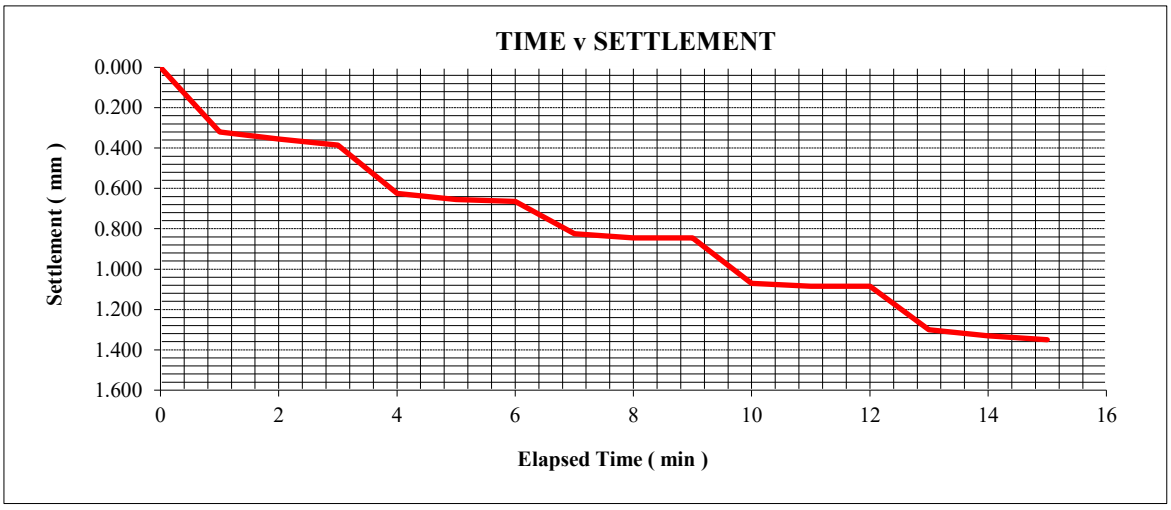


REPORT No : D23234
CLIENT : T.E.C.
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **5**	
DATE TESTED	: 22 May 2023	
SAMPLE TYPE	: Recompacted	
DEPTH (m)	: 900mm b.e.g.l	
SAMPLE DESCRIPTION	: Brown mottled grey sandy CLAY	
LOCATION	: **TP104**	
Plate Size	: 300 mm	
LOAD TO ACHIEVE 1.25mm SETTLEMENT >	:	**68.03 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >	:	**24040 kN/m2/m**
Equivalent CBR VALUE >	:	**2.4 %**

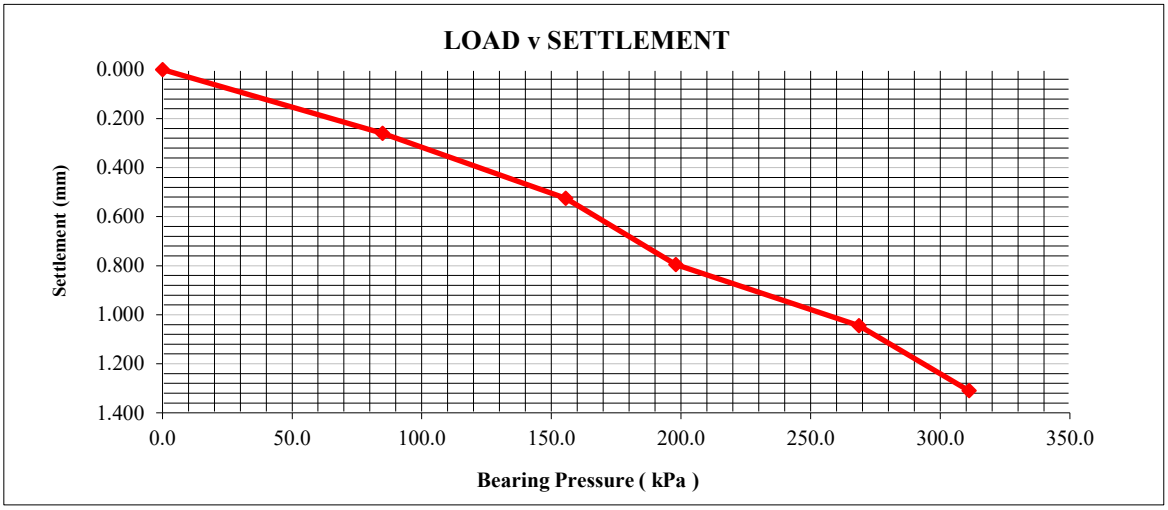


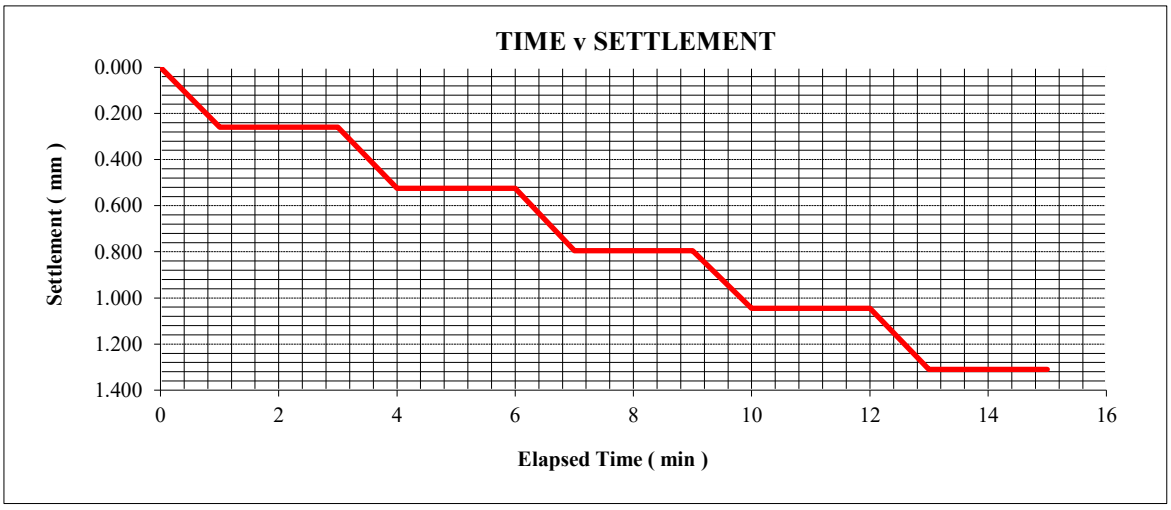


REPORT No : D23234
CLIENT : T.E.C.
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **6**		
DATE TESTED	: 22 May 2023		
SAMPLE TYPE	: Recompacted		
DEPTH (m)	: 600mm b.e.g.l		
SAMPLE DESCRIPTION	: Black gravelly very sandy SILT		
LOCATION	: **TP101**		
Plate Size	: 300 mm		
LOAD TO ACHIEVE 1.25mm SETTLEMENT >		**:**	**301.48 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >		**:**	**106529 kN/m2/m**
Equivalent CBR VALUE >		**:**	**31 %**

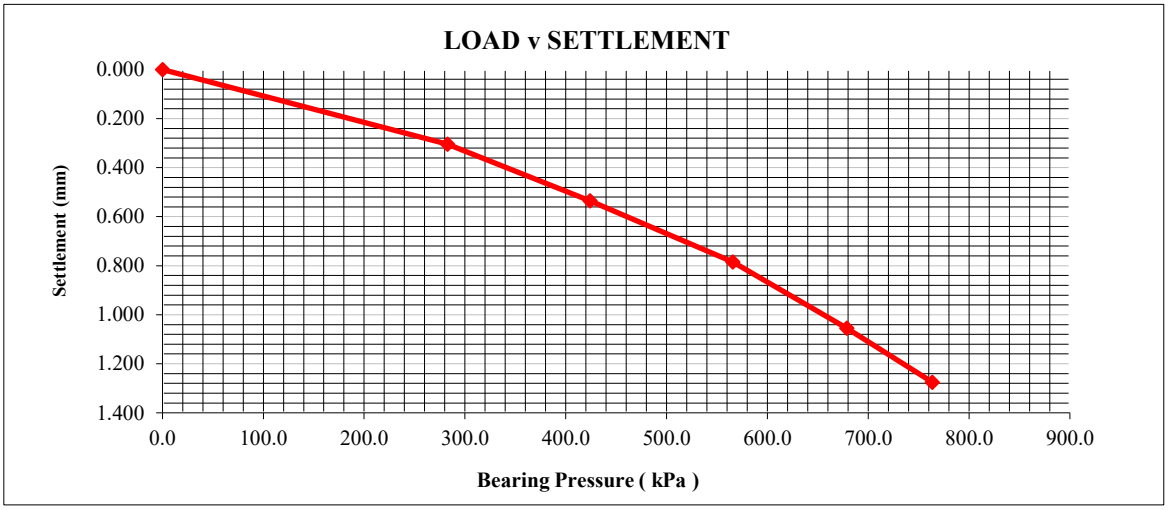


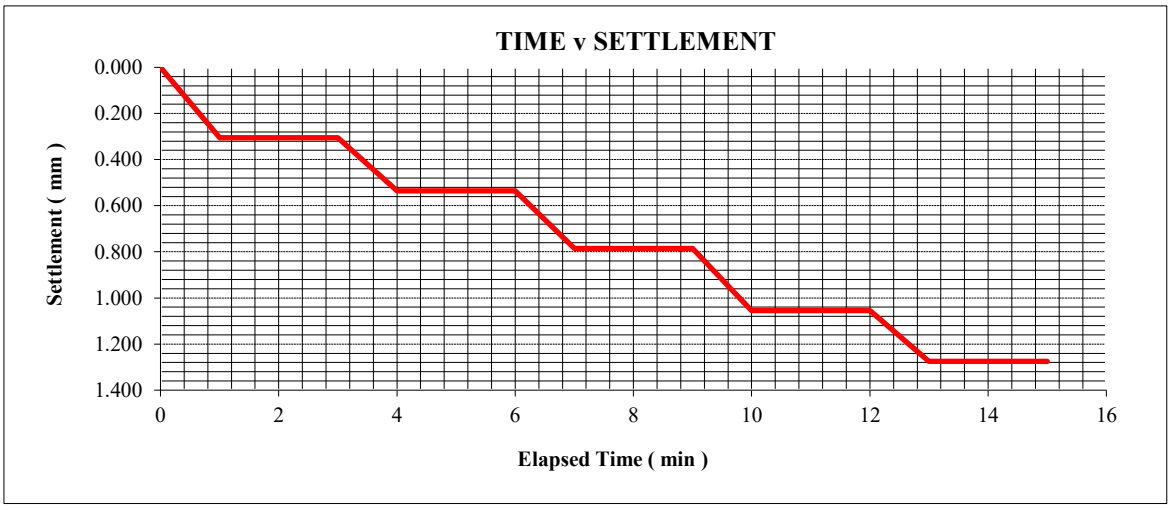


REPORT No : D23234
CLIENT : T.E.C.
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **7**		
DATE TESTED	: 22 May 2023		
SAMPLE TYPE	: Recompacted		
DEPTH (m)	: 900mm b.e.g.l		
SAMPLE DESCRIPTION	: Black gravelly very sandy SILT		
LOCATION	: **TP101**		
Plate Size	: 300 mm		
LOAD TO ACHIEVE 1.25mm SETTLEMENT >		**:**	**753.92 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >		**:**	**266405 kN/m2/m**
Equivalent CBR VALUE >		**:**	**154 %**

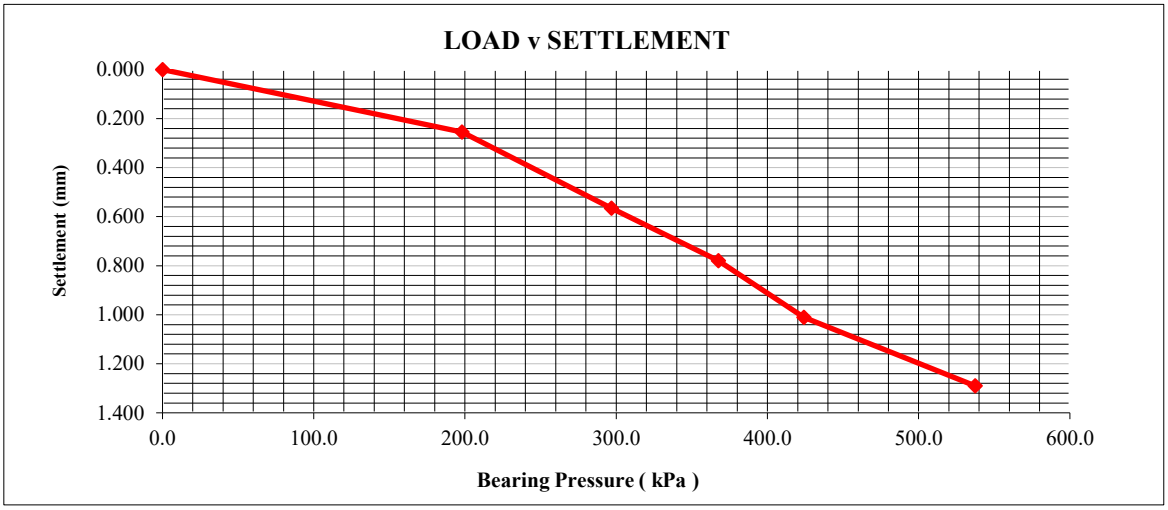


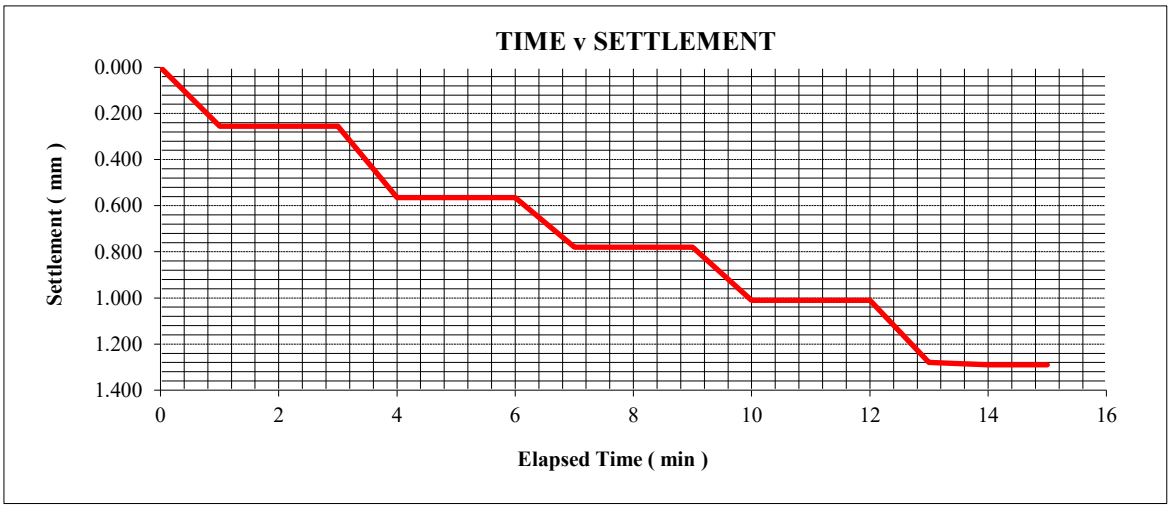


REPORT No : D23234
CLIENT : T.E.C.
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **8**		
DATE TESTED	: 22 May 2023		
SAMPLE TYPE	: Recompacted		
DEPTH (m)	: 600mm b.e.g.l		
SAMPLE DESCRIPTION	: Black gravelly sandy SILT		
LOCATION	: **TP103**		
Plate Size	: 300 mm		
LOAD TO ACHIEVE 1.25mm SETTLEMENT >		:	**521.16 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >		:	**184157 kN/m2/m**
Equivalent CBR VALUE >		:	**81 %**

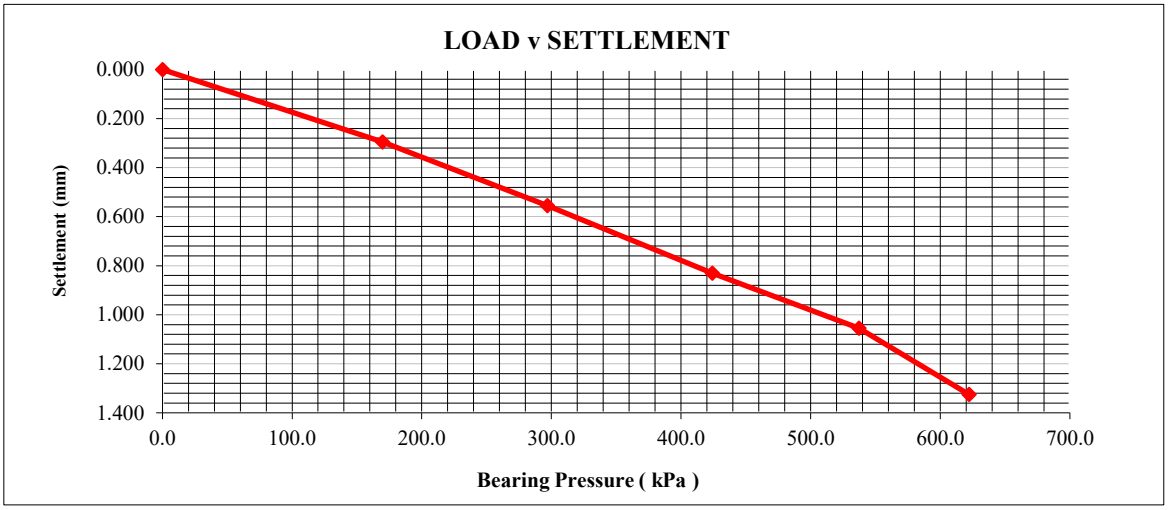


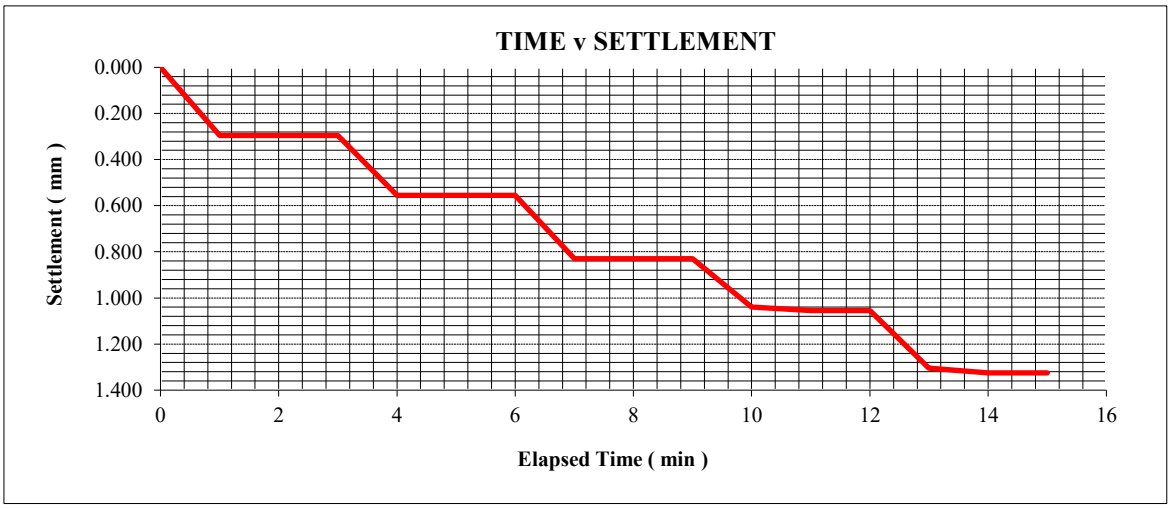


REPORT No : D23234
CLIENT : T.E.C.
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **9**		
DATE TESTED	: 22 May 2023		
SAMPLE TYPE	: Recompacted		
DEPTH (m)	: 900mm b.e.g.l		
SAMPLE DESCRIPTION	: Black gravelly sandy SILT		
LOCATION	: **TP105**		
Plate Size	: 300 mm		
LOAD TO ACHIEVE 1.25mm SETTLEMENT >		**:**	**598.59 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >		**:**	**211519 kN/m2/m**
Equivalent CBR VALUE >		**:**	**103 %**

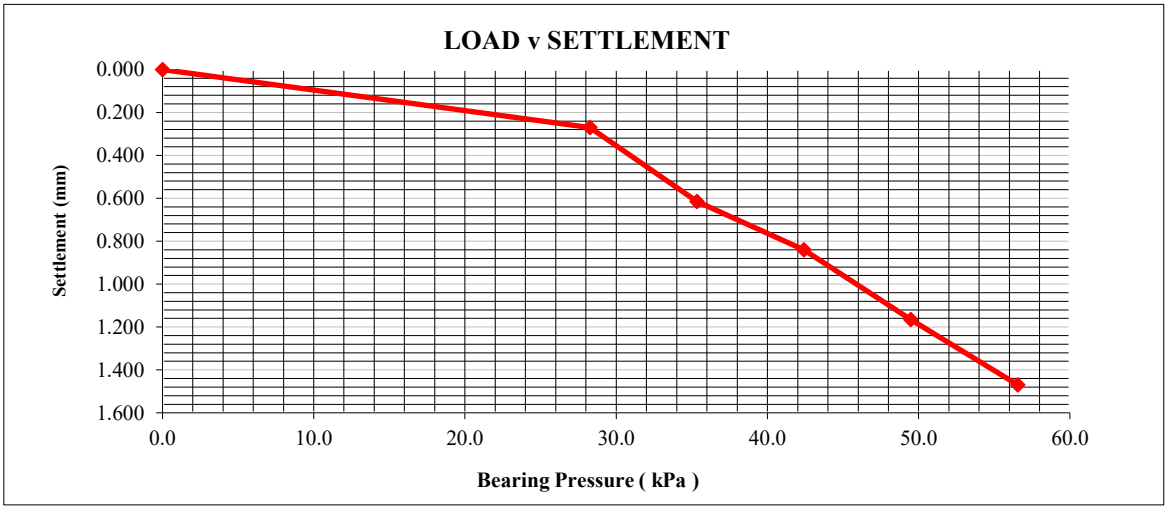


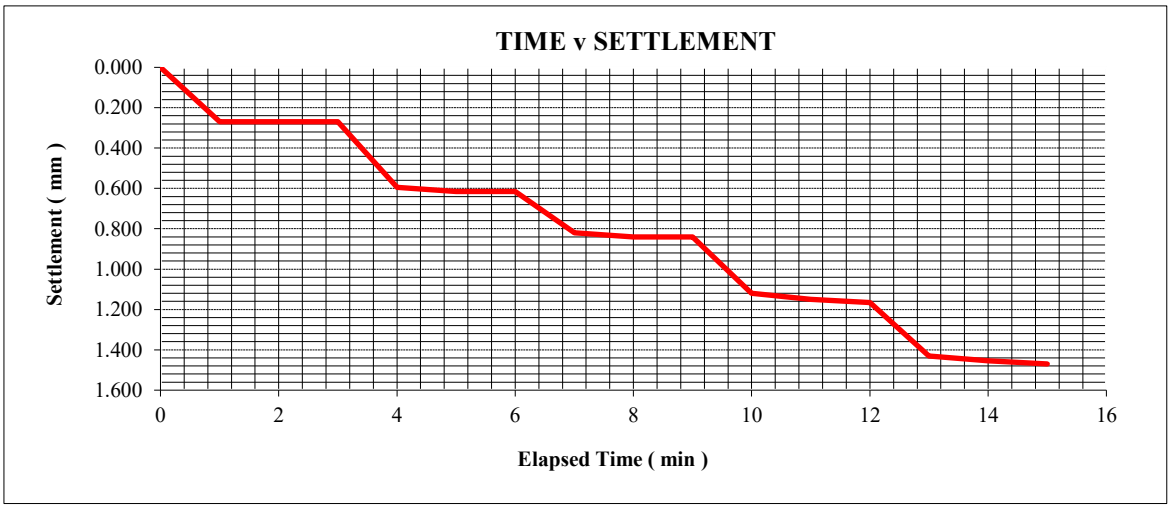


REPORT No : D23234
CLIENT : T.E.C.
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **10**	
DATE TESTED	: 22 May 2023	
SAMPLE TYPE	: Recompacted	
DEPTH (m)	: 600mm b.e.g.l	
SAMPLE DESCRIPTION	: Black PEAT	
LOCATION	: **TP106**	
Plate Size	: 300 mm	
LOAD TO ACHIEVE 1.25mm SETTLEMENT >	:	**51.46 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >	:	**18184 kN/m2/m**
Equivalent CBR VALUE >	:	**1.5 %**

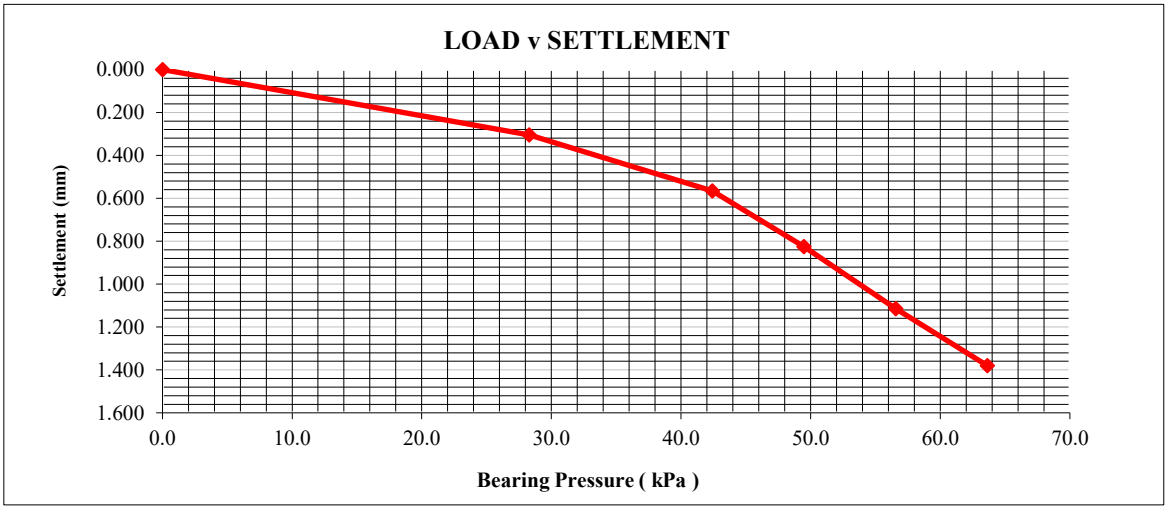


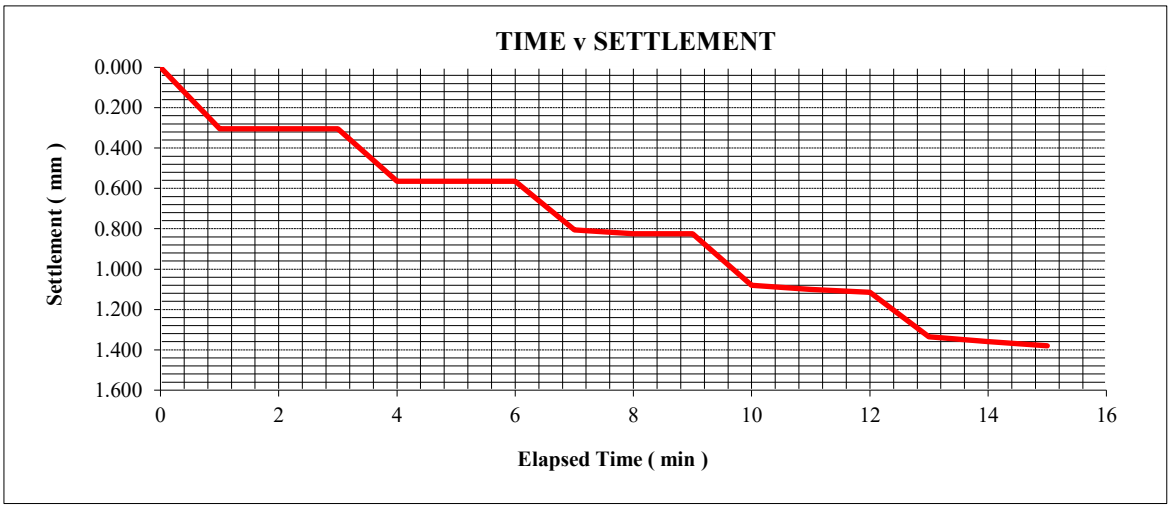


REPORT No : D23234
CLIENT : T.E.C.
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **11**		
DATE TESTED	: 22 May 2023		
SAMPLE TYPE	: Recompacted		
DEPTH (m)	: 900mm b.e.g.l		
SAMPLE DESCRIPTION	: Black PEAT		
LOCATION	: **TP106**		
Plate Size	: 300 mm		
LOAD TO ACHIEVE 1.25mm SETTLEMENT >		:	**60.16 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >		:	**21259 kN/m2/m**
Equivalent CBR VALUE >		:	**1.9 %**





Apex Testing Solutions
Sturmi Way
Village Farm Industrial Estate
Pyle
Bridgend
CF33 6BZ
Telephone :01656 746762
Facsimile :01656 749096
Email andrew.grogan@apex-drilling.com

REPORT No.	:	**D23234**
CLIENT	:	T.E.C
SITE	:	Phoenix Wharf
MATERIAL DESCRIPTION	:	See Individual Tests Results
DATE TESTED	:	23 May 2023
TESTING REQUIRED	:	9 No. Plate Load Bearing Tests
RELEVANT SPECIFICATION	:	BS 1377 : Part 9 : 1990 In House Method / Clients Specification CD 225 Rev 1 (Supersedes IAN 73/06 rev 1)
TEST METHOD	:	Clause 4.1.6.4.2
TEST RESULTS	:	See Pages 3 – 11

Apex Testing Solutions
Sturmi Way
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CF33 6BZ
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Email : andrew.grogan@apex-drilling.com

REPORT No. : **D23234**

CLIENT : T.E.C

SITE : Phoenix Wharf

TEST LOCATION : 9 No. Locations as instructed by Client

DEPTH (m) : See Individual Test Results

Reaction Load : 8T Excavator

Plate Diameter : 300 mm

TEST RESULTS

Test No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	
CBR%	0.9	23	7.7	6.2	9.5	7.2	7.8	13	12	

Test No.										
CBR%										

COMMENTS

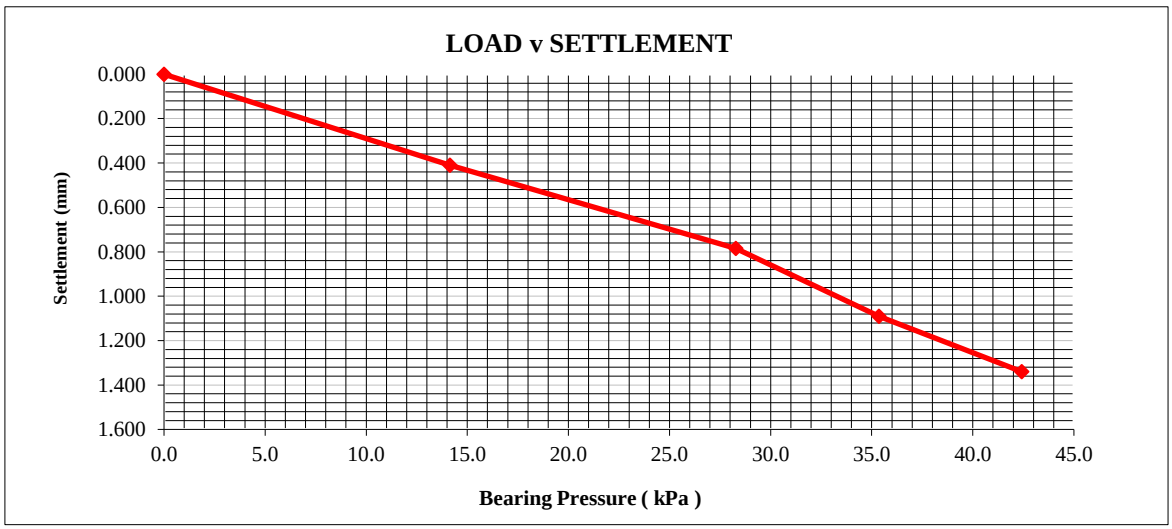
Weather - Sunny

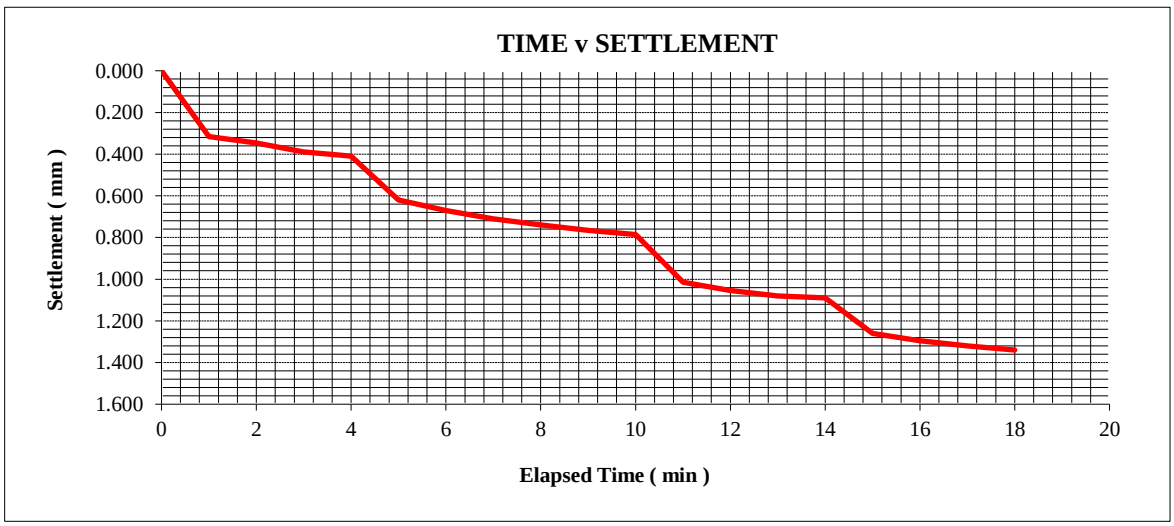
CHECKED BY: **L Davis** **DATE :** **25/05/2023**

REPORT No : D23234
CLIENT : T.E.C
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **1**		
DATE TESTED	: 23 May 2023		
SAMPLE TYPE	: Recompacted		
DEPTH (m)	: 300mm		
SAMPLE DESCRIPTION	: Black sandy gravelly CLAY		
LOCATION	: **TP110**		
Plate Size	: 300 mm		
LOAD TO ACHIEVE 1.25mm SETTLEMENT >		:	**39.87 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >		:	**14090 kN/m2/m**
Equivalent CBR VALUE >		:	**0.9 %**

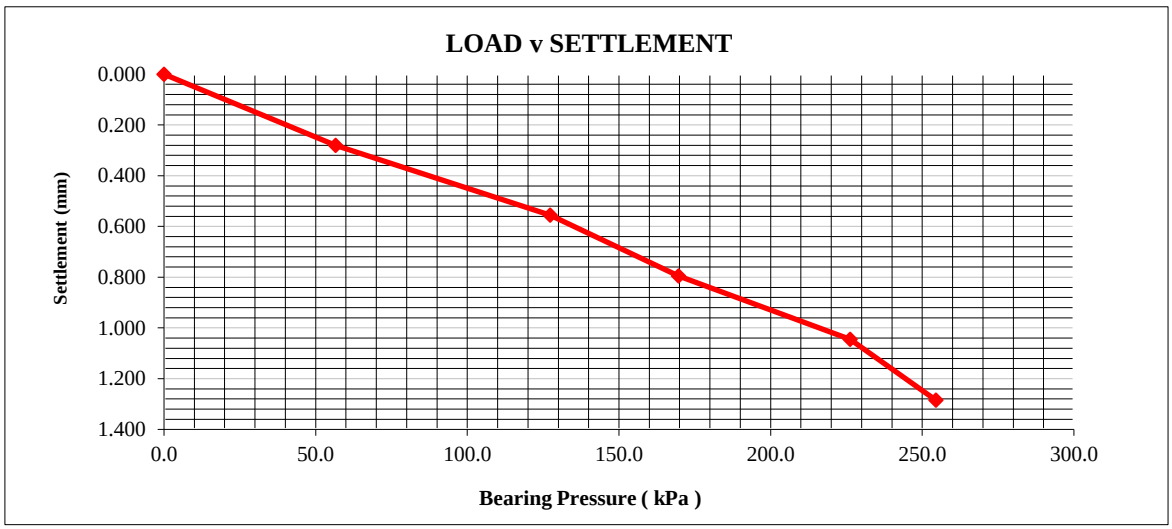


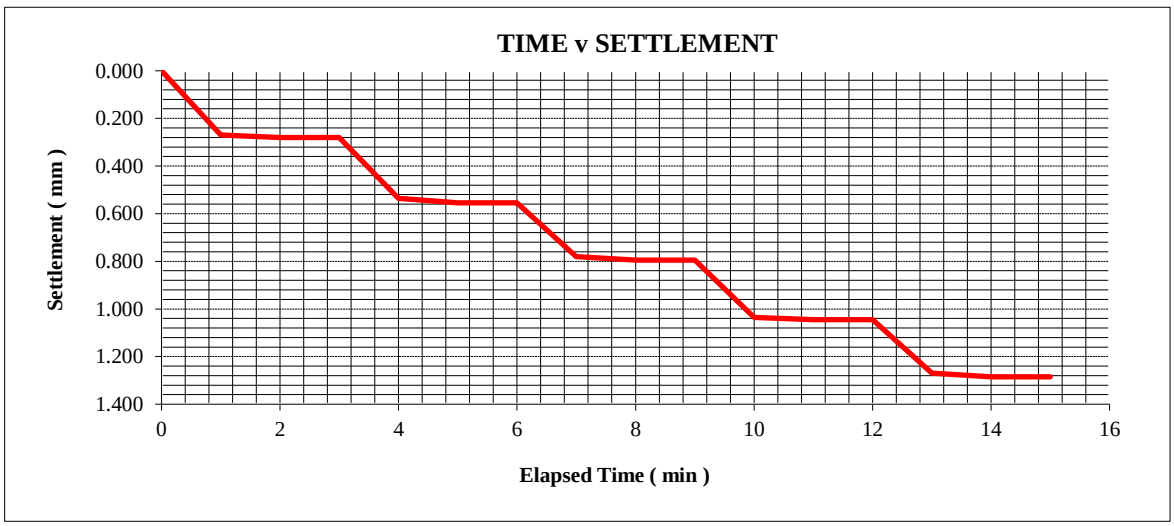


REPORT No : D23234
CLIENT : T.E.C
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **2**		
DATE TESTED	: 23 May 2023		
SAMPLE TYPE	: Recompacted		
DEPTH (m)	: 600mm		
SAMPLE DESCRIPTION	: Light brown SAND		
LOCATION	: **TP110**		
Plate Size	: 300 mm		
LOAD TO ACHIEVE 1.25mm SETTLEMENT >		:	**250.40 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >		:	**88480 kN/m2/m**
Equivalent CBR VALUE >		:	**23 %**

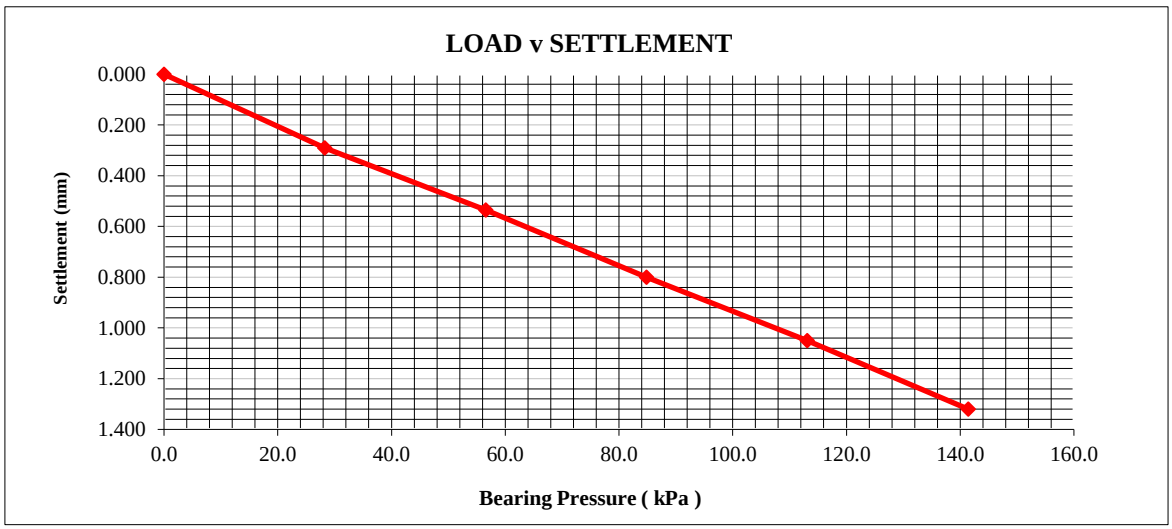


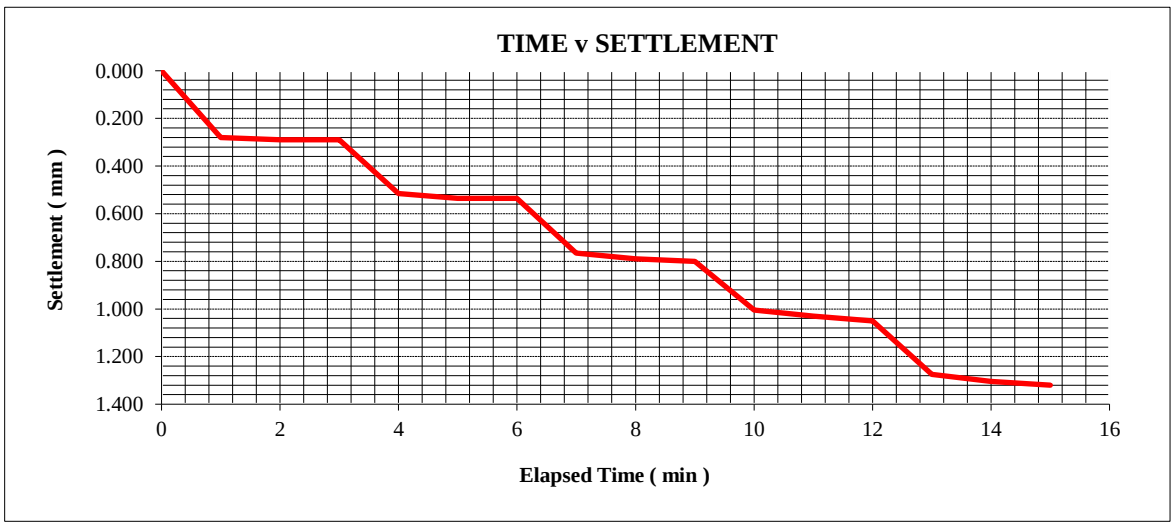


REPORT No : D23234
CLIENT : T.E.C
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **3**		
DATE TESTED	: 23 May 2023		
SAMPLE TYPE	: Recompacted		
DEPTH (m)	: 300mm		
SAMPLE DESCRIPTION	: Dark brown SAND		
LOCATION	: **TP111**		
Plate Size	: 300 mm		
LOAD TO ACHIEVE 1.25mm SETTLEMENT >		:	**134.07 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >		:	**47374 kN/m2/m**
Equivalent CBR VALUE >		:	**7.7 %**

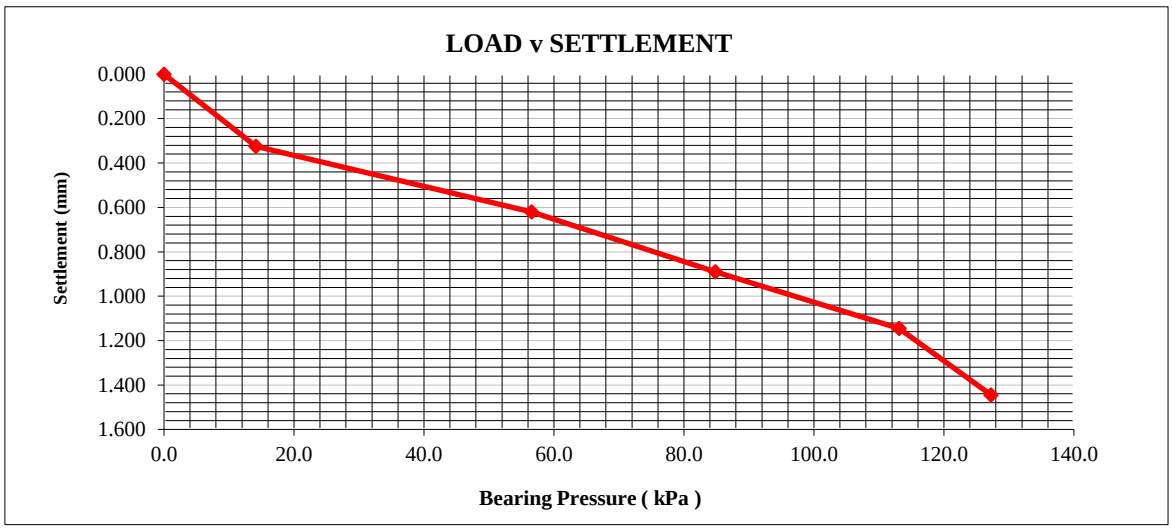


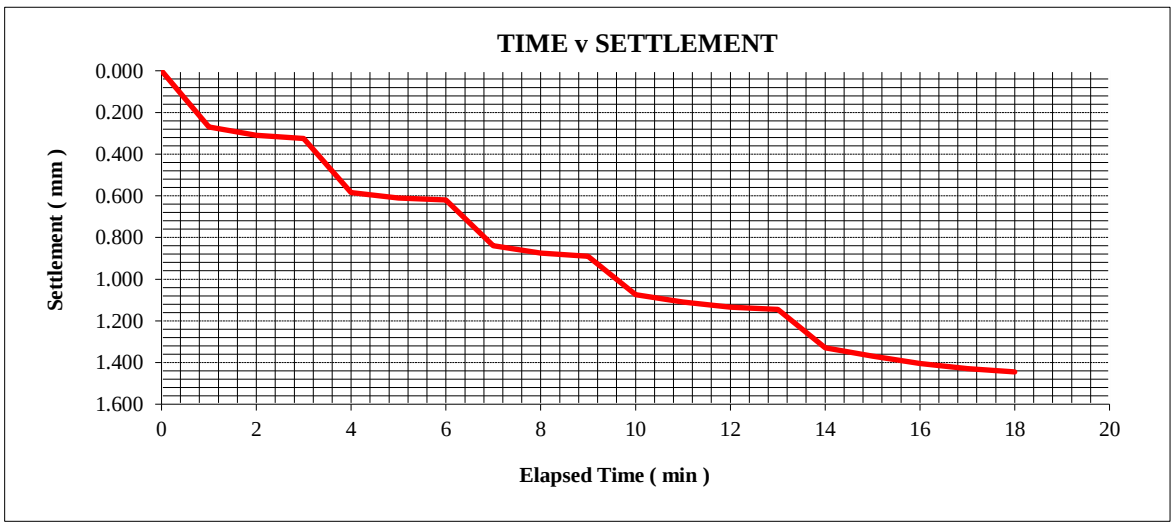


REPORT No : D23234
CLIENT : T.E.C
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **4**	
DATE TESTED	: 23 May 2023	
SAMPLE TYPE	: Recompacted	
DEPTH (m)	: 600mm	
SAMPLE DESCRIPTION	: Dark brown SAND	
LOCATION	: **TP111**	
Plate Size	: 300 mm	
LOAD TO ACHIEVE 1.25mm SETTLEMENT >	:	**118.07 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >	:	**41721 kN/m2/m**
Equivalent CBR VALUE >	:	**6.2 %**

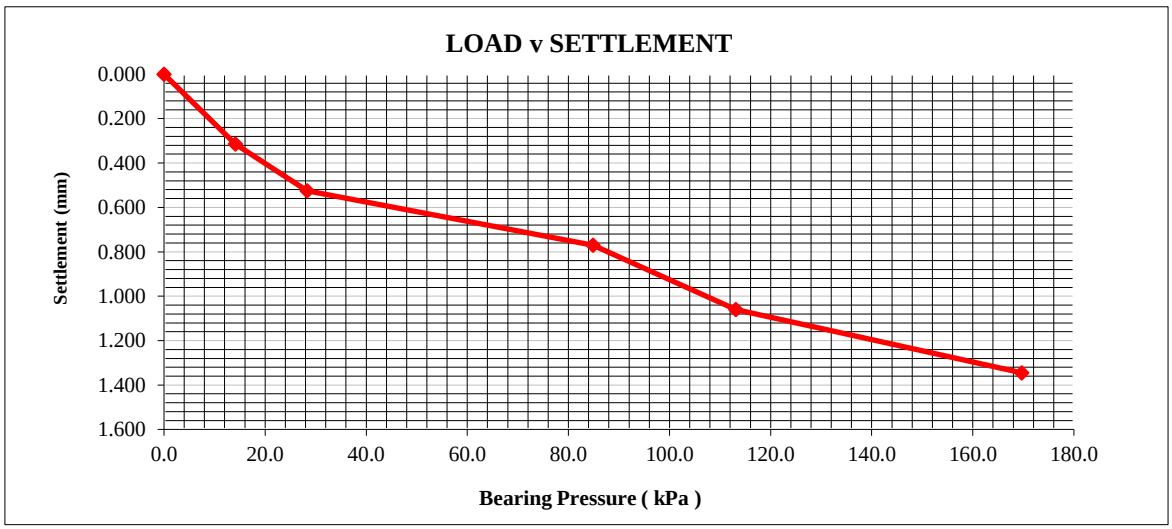


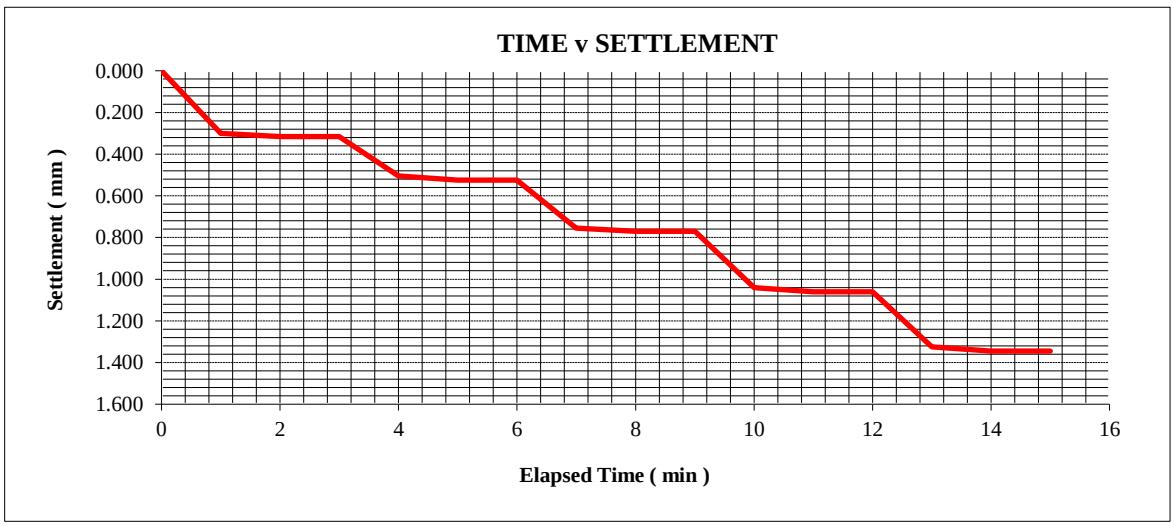


REPORT No : D23234
CLIENT : T.E.C
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **5**		
DATE TESTED	: 23 May 2023		
SAMPLE TYPE	: Recompacted		
DEPTH (m)	: 900mm		
SAMPLE DESCRIPTION	: Dark brown SAND		
LOCATION	: **TP111**		
Plate Size	: 300 mm		
LOAD TO ACHIEVE 1.25mm SETTLEMENT >		:	**150.83 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >		:	**53296 kN/m2/m**
Equivalent CBR VALUE >		:	**9.5 %**

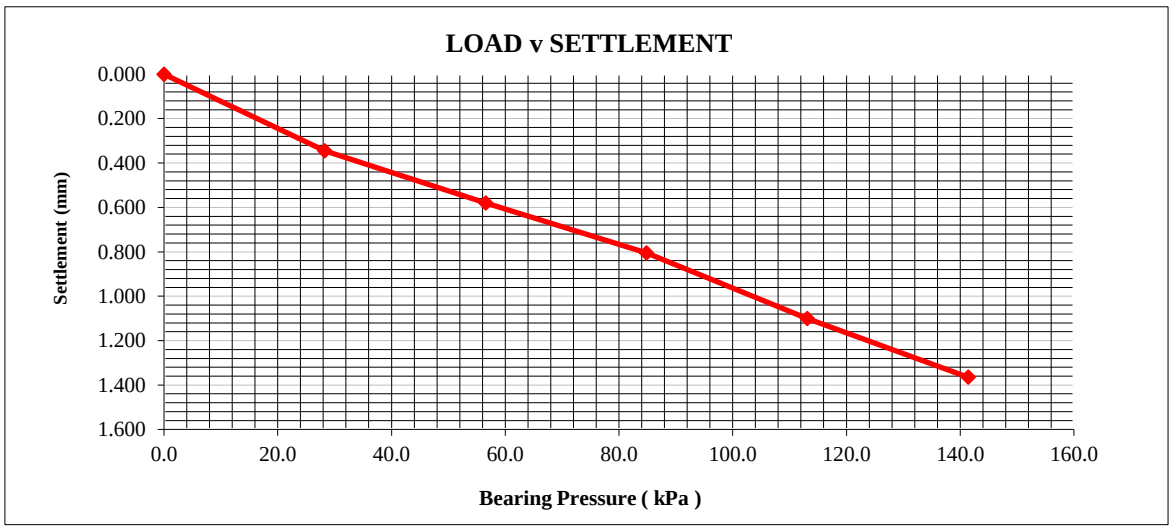


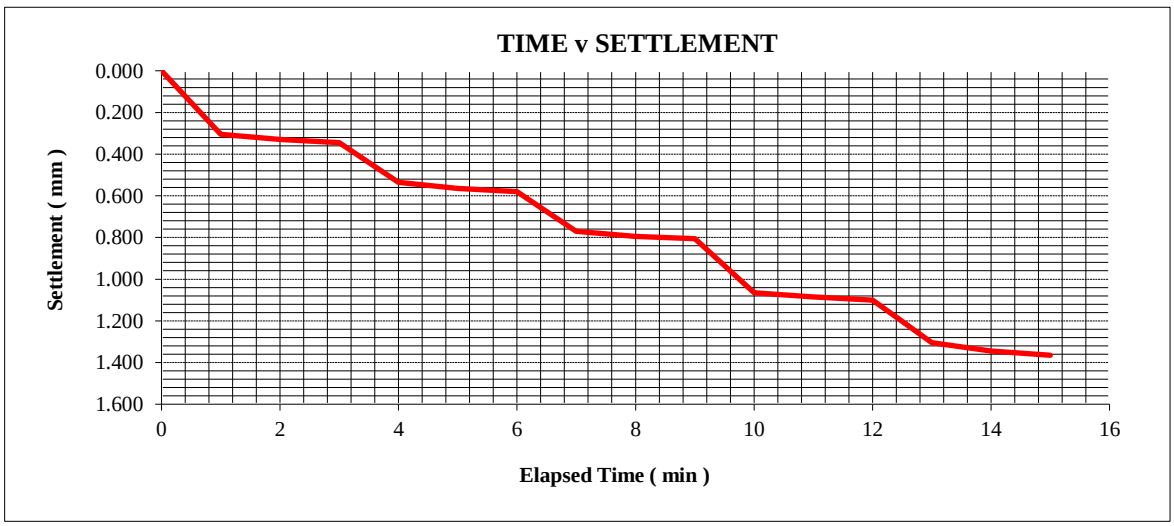


REPORT No : D23234
CLIENT : T.E.C
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **6**		
DATE TESTED	: 23 May 2023		
SAMPLE TYPE	: Recompacted		
DEPTH (m)	: 300mm		
SAMPLE DESCRIPTION	: Black sandy silty GRAVEL		
LOCATION	: **TP108**		
Plate Size	: 300 mm		
LOAD TO ACHIEVE 1.25mm SETTLEMENT >		:	**129.13 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >		:	**45629 kN/m2/m**
Equivalent CBR VALUE >		:	**7.2 %**

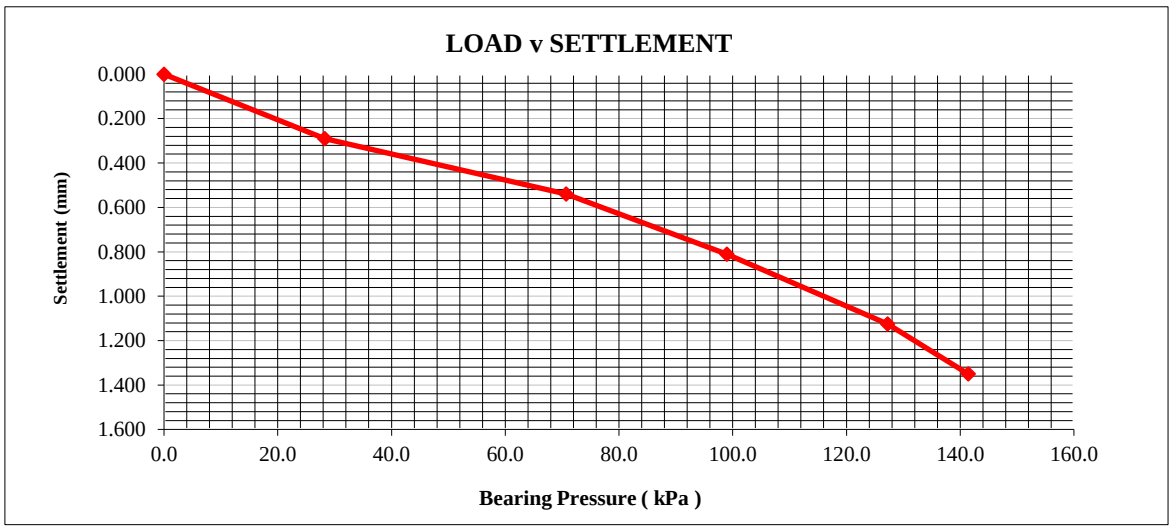




REPORT No : D23234
CLIENT : T.E.C
SITE : Phoenix Wharf

TEST RESULTS

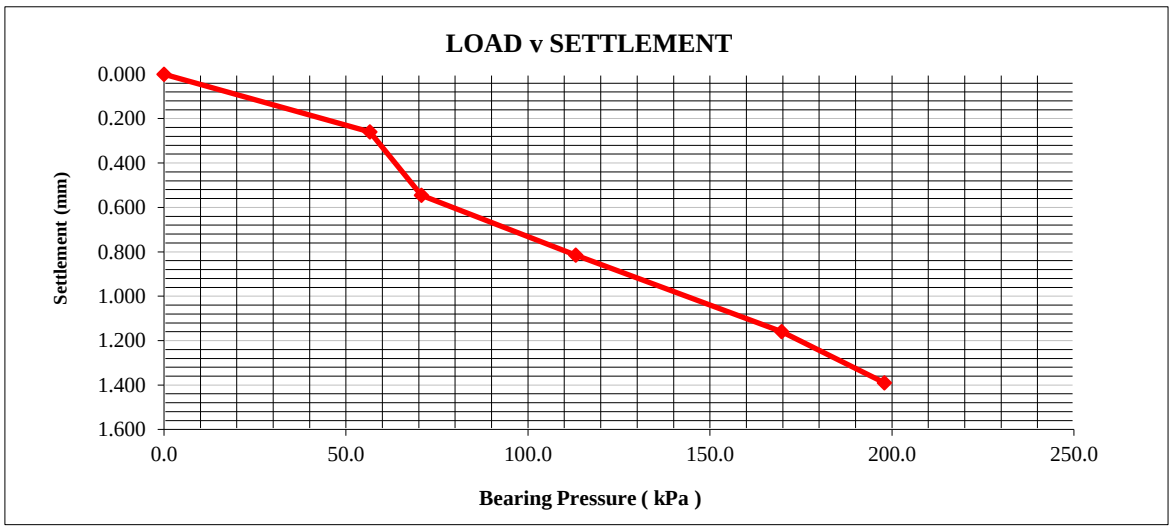
TEST No.	: **7**		
DATE TESTED	: 23 May 2023		
SAMPLE TYPE	: Recompacted		
DEPTH (m)	: 600mm		
SAMPLE DESCRIPTION	: Black sandy silty GRAVEL		
LOCATION	: **TP108**		
Plate Size	: 300 mm		
LOAD TO ACHIEVE 1.25mm SETTLEMENT >		:	**135.12 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >		:	**47744 kN/m2/m**
Equivalent CBR VALUE >		:	**7.8 %**

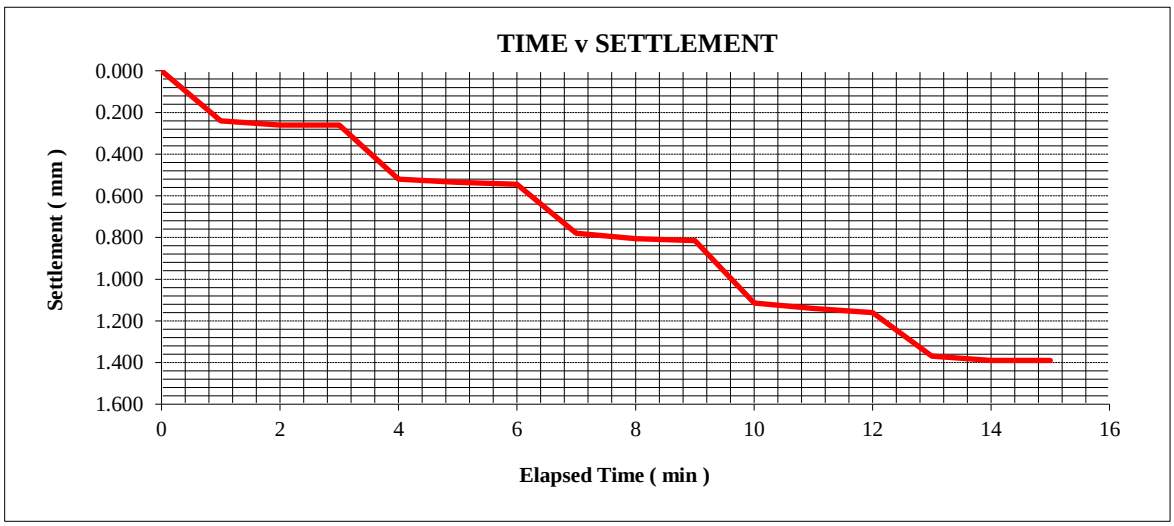


REPORT No : D23234
CLIENT : T.E.C
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **8**		
DATE TESTED	: 23 May 2023		
SAMPLE TYPE	: Recompacted		
DEPTH (m)	: 300mm		
SAMPLE DESCRIPTION	: Black silty sandy GRAVEL		
LOCATION	: **TP109**		
Plate Size	: 300 mm		
LOAD TO ACHIEVE 1.25mm SETTLEMENT >		:	**180.75 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >		:	**63868 kN/m2/m**
Equivalent CBR VALUE >		:	**13 %**

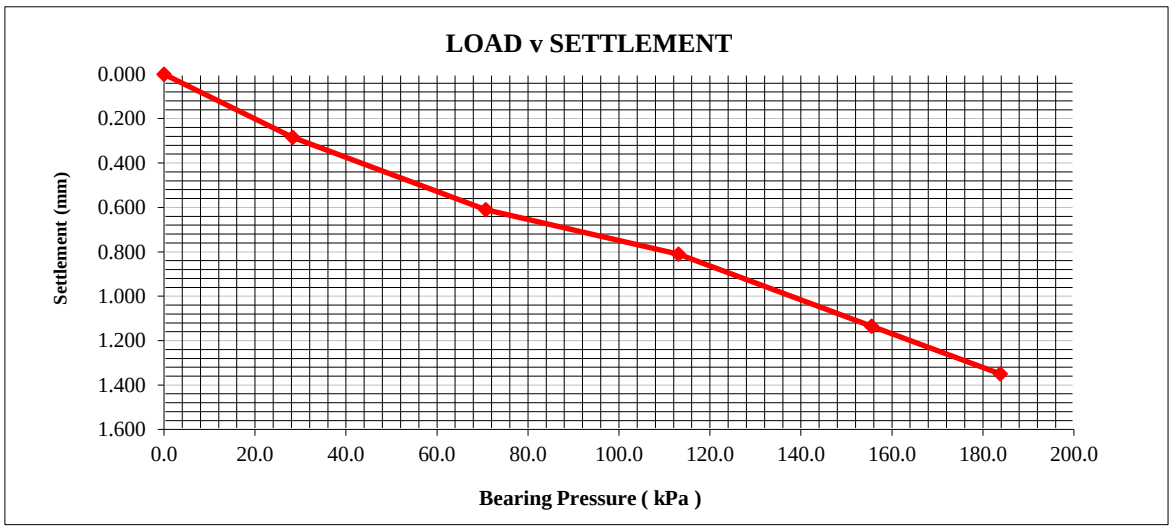


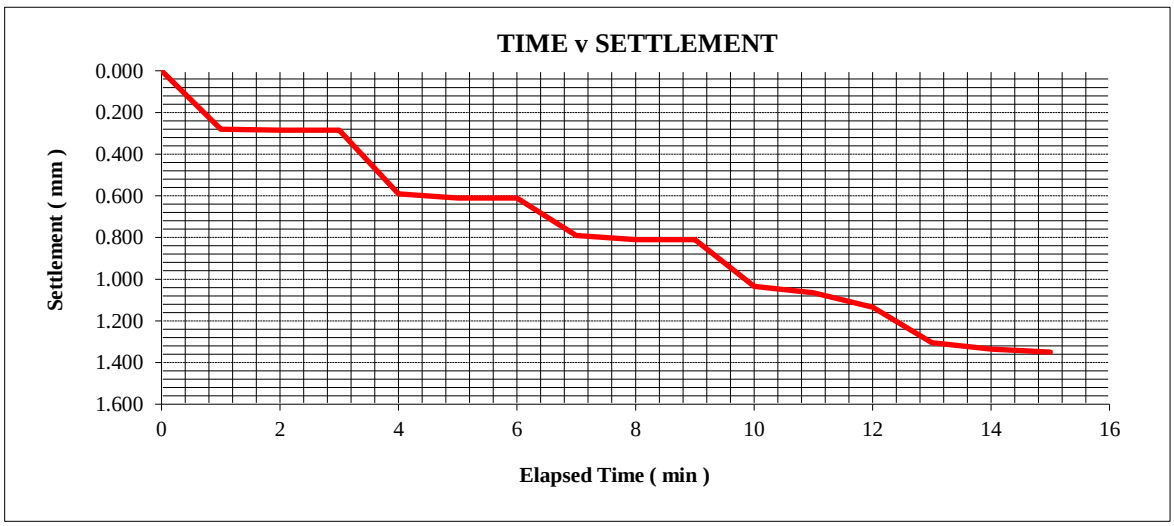


REPORT No : D23234
CLIENT : T.E.C
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **9**		
DATE TESTED	: 23 May 2023		
SAMPLE TYPE	: Recompacted		
DEPTH (m)	: 600mm		
SAMPLE DESCRIPTION	: Black silty sandy GRAVEL		
LOCATION	: **TP109**		
Plate Size	: 300 mm		
LOAD TO ACHIEVE 1.25mm SETTLEMENT >		:	**170.67 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >		:	**60307 kN/m2/m**
Equivalent CBR VALUE >		:	**12 %**





Apex Testing Solutions
Sturmi Way
Village Farm Industrial Estate
Pyle
Bridgend
CF33 6BZ
Telephone :01656 746762
Facsimile :01656 749096
Email andrew.grogan@apex-drilling.com

REPORT No.	:	**D23234**
CLIENT	:	T.E.C
SITE	:	Phoenix Wharf
MATERIAL DESCRIPTION	:	See Individual Tests Results
DATE TESTED	:	24 May 2023
TESTING REQUIRED	:	8 No. Plate Load Bearing Tests
RELEVANT SPECIFICATION	:	BS 1377 : Part 9 : 1990 In House Method / Clients Specification CD 225 Rev 1 (Supersedes IAN 73/06 rev 1)
TEST METHOD	:	Clause 4.1.6.4.2
TEST RESULTS	:	See Pages 3 – 10

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REPORT No. : **D23234**

CLIENT : T.E.C

SITE : Phoenix Wharf

TEST LOCATION : 8 No. Locations as instructed by Client

DEPTH (m) : See Individual Test Results

Reaction Load : 8T Excavator

Plate Diameter : 300 mm

TEST RESULTS

Test No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**		
CBR%	3.3	0.9	10	8.0	14	29	26	7.7		

Test No.										
CBR%										

COMMENTS

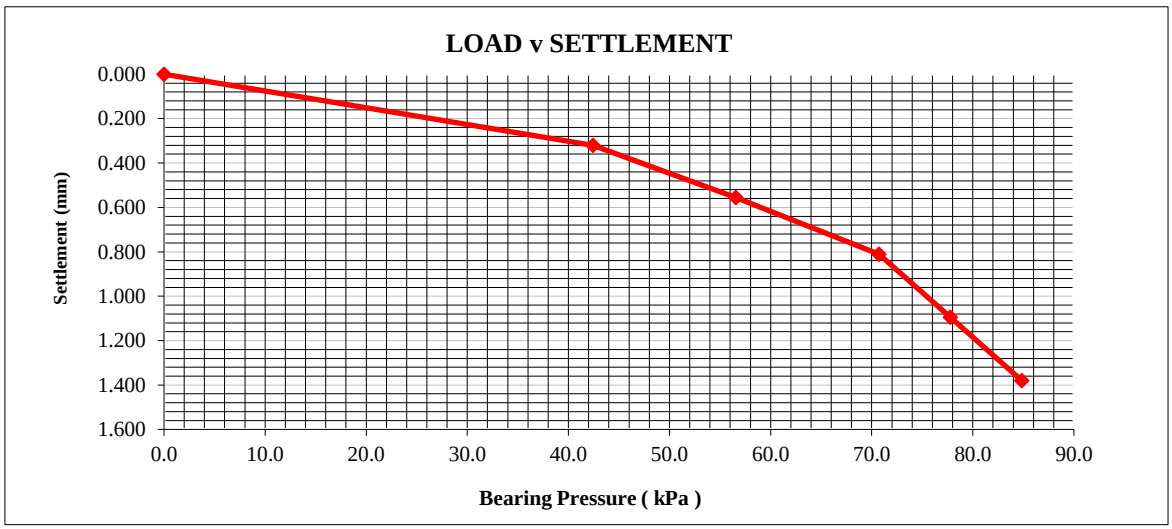
Weather - Sunny

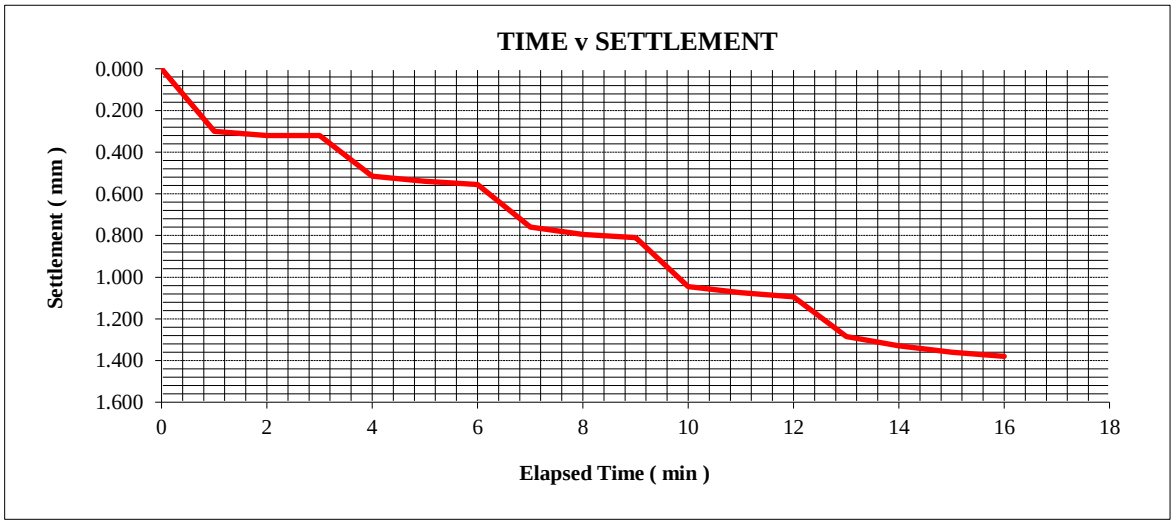
CHECKED BY: **L Davis** **DATE :** **25/05/2023**

REPORT No : D23234
CLIENT : T.E.C
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **1**		
DATE TESTED	: 24 May 2023		
SAMPLE TYPE	: Recompacted		
DEPTH (m)	: 300mm		
SAMPLE DESCRIPTION	: Black sand		
LOCATION	: **TP107**		
Plate Size	: 300 mm		
LOAD TO ACHIEVE 1.25mm SETTLEMENT >		:	**81.62 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >		:	**28840 kN/m2/m**
Equivalent CBR VALUE >		:	**3.3 %**

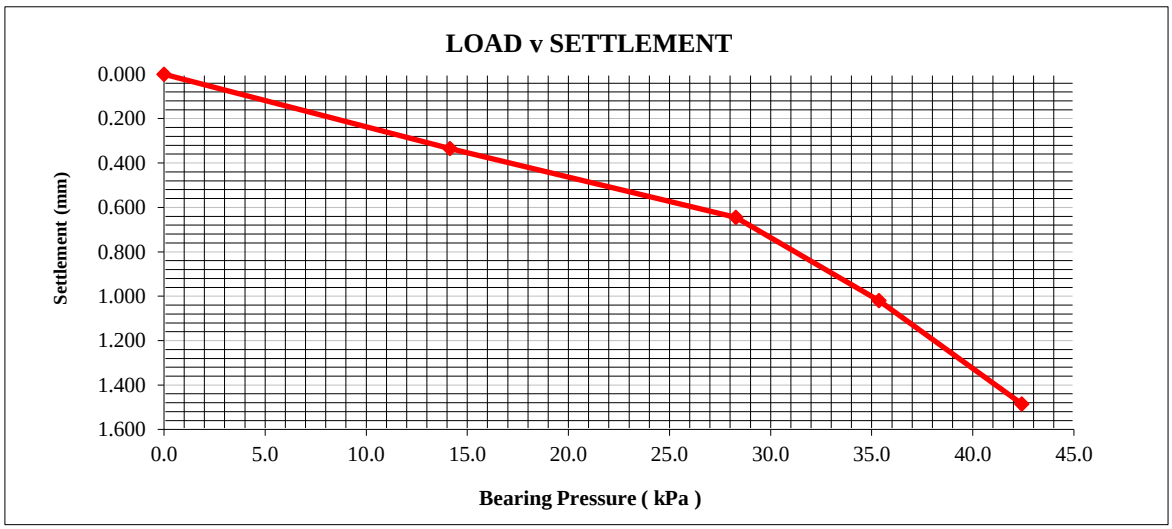


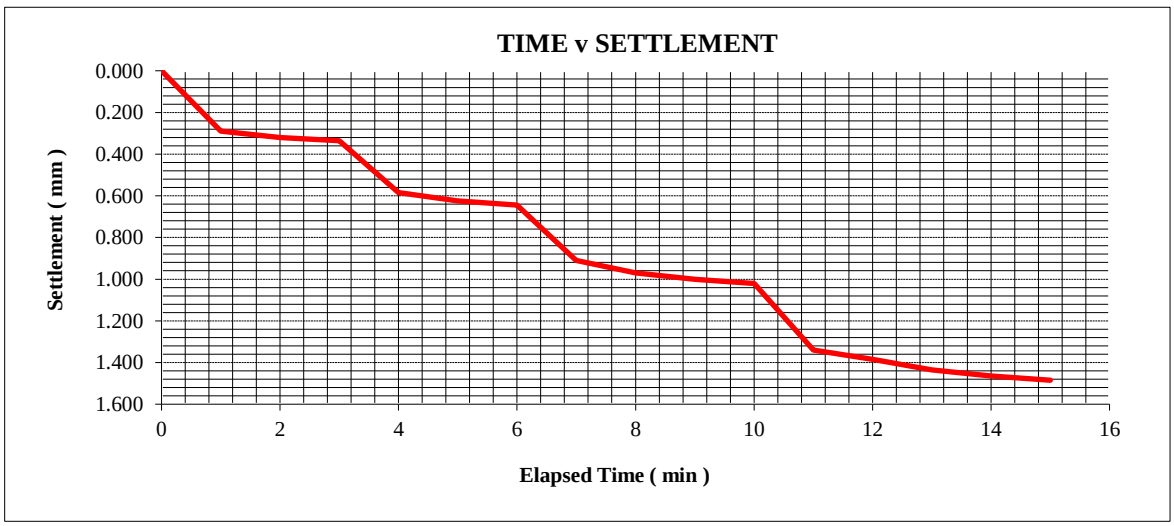


REPORT No : D23234
CLIENT : T.E.C
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **2**		
DATE TESTED	: 24 May 2023		
SAMPLE TYPE	: Recompacted		
DEPTH (m)	: 600mm		
SAMPLE DESCRIPTION	: Greyish brown sand		
LOCATION	: **TP107**		
Plate Size	: 300 mm		
LOAD TO ACHIEVE 1.25mm SETTLEMENT >		:	**38.85 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >		:	**13727 kN/m2/m**
Equivalent CBR VALUE >		:	**0.9 %**

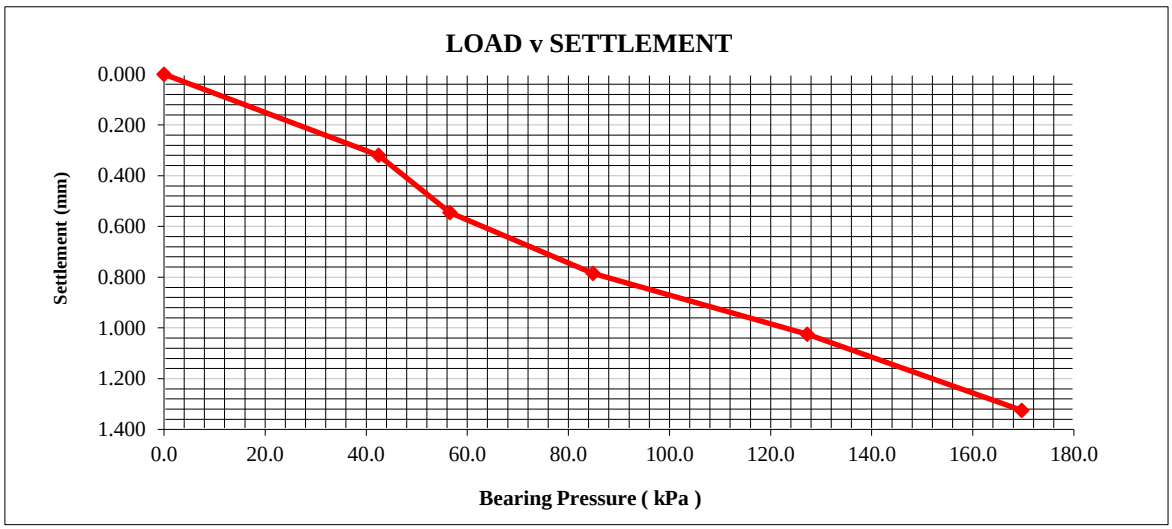


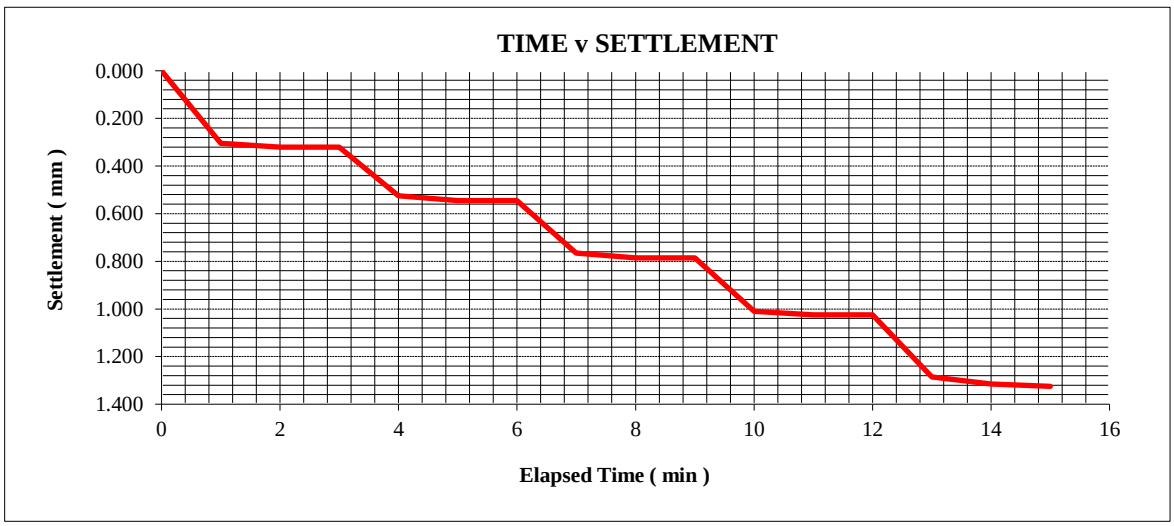


REPORT No : D23234
CLIENT : T.E.C
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **3**		
DATE TESTED	: 24 May 2023		
SAMPLE TYPE	: Recompacted		
DEPTH (m)	: 300mm		
SAMPLE DESCRIPTION	: Dark grey gravelly CLAY		
LOCATION	: **TP112**		
Plate Size	: 300 mm		
LOAD TO ACHIEVE 1.25mm SETTLEMENT >		:	**159.08 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >		:	**56211 kN/m2/m**
Equivalent CBR VALUE >		:	**10 %**

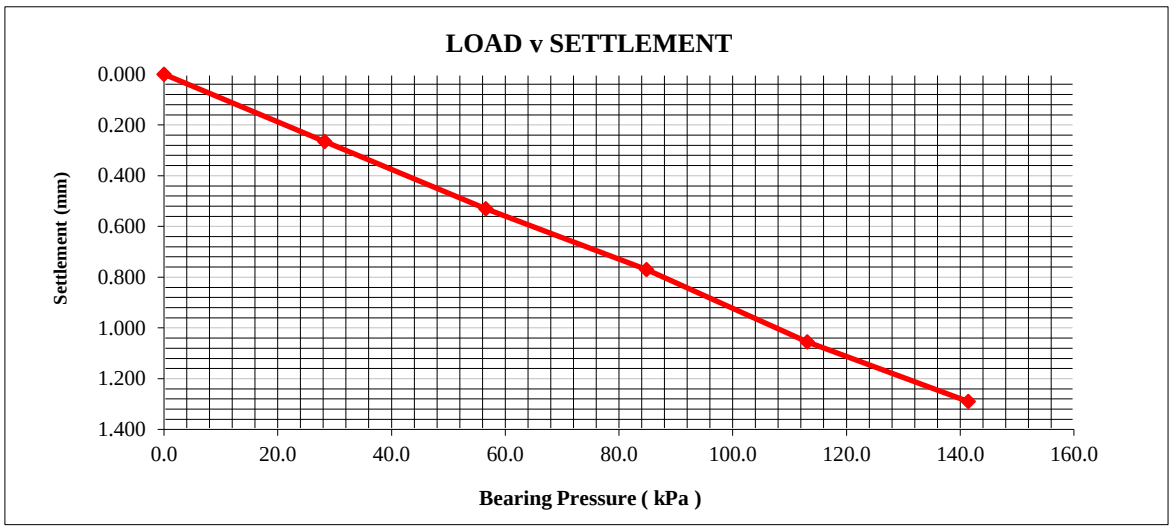


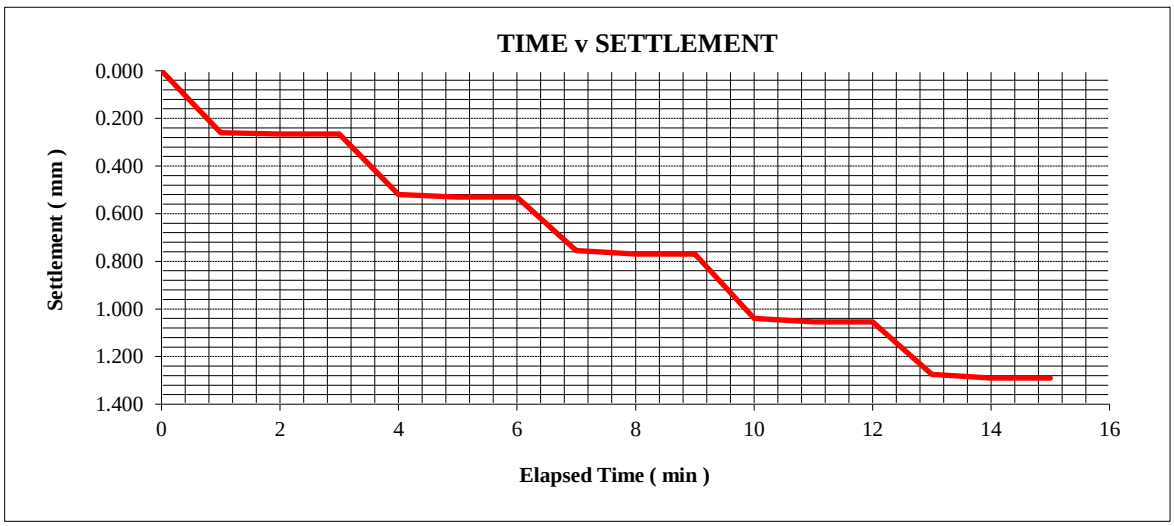


REPORT No : D23234
CLIENT : T.E.C
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **4**		
DATE TESTED	: 24 May 2023		
SAMPLE TYPE	: Recompacted		
DEPTH (m)	: 600mm		
SAMPLE DESCRIPTION	: Dark grey gravelly CLAY		
LOCATION	: **TP112**		
Plate Size	: 300 mm		
LOAD TO ACHIEVE 1.25mm SETTLEMENT >		:	**136.59 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >		:	**48264 kN/m2/m**
Equivalent CBR VALUE >		:	**8.0 %**

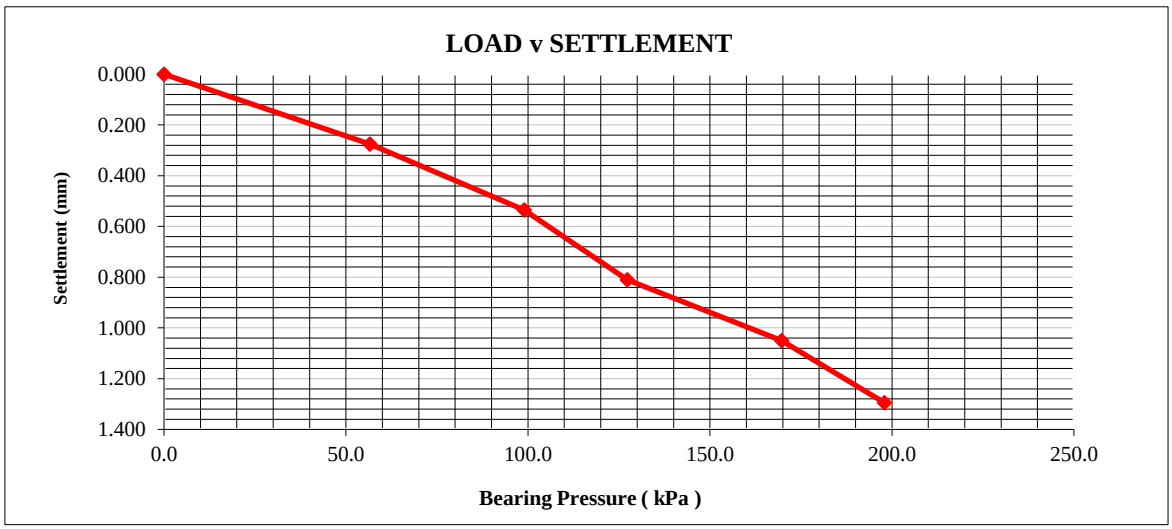


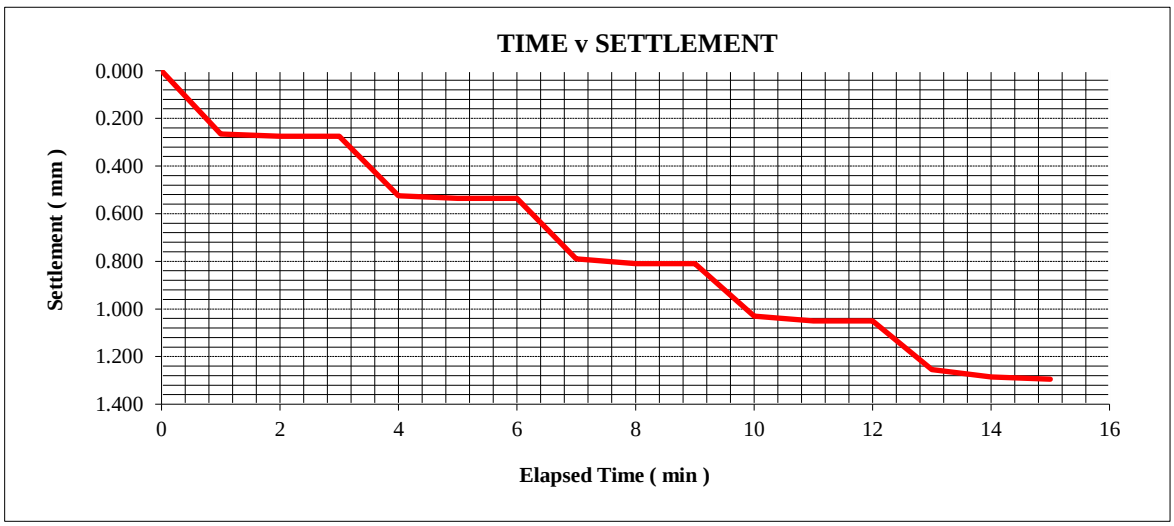


REPORT No : D23234
CLIENT : T.E.C
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **5**		
DATE TESTED	: 24 May 2023		
SAMPLE TYPE	: Recompacted		
DEPTH (m)	: 900mm		
SAMPLE DESCRIPTION	: Dark grey clayey GRAVEL		
LOCATION	: **TP112**		
Plate Size	: 300 mm		
LOAD TO ACHIEVE 1.25mm SETTLEMENT >		:	**192.77 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >		:	**68116 kN/m2/m**
Equivalent CBR VALUE >		:	**14 %**

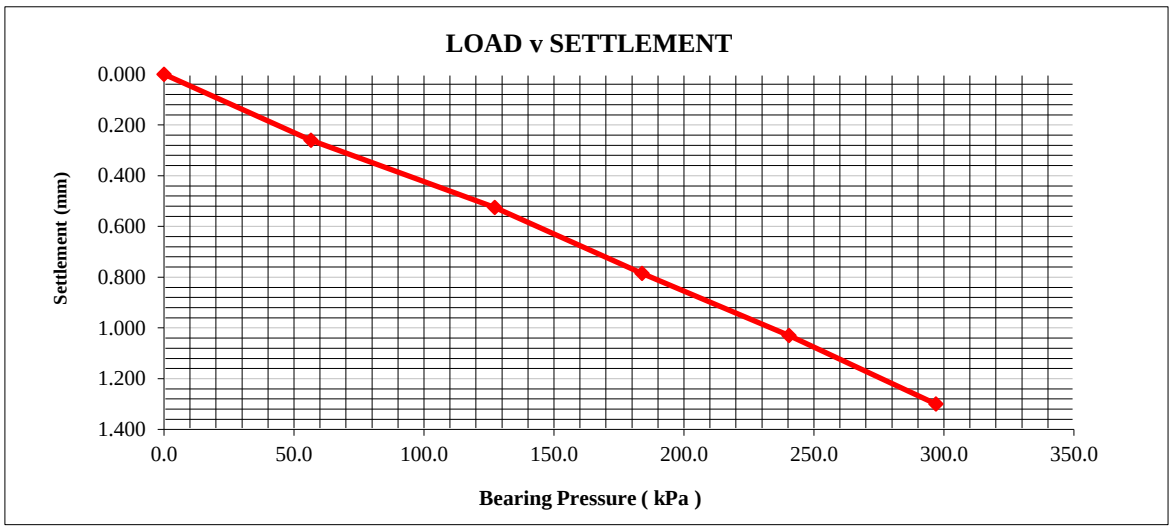


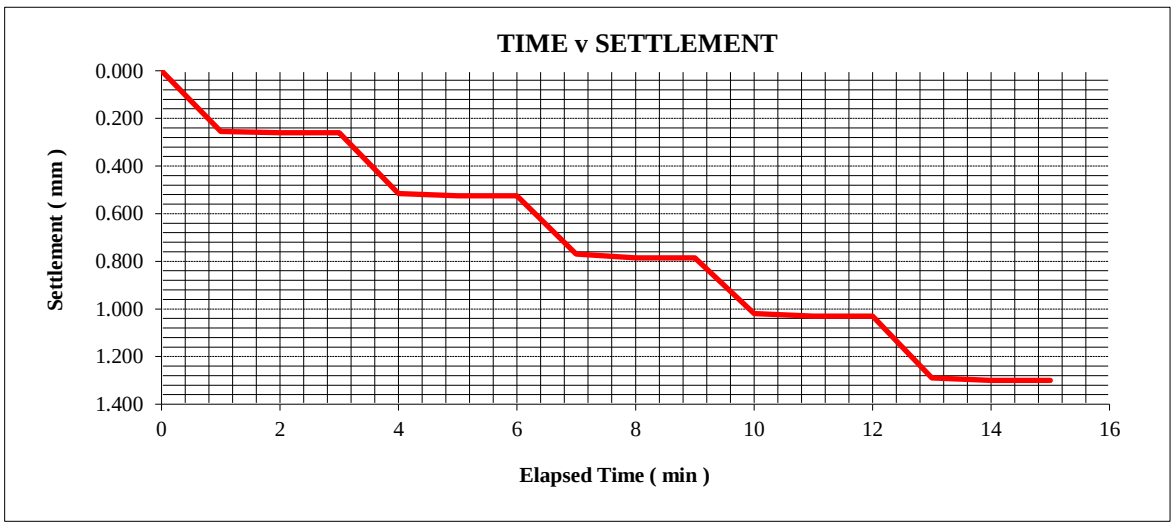


REPORT No : D23234
CLIENT : T.E.C
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **6**		
DATE TESTED	: 24 May 2023		
SAMPLE TYPE	: Recompacted		
DEPTH (m)	: 300mm		
SAMPLE DESCRIPTION	: Dark grey sandy SILT		
LOCATION	: **TP103**		
Plate Size	: 300 mm		
LOAD TO ACHIEVE 1.25mm SETTLEMENT >		:	**286.47 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >		:	**101226 kN/m2/m**
Equivalent CBR VALUE >		:	**29 %**

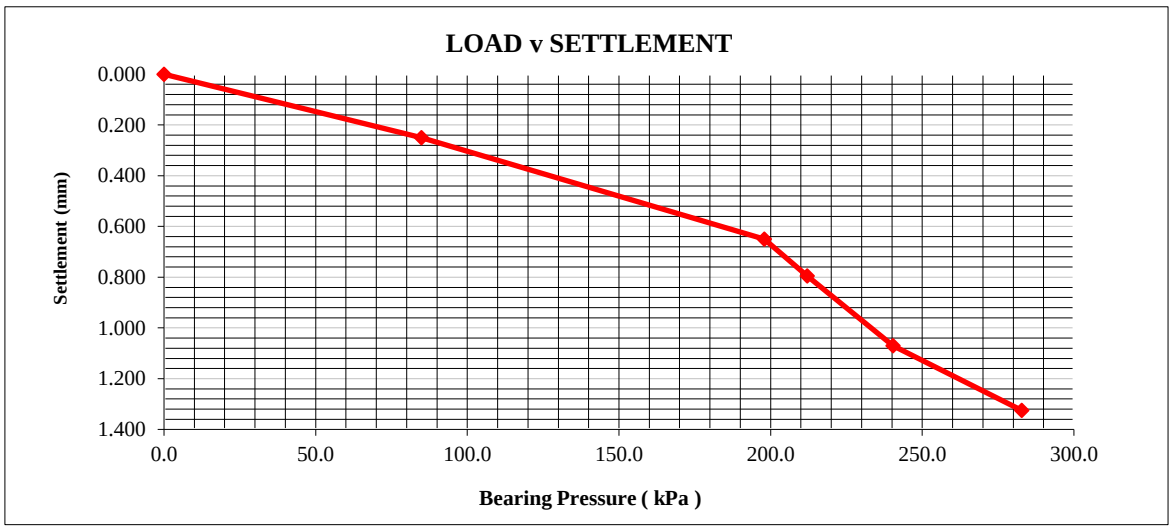


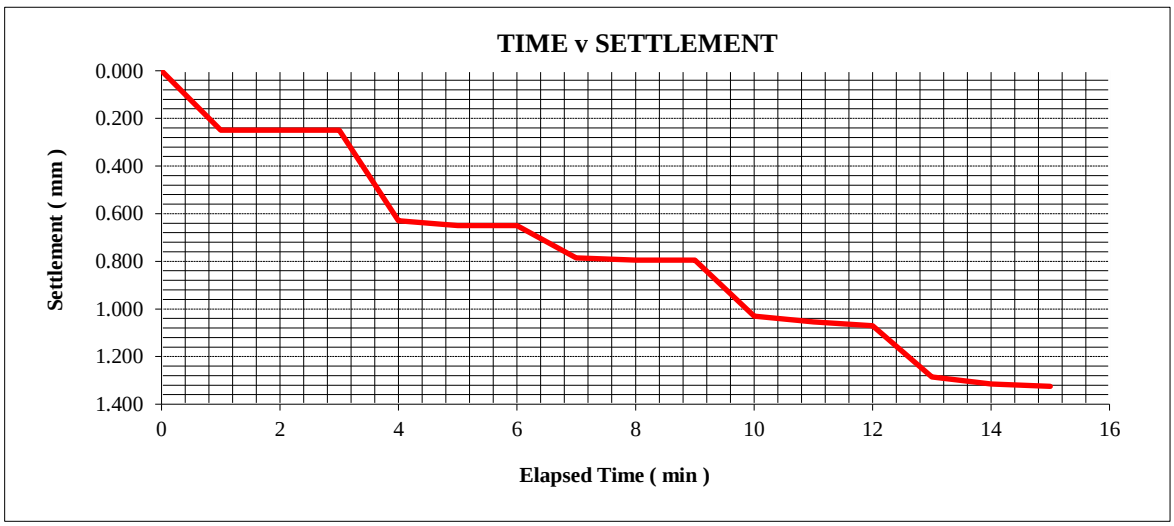


REPORT No : D23234
CLIENT : T.E.C
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **7**		
DATE TESTED	: 24 May 2023		
SAMPLE TYPE	: Recompacted		
DEPTH (m)	: 600mm		
SAMPLE DESCRIPTION	: Grey mottled brown SAND		
LOCATION	: **TP103**		
Plate Size	: 300 mm		
LOAD TO ACHIEVE 1.25mm SETTLEMENT >		:	**270.32 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >		:	**95522 kN/m2/m**
Equivalent CBR VALUE >		:	**26 %**

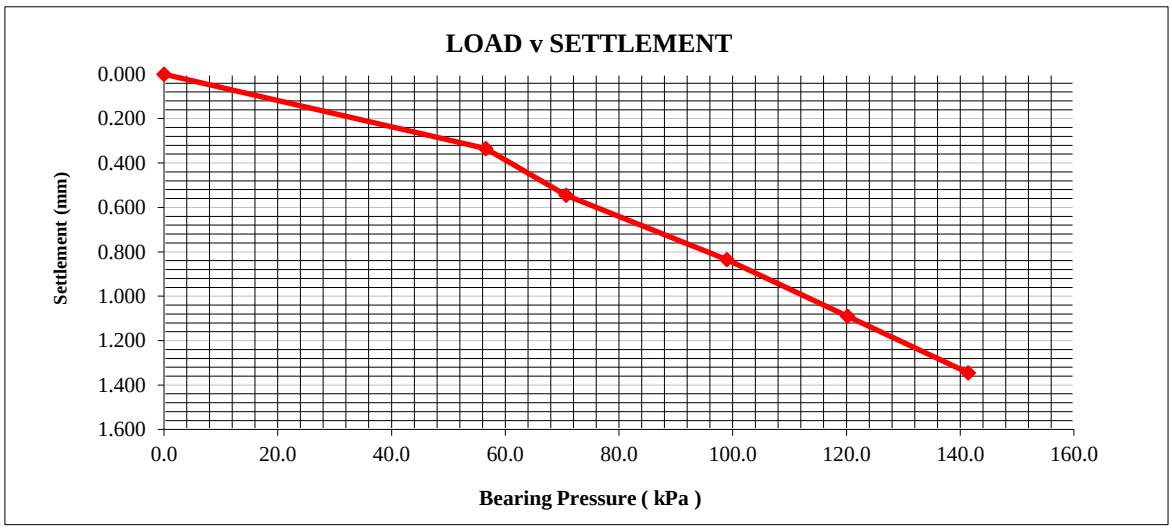


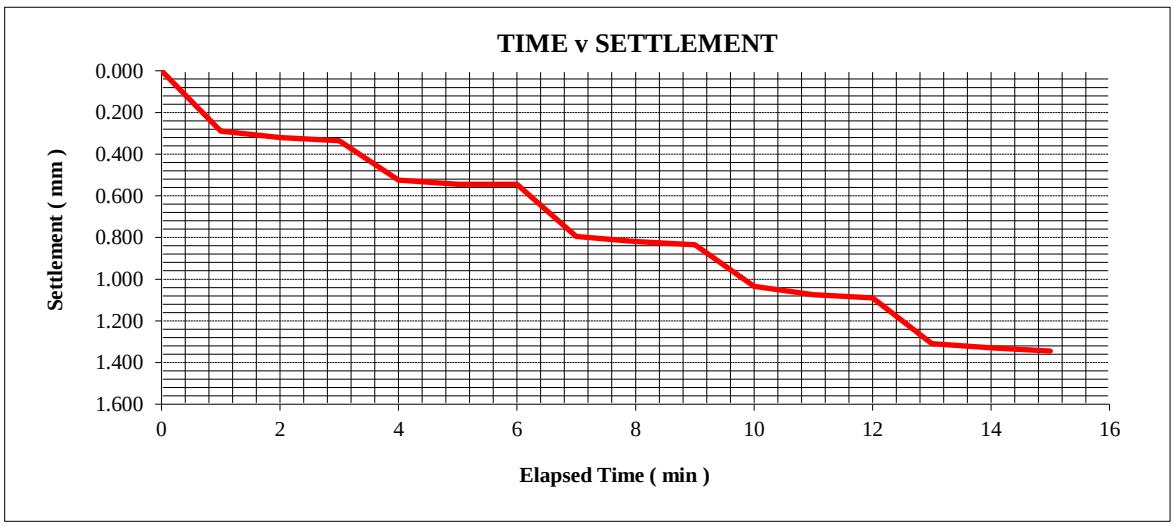


REPORT No : D23234
CLIENT : T.E.C
SITE : Phoenix Wharf

TEST RESULTS

TEST No.	: **8**		
DATE TESTED	: 24 May 2023		
SAMPLE TYPE	: Recompacted		
DEPTH (m)	: 900mm		
SAMPLE DESCRIPTION	: Dark grey SAND		
LOCATION	: **TP103**		
Plate Size	: 300 mm		
LOAD TO ACHIEVE 1.25mm SETTLEMENT >		:	**133.50 kN/m^2**
MODULUS OF SUBGRADE REACTION (k_{762}) >		:	**47173 kN/m2/m**
Equivalent CBR VALUE >		:	**7.7 %**





Appendix N

DCP-TRL Results

TRL Dynamic Cone Penetration Test Results

DCP101

Cumulative Blow Count	Penetration (mm)	Penetration Index (DPI) mm/blow	Estimated CBR[1] (%)	Adjusted CBR[2] (%)
0	94			
1	151	57.0	4.2	3.2
2	221	70.0	3.4	2.6
3	247	26.0	9.6	7.5
4	289	42.0	5.8	4.6
5	337	48.0	5.0	4.1
6	364	27.0	9.3	7.6
7	389	25.0	10.1	8.3
8	460	71.0	3.3	2.8
9	518	58.0	4.1	3.6
10	549	31.0	8.0	7.0
11	574	25.0	10.1	8.8
12	594	20.0	12.7	11.2
13	614	20.0	12.7	11.3
14	632	18.0	14.2	12.7
15	657	25.0	10.1	9.1
16	684	27.0	9.3	8.4
17	714	30.0	8.3	7.6
18	734	20.0	12.7	11.7
19	752	18.0	14.2	13.2
20	774	22.0	11.5	10.8
21	784	10.0	26.5	24.8
22	799	15.0	17.3	16.2
23	806	7.0	38.6	36.4
24	812	6.0	45.4	43.0
25	821	9.0	29.6	28.1
26	839	18.0	14.2	13.6
27	854	15.0	17.3	16.5
28	869	15.0	17.3	16.6
29	882	13.0	20.1	19.4
30	902	20.0	12.7	12.4
31	924	22.0	11.5	11.3
32	935	11.0	23.9	23.5
33	946	11.0	23.9	23.6

DCP101

Project:	Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility: PDZ
Project No.	2111006.001
Client:	LanzaTech UK Limited
Test No.	DCP101
Test Date:	28/03/2023
Surface Moisture:	Moderate
Soil Type	Made Ground: Slightly gravelly silty clay with low cobble content.

Notes/Comments

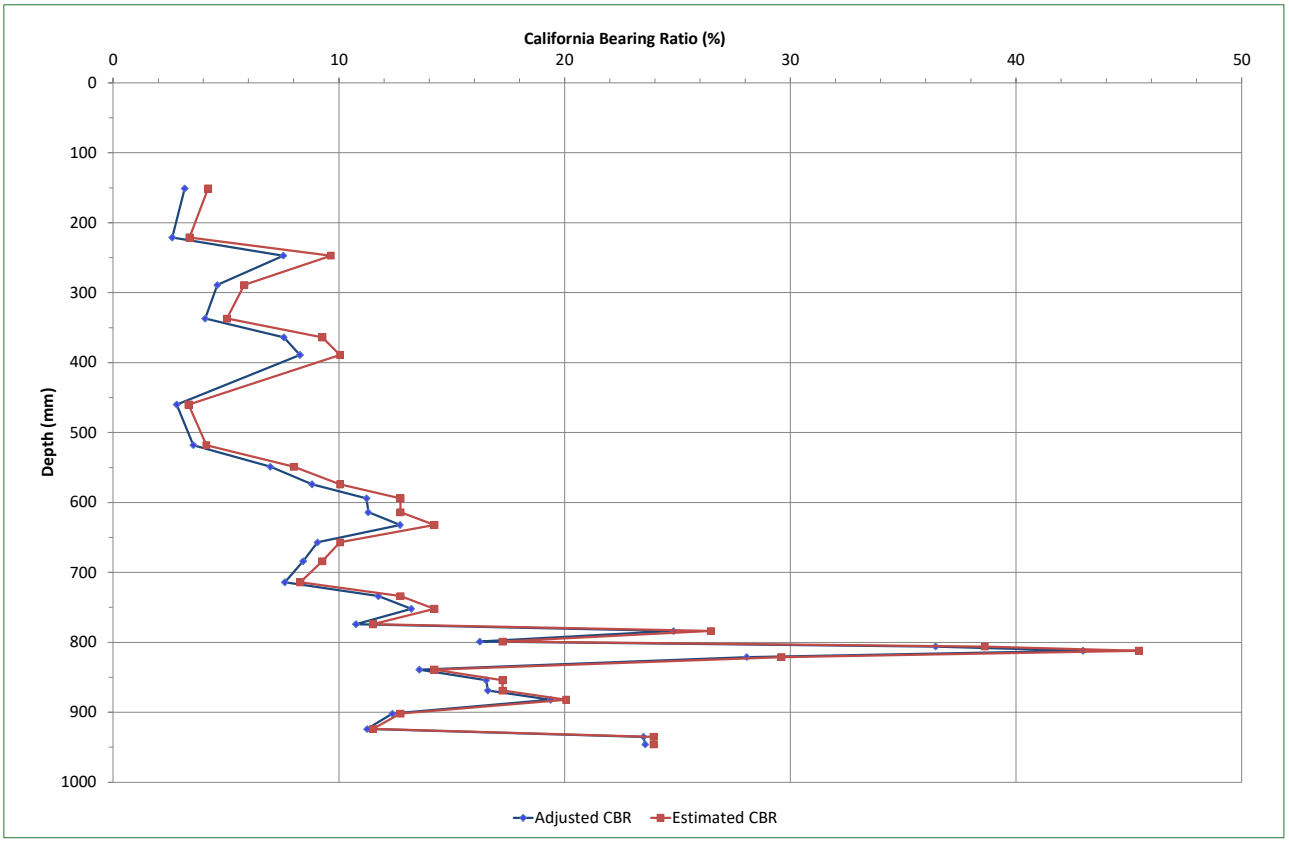
Notes:

1. CBR Value calculated using Jones C R and J Rolt (1991), "*Operating instructions for the TRL dynamic cone penetrometer*" (2nd edition). Information Note. Crowthorne: Transport Research Laboratory, as follows:

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057\ \text{Log}_{10}(\text{DPI})$$

2. Adjusted CBR vaules obtined from Table 4.2 of Simon Done and Piouslin Samuel (2006), "*Measuring Road Pavement Strength and Designing Low Volume Sealed Roads using the Dynamic Cone Penetrometer*" Unpublished TRL Project Report UPR/IE/76/06 Project Record No R7783.

The CBR Adjustment Factors are applied to unpaved roads on the assumption that the effect of moisture will be a maximum at the top surface and will reduce linearly to zero at a depth of 1000 mm.



TRL Dynamic Cone Penetration Test Results

DCP102

Cumulative Blow Count	Penetration (mm)	Penetration Index (DPI) mm/blow	Estimated CBR[1] (%)	Adjusted CBR[2] (%)
0	100			
1	150	50.0	4.8	3.6
2	192	42.0	5.8	4.4
3	224	32.0	7.7	6.0
4	230	6.0	45.4	35.3
5	252	22.0	11.5	9.0
8	262	3.3	84.6	66.5
13	275	2.6	110.0	86.9
16	278	1.0	302.0	238.8

DCP102

Project:	Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility: PDZ
Project No.	2111006.001
Client:	LanzaTech UK Limited
Test No.	DCP102
Test Date:	28/03/2023
Surface Moisture:	Moderate
Soil Type	Made Ground: Slightly gravelly silty clay with low cobble content.

Notes/Comments

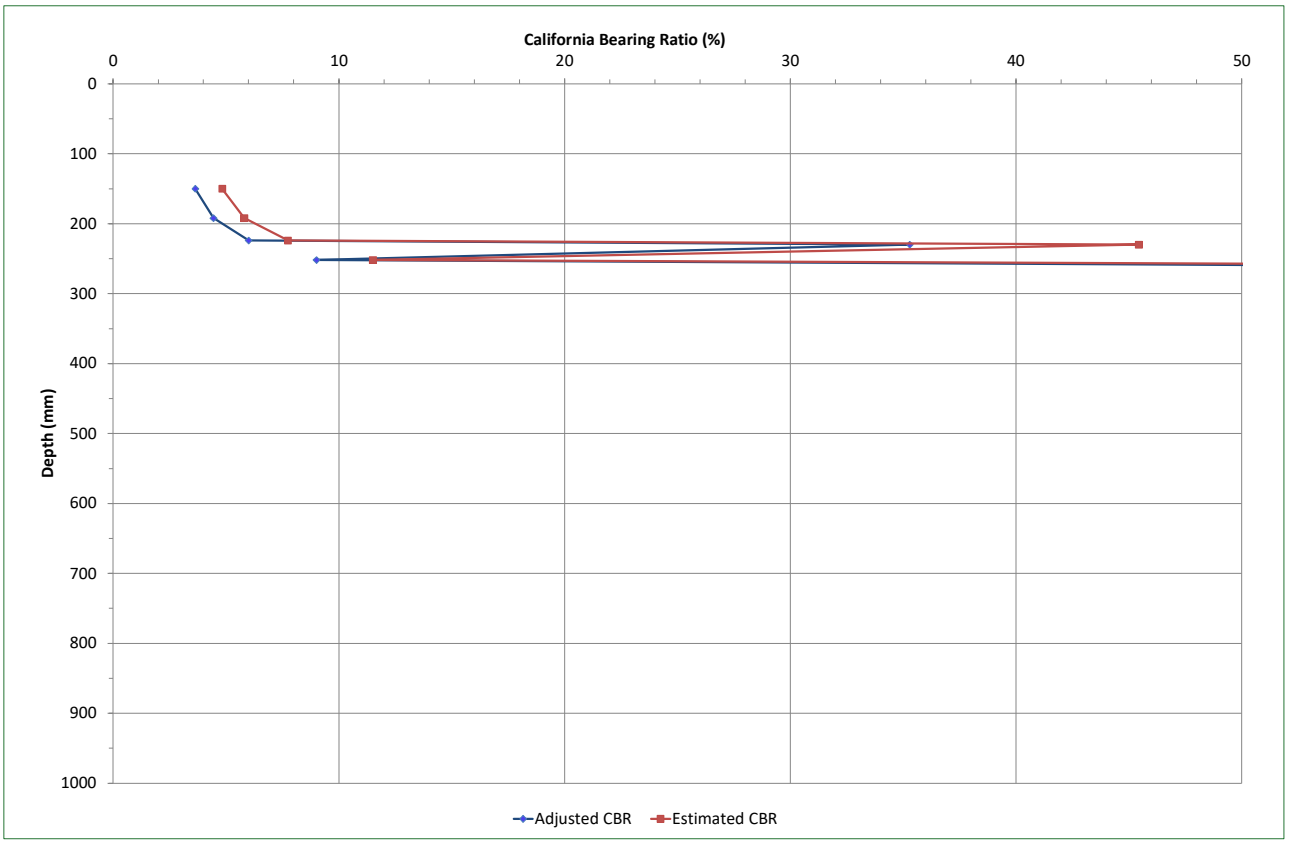
Notes:

1. CBR Value calculated using Jones C R and J Rolt (1991), "*Operating instructions for the TRL dynamic cone penetrometer*" (2nd edition). Information Note. Crowthorne: Transport Research Laboratory, as follows:

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057\ \text{Log}_{10}(\text{DPI})$$

2. Adjusted CBR vaules obtined from Table 4.2 of Simon Done and Piouslin Samuel (2006), "*Measuring Road Pavement Strength and Designing Low Volume Sealed Roads using the Dynamic Cone Penetrometer*" Unpublished TRL Project Report UPR/IE/76/06 Project Record No R7783.

The CBR Adjustment Factors are applied to unpaved roads on the assumption that the effect of moisture will be a maximum at the top surface and will reduce linearly to zero at a depth of 1000 mm.



TRL Dynamic Cone Penetration Test Results

DCP102A

Cumulative Blow Count	Penetration (mm)	Penetration Index (DPI) mm/blow	Estimated CBR[1] (%)	Adjusted CBR[2] (%)
0	80			
1	110	30.0	8.3	6.2
2	141	31.0	8.0	6.0
3	162	21.0	12.1	9.2
4	170	8.0	33.5	25.5
5	175	5.0	55.1	41.9
6	184	9.0	29.6	22.6
8	190	3.0	94.6	72.3
11	204	4.7	59.3	45.6
14	214	3.3	84.6	65.3
17	222	2.7	107.1	82.9
20	232	3.3	84.6	65.7
23	240	2.7	107.1	83.5
26	250	3.3	84.6	66.2
29	255	1.7	176.0	138.0
32	260	1.7	176.0	138.2

DCP102A

Project:	Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility: PDZ
Project No.	2111006.001
Client:	LanzaTech UK Limited
Test No.	DCP102A
Test Date:	28/03/2023
Surface Moisture:	Moderate
Soil Type	Made Ground: Slightly gravelly silty clay with low cobble content.

Notes/Comments

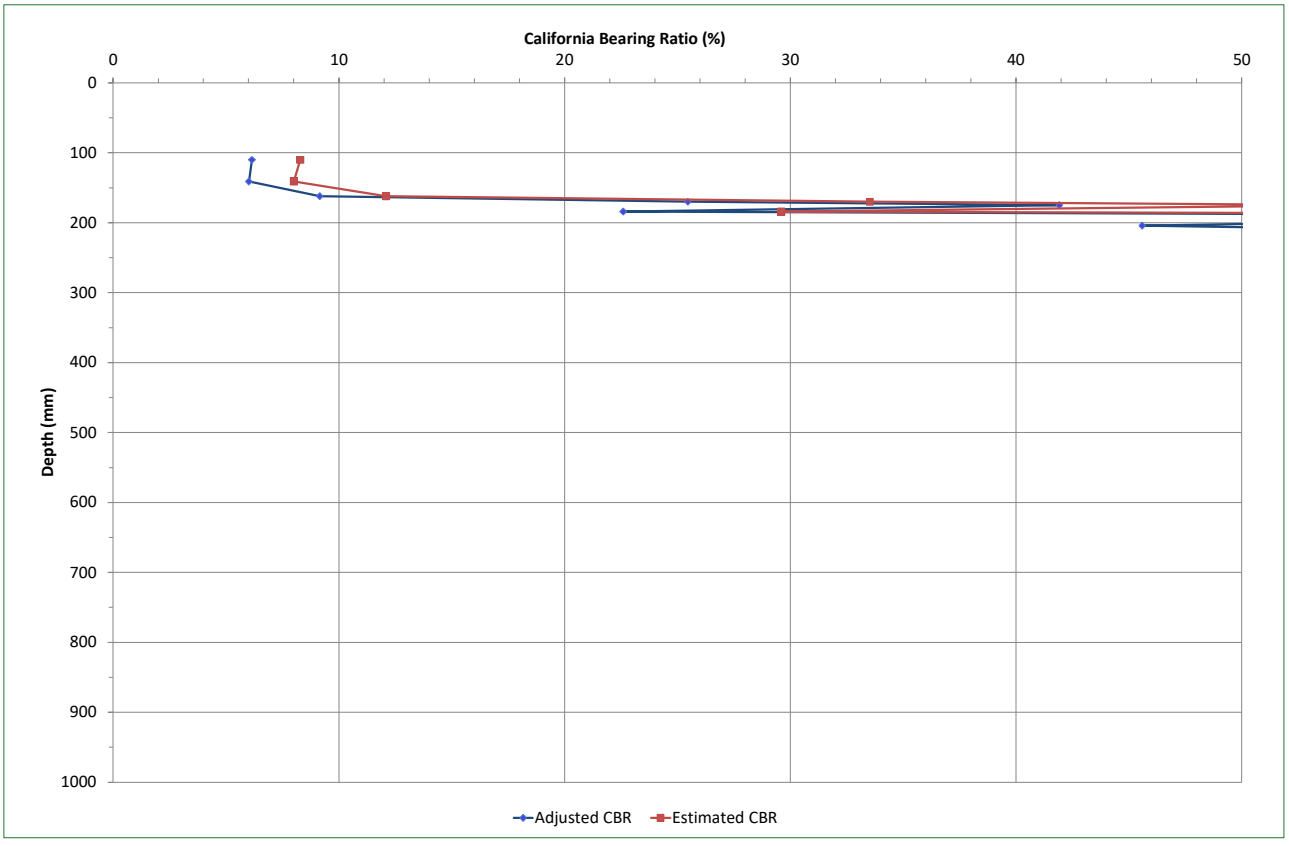
Notes:

1. CBR Value calculated using Jones C R and J Rolt (1991), "*Operating instructions for the TRL dynamic cone penetrometer*" (2nd edition). Information Note. Crowthorne: Transport Research Laboratory, as follows:

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057\ \text{Log}_{10}(\text{DPI})$$

2. Adjusted CBR vaules obtined from Table 4.2 of Simon Done and Piouslin Samuel (2006), "*Measuring Road Pavement Strength and Designing Low Volume Sealed Roads using the Dynamic Cone Penetrometer*" Unpublished TRL Project Report UPR/IE/76/06 Project Record No R7783.

The CBR Adjustment Factors are applied to unpaved roads on the assumption that the effect of moisture will be a maximum at the top surface and will reduce linearly to zero at a depth of 1000 mm.



TRL Dynamic Cone Penetration Test Results

DCP102B

Cumulative Blow Count	Penetration (mm)	Penetration Index (DPI) mm/blow	Estimated CBR[1] (%)	Adjusted CBR[2] (%)
0	74			
1	134	60.0	4.0	3.0
2	172	38.0	6.5	4.9
3	195	23.0	11.0	8.4
4	224	29.0	8.6	6.7
5	254	30.0	8.3	6.5
6	290	36.0	6.8	5.4
7	301	11.0	23.9	19.1
8	314	13.0	20.1	16.1
9	324	10.0	26.5	21.3
10	328	4.0	69.8	56.2
11	331	3.0	94.6	76.2
13	339	4.0	69.8	56.4
15	345	3.0	94.6	76.6
17	352	3.5	80.3	65.2
19	360	4.0	69.8	56.8
21	365	2.5	114.7	93.5
23	371	3.0	94.6	77.3
25	374	1.5	196.7	161.0
27	382	4.0	69.8	57.3
29	388	3.0	94.6	77.8
31	393	2.5	114.7	94.5
33	397	2.0	145.1	119.8
35	402	2.5	114.7	94.8
37	408	3.0	94.6	78.3
39	412	2.0	145.1	120.4
41	424	6.0	45.4	37.9
43	430	3.0	94.6	78.9
45	438	4.0	69.8	58.4
47	456	9.0	29.6	24.9
49	462	3.0	94.6	79.8
51	473	5.5	49.8	42.2
53	482	4.5	61.6	52.3
56	493	3.7	76.5	65.2
58	504	5.5	49.8	42.7

DCP102B

Project:	Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility: PDZ
Project No.	2111006.001
Client:	LanzaTech UK Limited
Test No.	DCP102B
Test Date:	28/03/2023
Surface Moisture:	Moderate
Soil Type	Made Ground: Slightly gravelly silty clay with low cobble content.

Notes/Comments

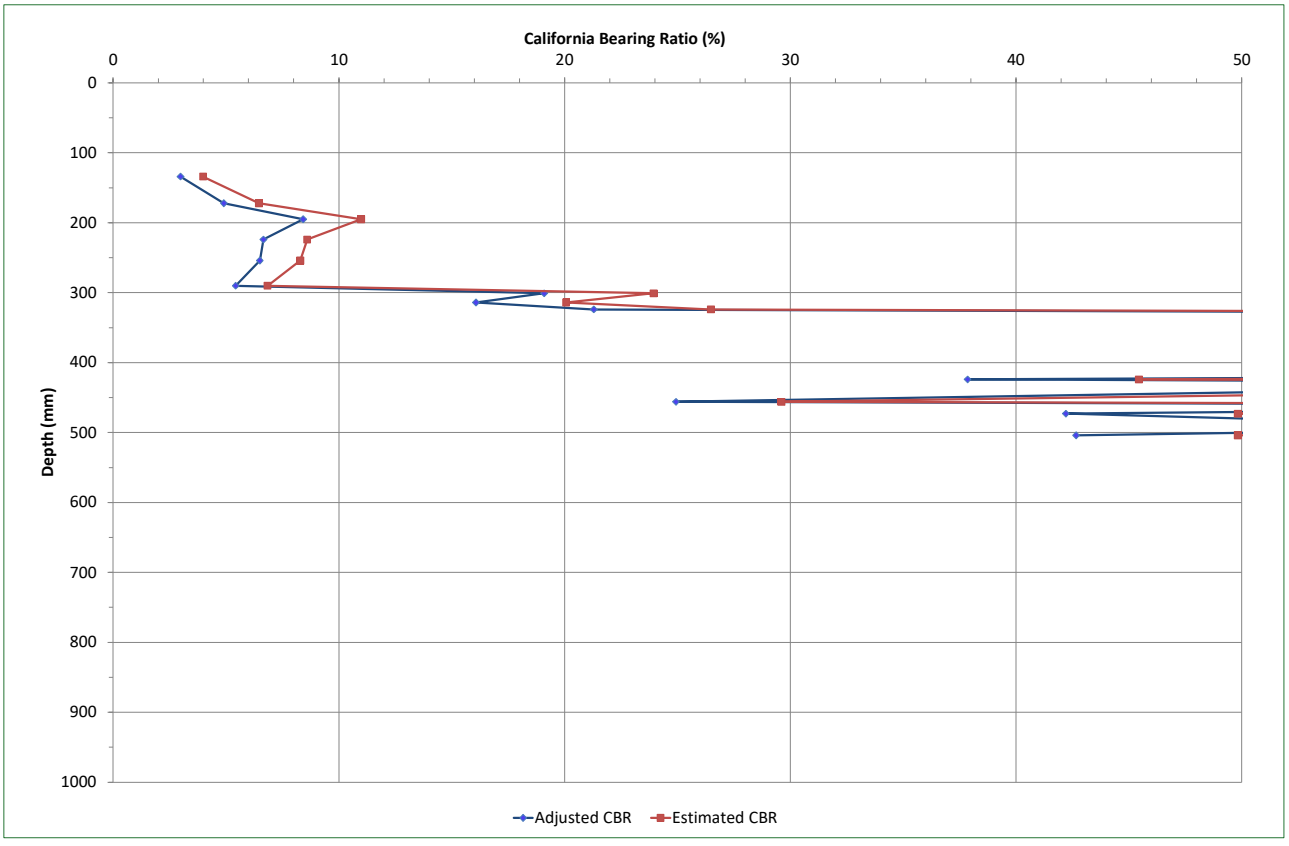
Notes:

1. CBR Value calculated using Jones C R and J Rolt (1991), "*Operating instructions for the TRL dynamic cone penetrometer*" (2nd edition). Information Note. Crowthorne: Transport Research Laboratory, as follows:

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057\ \text{Log}_{10}(\text{DPI})$$

2. Adjusted CBR vaules obtined from Table 4.2 of Simon Done and Piouslin Samuel (2006), "*Measuring Road Pavement Strength and Designing Low Volume Sealed Roads using the Dynamic Cone Penetrometer*" Unpublished TRL Project Report UPR/IE/76/06 Project Record No R7783.

The CBR Adjustment Factors are applied to unpaved roads on the assumption that the effect of moisture will be a maximum at the top surface and will reduce linearly to zero at a depth of 1000 mm.



TRL Dynamic Cone Penetration Test Results

DCP103

Cumulative Blow Count	Penetration (mm)	Penetration Index (DPI) mm/blow	Estimated CBR[1] (%)	Adjusted CBR[2] (%)
0	92			
1	141	49.0	4.9	3.7
2	174	33.0	7.5	5.7
3	190	16.0	16.1	12.3
4	213	23.0	11.0	8.5
5	272	59.0	4.1	3.2
6	280	8.0	33.5	26.5
7	291	11.0	23.9	19.0
8	302	11.0	23.9	19.1
9	324	22.0	11.5	9.3
10	346	22.0	11.5	9.3
11	370	24.0	10.5	8.6
12	385	15.0	17.3	14.2
13	401	16.0	16.1	13.3
14	412	11.0	23.9	19.9
15	423	11.0	23.9	19.9
16	432	9.0	29.6	24.7
17	440	8.0	33.5	28.1
22	444	0.8	382.3	320.7
27	449	1.0	302.0	253.7

DCP103

Project:	Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility: PDZ
Project No.	2111006.001
Client:	LanzaTech UK Limited
Test No.	DCP103
Test Date:	28/03/2023
Surface Moisture:	Moderate
Soil Type	Made Ground: Slightly gravelly silty clay with low cobble content.

Notes/Comments

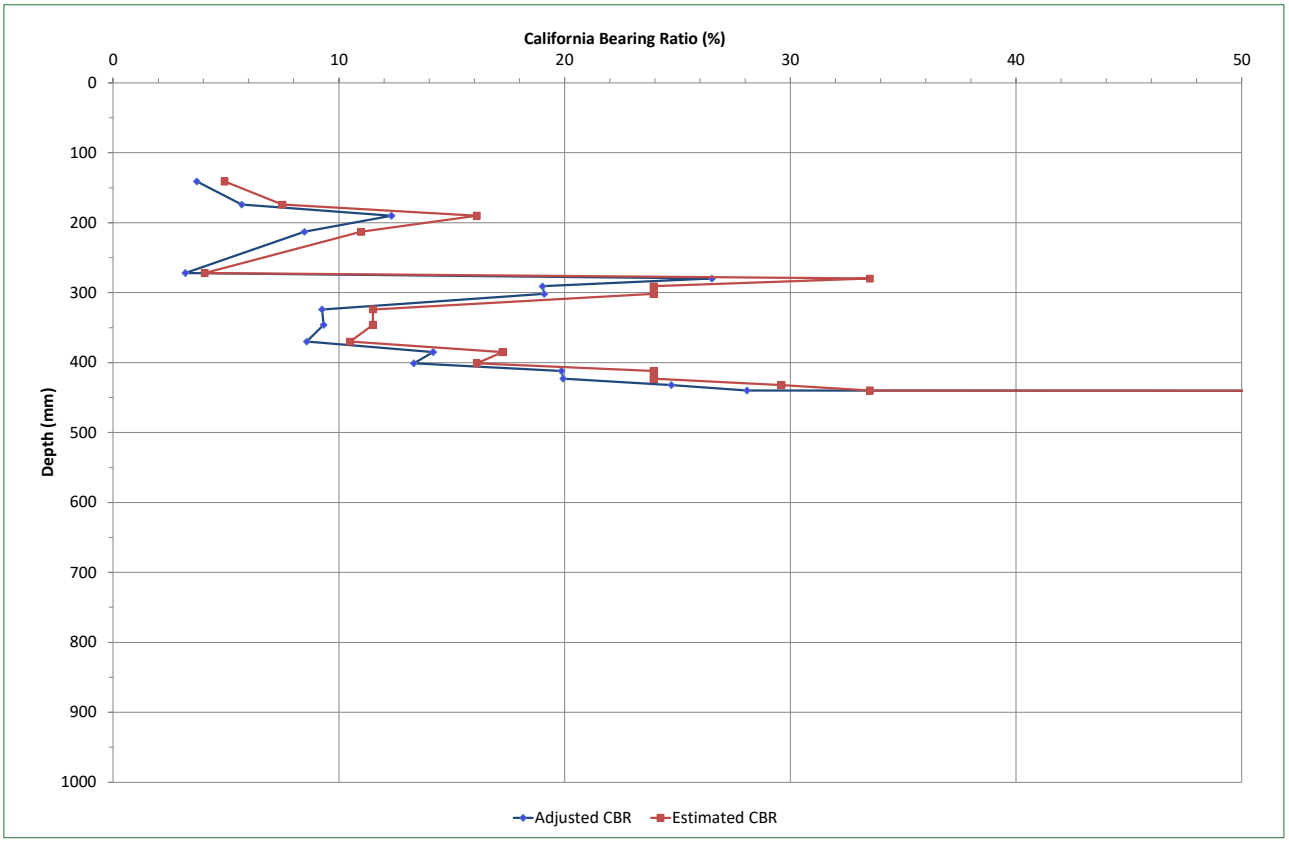
Notes:

1. CBR Value calculated using Jones C R and J Rolt (1991), "*Operating instructions for the TRL dynamic cone penetrometer* " (2nd edition). Information Note. Crowthorne: Transport Research Laboratory, as follows:

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057\ \text{Log}_{10}(\text{DPI})$$

2. Adjusted CBR vaules obtined from Table 4.2 of Simon Done and Piouslin Samuel (2006), "*Measuring Road Pavement Strength and Designing Low Volume Sealed Roads using the Dynamic Cone Penetrometer* " Unpublished TRL Project Report UPR/IE/76/06 Project Record No R7783.

The CBR Adjustment Factors are applied to unpaved roads on the assumption that the effect of moisture will be a maximum at the top surface and will reduce linearly to zero at a depth of 1000 mm.



TRL Dynamic Cone Penetration Test Results

DCP104

Cumulative Blow Count	Penetration (mm)	Penetration Index (DPI) mm/blow	Estimated CBR[1] (%)	Adjusted CBR[2] (%)
0	94			
1	164	70.0	3.4	2.6
2	202	38.0	6.5	5.0
3	232	30.0	8.3	6.4
4	319	87.0	2.7	2.2
5	350	31.0	8.0	6.5
6	384	34.0	7.3	6.0
7	412	28.0	8.9	7.4
8	432	20.0	12.7	10.6
9	454	22.0	11.5	9.7
10	472	18.0	14.2	12.1
11	490	18.0	14.2	12.1
12	502	12.0	21.8	18.7
13	514	12.0	21.8	18.8
14	532	18.0	14.2	12.3
15	546	14.0	18.6	16.1
16	559	13.0	20.1	17.5
17	569	10.0	26.5	23.2
18	578	9.0	29.6	26.0
19	592	14.0	18.6	16.4
20	602	10.0	26.5	23.4
21	613	11.0	23.9	21.3
22	624	11.0	23.9	21.3
23	652	28.0	8.9	8.0
24	664	12.0	21.8	19.7
25	682	18.0	14.2	12.9
26	716	34.0	7.3	6.7
27	724	8.0	33.5	30.8
28	734	10.0	26.5	24.4
29	754	20.0	12.7	11.8
30	764	10.0	26.5	24.7
31	778	14.0	18.6	17.4
32	792	14.0	18.6	17.4
33	807	15.0	17.3	16.3
34	820	13.0	20.1	19.0
35	834	14.0	18.6	17.7
36	851	17.0	15.1	14.5
37	860	9.0	29.6	28.4
38	871	11.0	23.9	23.1
39	884	13.0	20.1	19.4
40	893	9.0	29.6	28.7
41	900	7.0	38.6	37.5
42	916	16.0	16.1	15.7
43	924	8.0	33.5	32.8
44	932	8.0	33.5	32.9
45	940	8.0	33.5	32.9

DCP104

Project:	Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility: PDZ
Project No.	2111006.001
Client:	LanzaTech UK Limited
Test No.	DCP104
Test Date:	28/03/2023
Surface Moisture:	Moderate
Soil Type	Made Ground: Slightly gravelly silty clay with low cobble content.

Notes/Comments

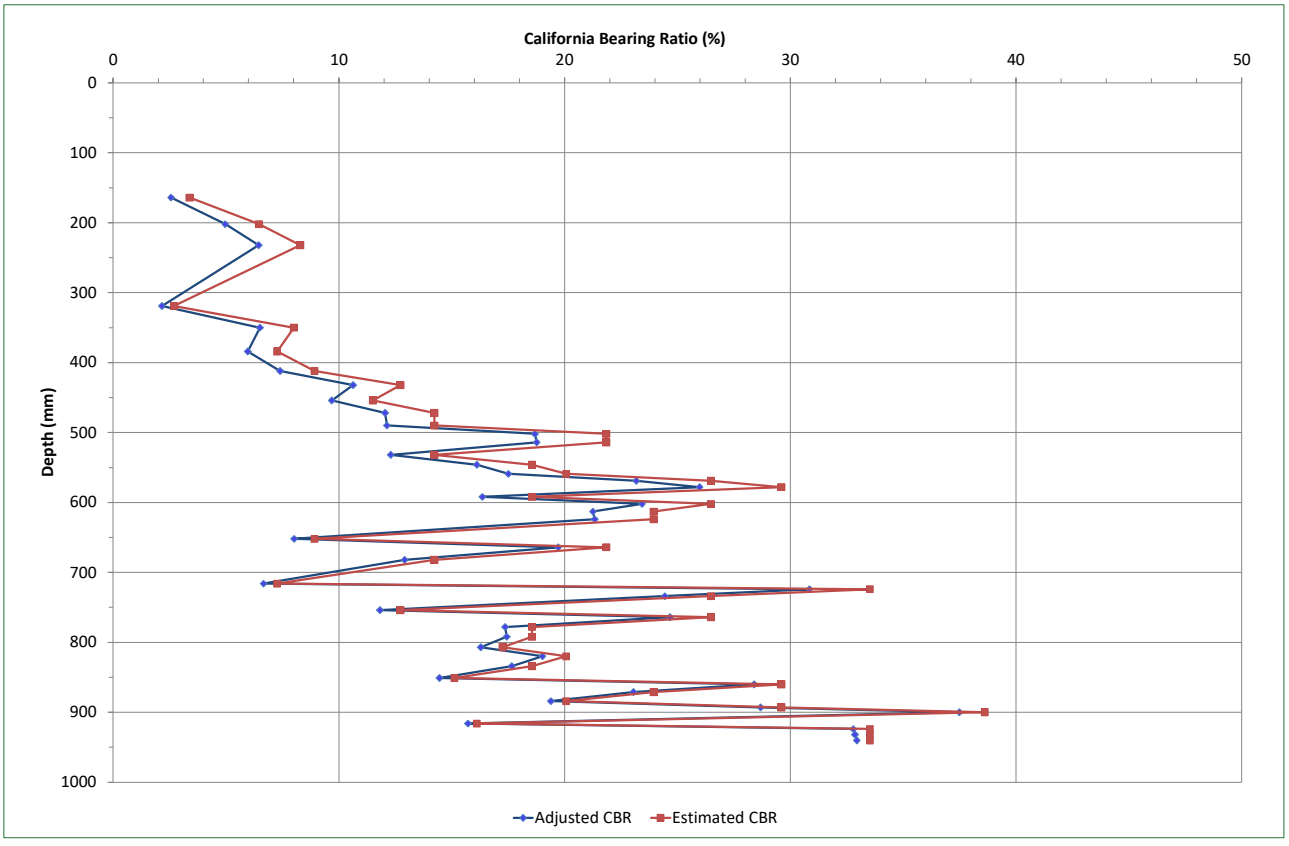
Notes:

1. CBR Value calculated using Jones C R and J Rolt (1991), "*Operating instructions for the TRL dynamic cone penetrometer*" (2nd edition). Information Note. Crowthorne: Transport Research Laboratory, as follows:

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057\ \text{Log}_{10}(\text{DPI})$$

2. Adjusted CBR vaules obtined from Table 4.2 of Simon Done and Piouslin Samuel (2006), "*Measuring Road Pavement Strength and Designing Low Volume Sealed Roads using the Dynamic Cone Penetrometer*" Unpublished TRL Project Report UPR/IE/76/06 Project Record No R7783.

The CBR Adjustment Factors are applied to unpaved roads on the assumption that the effect of moisture will be a maximum at the top surface and will reduce linearly to zero at a depth of 1000 mm.



TRL Dynamic Cone Penetration Test Results

DCP105

Cumulative Blow Count	Penetration (mm)	Penetration Index (DPI) mm/blow	Estimated CBR[1] (%)	Adjusted CBR[2] (%)
0	72			
1	104	32.0	7.7	5.7
2	124	20.0	12.7	9.5
3	146	22.0	11.5	8.7
4	155	9.0	29.6	22.4
5	170	15.0	17.3	13.1
6	184	14.0	18.6	14.2
7	200	16.0	16.1	12.4
8	215	15.0	17.3	13.3
9	224	9.0	29.6	22.9
10	234	10.0	26.5	20.6
11	241	7.0	38.6	30.1
12	252	11.0	23.9	18.8
13	260	8.0	33.5	26.3
14	264	4.0	69.8	54.9
15	271	7.0	38.6	30.4
16	274	3.0	94.6	74.6
17	285	11.0	23.9	19.0
18	294	9.0	29.6	23.5
19	304	10.0	26.5	21.1
20	314	10.0	26.5	21.2
21	324	10.0	26.5	21.3
22	335	11.0	23.9	19.3
23	348	13.0	20.1	16.3
24	359	11.0	23.9	19.5
25	369	10.0	26.5	21.6
26	379	10.0	26.5	21.7
27	390	11.0	23.9	19.7
28	401	11.0	23.9	19.8
29	412	11.0	23.9	19.9
30	422	10.0	26.5	22.0
31	436	14.0	18.6	15.5
32	449	13.0	20.1	16.9
33	460	11.0	23.9	20.2
34	471	11.0	23.9	20.3
35	501	30.0	8.3	7.1
36	514	13.0	20.1	17.2
37	530	16.0	16.1	13.9
38	550	20.0	12.7	11.1
39	570	20.0	12.7	11.1
40	589	19.0	13.4	11.8
41	600	11.0	23.9	21.2
42	610	10.0	26.5	23.5
43	624	14.0	18.6	16.5
44	644	20.0	12.7	11.4
45	656	12.0	21.8	19.7
46	662	6.0	45.4	41.0
47	680	18.0	14.2	12.9
48	691	11.0	23.9	21.8
50	718	13.5	19.3	17.7
52	760	21.0	12.1	11.2
55	817	19.0	13.4	12.7
57	828	5.5	49.8	47.3
62	840	2.4	119.7	114.2
67	851	2.2	131.2	125.6

DCP105

Project:	Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility: PDZ
Project No.	2111006.001
Client:	LanzaTech UK Limited
Test No.	DCP105
Test Date:	28/03/2023
Surface Moisture:	Moderate
Soil Type	Made Ground: Slightly gravelly silty clay with low cobble content.

Notes/Comments

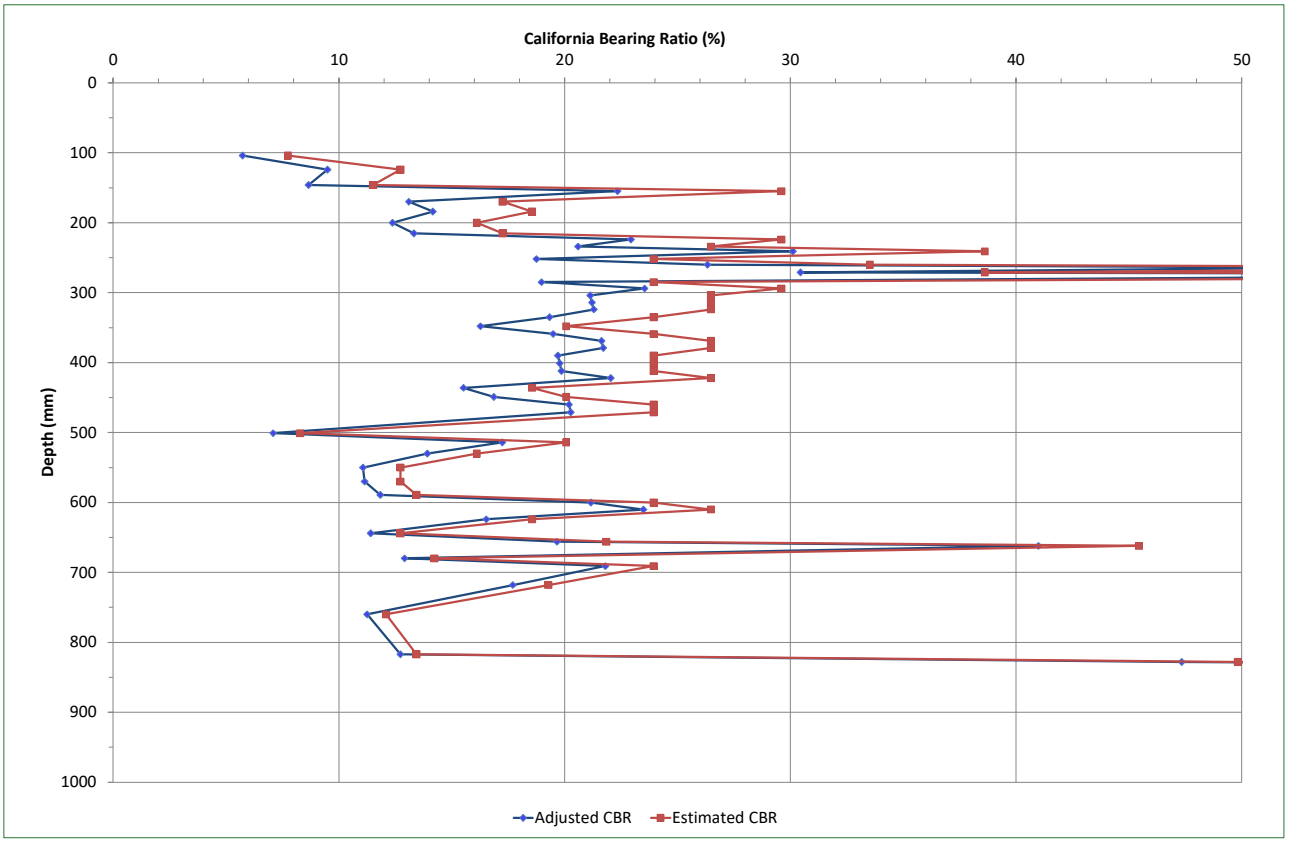
Notes:

1. CBR Value calculated using Jones C R and J Rolt (1991), "*Operating instructions for the TRL dynamic cone penetrometer*" (2nd edition). Information Note. Crowthorne: Transport Research Laboratory, as follows:

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057\ \text{Log}_{10}(\text{DPI})$$

2. Adjusted CBR vaules obtined from Table 4.2 of Simon Done and Piouslin Samuel (2006), "*Measuring Road Pavement Strength and Designing Low Volume Sealed Roads using the Dynamic Cone Penetrometer*" Unpublished TRL Project Report UPR/IE/76/06 Project Record No R7783.

The CBR Adjustment Factors are applied to unpaved roads on the assumption that the effect of moisture will be a maximum at the top surface and will reduce linearly to zero at a depth of 1000 mm.



TRL Dynamic Cone Penetration Test Results

DCP106

Cumulative Blow Count	Penetration (mm)	Penetration Index (DPI) mm/blow	Estimated CBR[1] (%)	Adjusted CBR[2] (%)
0	89			
1	124	35.0	7.0	5.3
2	135	11.0	23.9	17.9
3	151	16.0	16.1	12.1
4	182	31.0	8.0	6.1
5	214	32.0	7.7	6.0
6	232	18.0	14.2	11.1
7	242	10.0	26.5	20.7
8	252	10.0	26.5	20.7
9	270	18.0	14.2	11.2
10	281	11.0	23.9	19.0
12	305	12.0	21.8	17.4
14	335	15.0	17.3	13.9
15	349	14.0	18.6	15.1
16	355	6.0	45.4	36.9
17	361	6.0	45.4	37.0
19	370	4.5	61.6	50.3
21	382	6.0	45.4	37.3
23	400	9.0	29.6	24.5
25	412	6.0	45.4	37.7
27	422	5.0	55.1	45.9
29	432	5.0	55.1	46.0
31	441	4.5	61.6	51.6
33	452	5.5	49.8	41.9
35	463	5.5	49.8	42.1
37	470	3.5	80.3	68.0
39	479	4.5	61.6	52.3
41	486	3.5	80.3	68.4
43	496	5.0	55.1	47.1
45	507	5.5	49.8	42.7
47	519	6.0	45.4	39.1
49	524	2.5	114.7	98.8
51	532	4.0	69.8	60.3
53	543	5.5	49.8	43.2
55	568	12.5	20.9	18.3
57	579	5.5	49.8	43.7
59	604	12.5	20.9	18.5
61	642	19.0	13.4	12.0
63	672	15.0	17.3	15.6
65	712	20.0	12.7	11.7
67	724	6.0	45.4	41.8
69	742	9.0	29.6	27.4
71	759	8.5	31.4	29.3
73	780	10.5	25.2	23.5
75	791	5.5	49.8	46.8
77	802	5.5	49.8	47.0
79	817	7.5	35.9	34.0
81	839	11.0	23.9	22.8
83	854	7.5	35.9	34.4
85	862	4.0	69.8	67.0
87	874	6.0	45.4	43.8
89	885	5.5	49.8	48.2
91	905	10.0	26.5	25.8
93	915	5.0	55.1	53.7

DCP106

Project:	Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility: PDZ
Project No.	2111006.001
Client:	LanzaTech UK Limited
Test No.	DCP106
Test Date:	28/03/2023
Surface Moisture:	Moderate
Soil Type	Made Ground: Slightly gravelly silty clay with low cobble content.

Notes/Comments

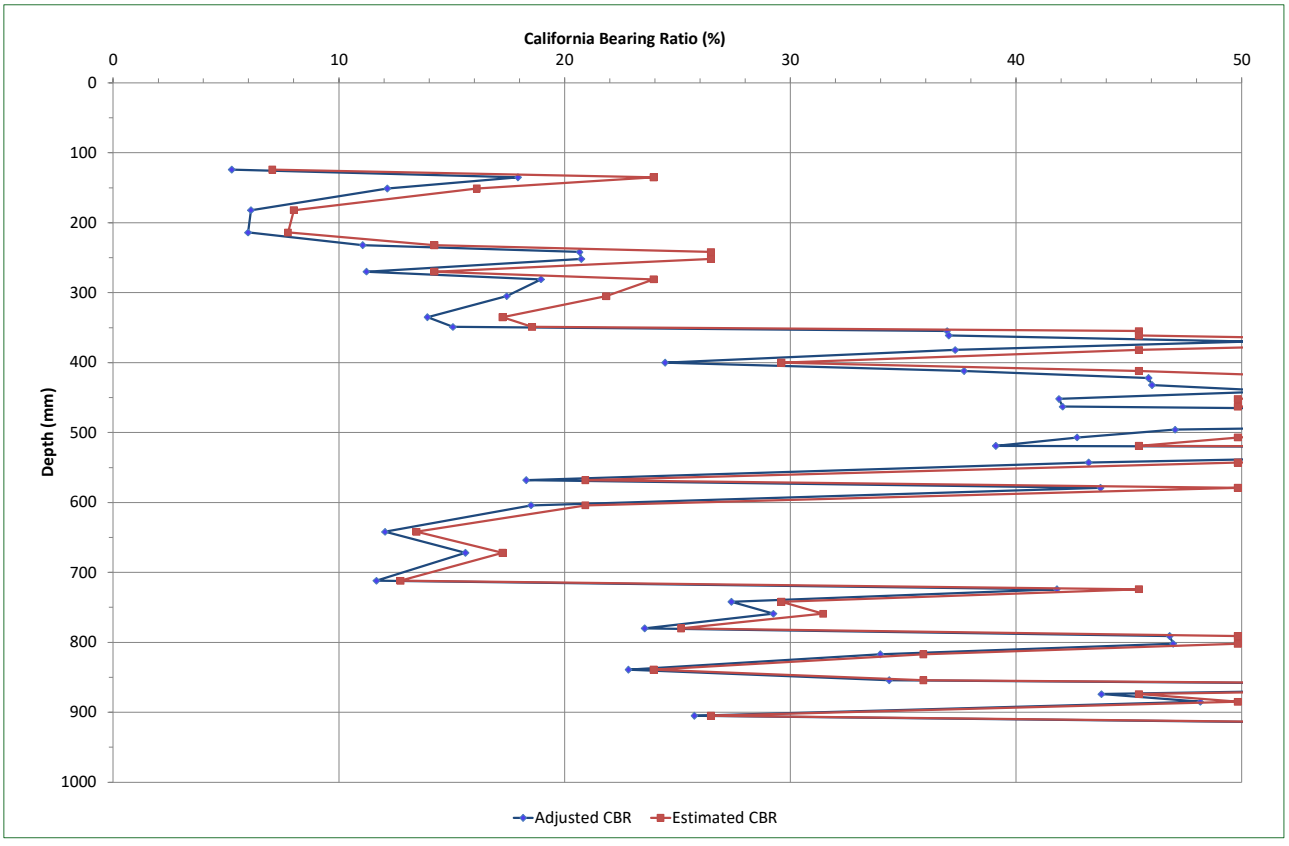
Notes:

1. CBR Value calculated using Jones C R and J Rolt (1991), "*Operating instructions for the TRL dynamic cone penetrometer*" (2nd edition). Information Note. Crowthorne: Transport Research Laboratory, as follows:

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057\ \text{Log}_{10}(\text{DPI})$$

2. Adjusted CBR vaules obtined from Table 4.2 of Simon Done and Piouslin Samuel (2006), "*Measuring Road Pavement Strength and Designing Low Volume Sealed Roads using the Dynamic Cone Penetrometer*" Unpublished TRL Project Report UPR/IE/76/06 Project Record No R7783.

The CBR Adjustment Factors are applied to unpaved roads on the assumption that the effect of moisture will be a maximum at the top surface and will reduce linearly to zero at a depth of 1000 mm.



TRL Dynamic Cone Penetration Test Results

DCP107

Cumulative Blow Count	Penetration (mm)	Penetration Index (DPI) mm/blow	Estimated CBR[1] (%)	Adjusted CBR[2] (%)
0	101			
1	184	83.0	2.8	2.2
2	214	30.0	8.3	6.4
3	234	20.0	12.7	9.9
4	254	20.0	12.7	10.0
5	272	18.0	14.2	11.2
6	290	18.0	14.2	11.3
7	304	14.0	18.6	14.8
8	321	17.0	15.1	12.1
9	332	11.0	23.9	19.3
10	354	22.0	11.5	9.4
11	369	15.0	17.3	14.1
12	385	16.0	16.1	13.2
13	396	11.0	23.9	19.8
14	402	6.0	45.4	37.6
15	412	10.0	26.5	22.0
16	423	11.0	23.9	19.9
17	432	9.0	29.6	24.7
18	441	9.0	29.6	24.8
19	452	11.0	23.9	20.1
21	463	5.5	49.8	42.1
23	480	8.5	31.4	26.7
25	492	6.0	45.4	38.8
27	504	6.0	45.4	38.9
29	516	6.0	45.4	39.1
31	530	7.0	38.6	33.3
33	541	5.5	49.8	43.2
35	554	6.5	41.8	36.4
37	568	7.0	38.6	33.8
39	585	8.5	31.4	27.7
41	606	10.5	25.2	22.3
43	622	8.0	33.5	29.9
45	634	6.0	45.4	40.6
47	640	3.0	94.6	84.7
49	664	12.0	21.8	19.7
51	682	9.0	29.6	26.9
53	699	8.5	31.4	28.7
55	712	6.5	41.8	38.3
57	730	9.0	29.6	27.3
59	742	6.0	45.4	42.0
61	767	12.5	20.9	19.5
63	780	6.5	41.8	39.1
65	790	5.0	55.1	51.7
67	804	7.0	38.6	36.4
69	812	4.0	69.8	66.0
71	814	1.0	302.0	285.7
73	817	1.5	196.7	186.3
75	820	1.5	196.7	186.5
77	822	1.0	302.0	286.4

DCP107

Project:	Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility: PDZ
Project No.	2111006.001
Client:	LanzaTech UK Limited
Test No.	DCP107
Test Date:	28/03/2023
Surface Moisture:	Moderate
Soil Type	Made Ground: Slightly gravelly silty clay with low cobble content.

Notes/Comments

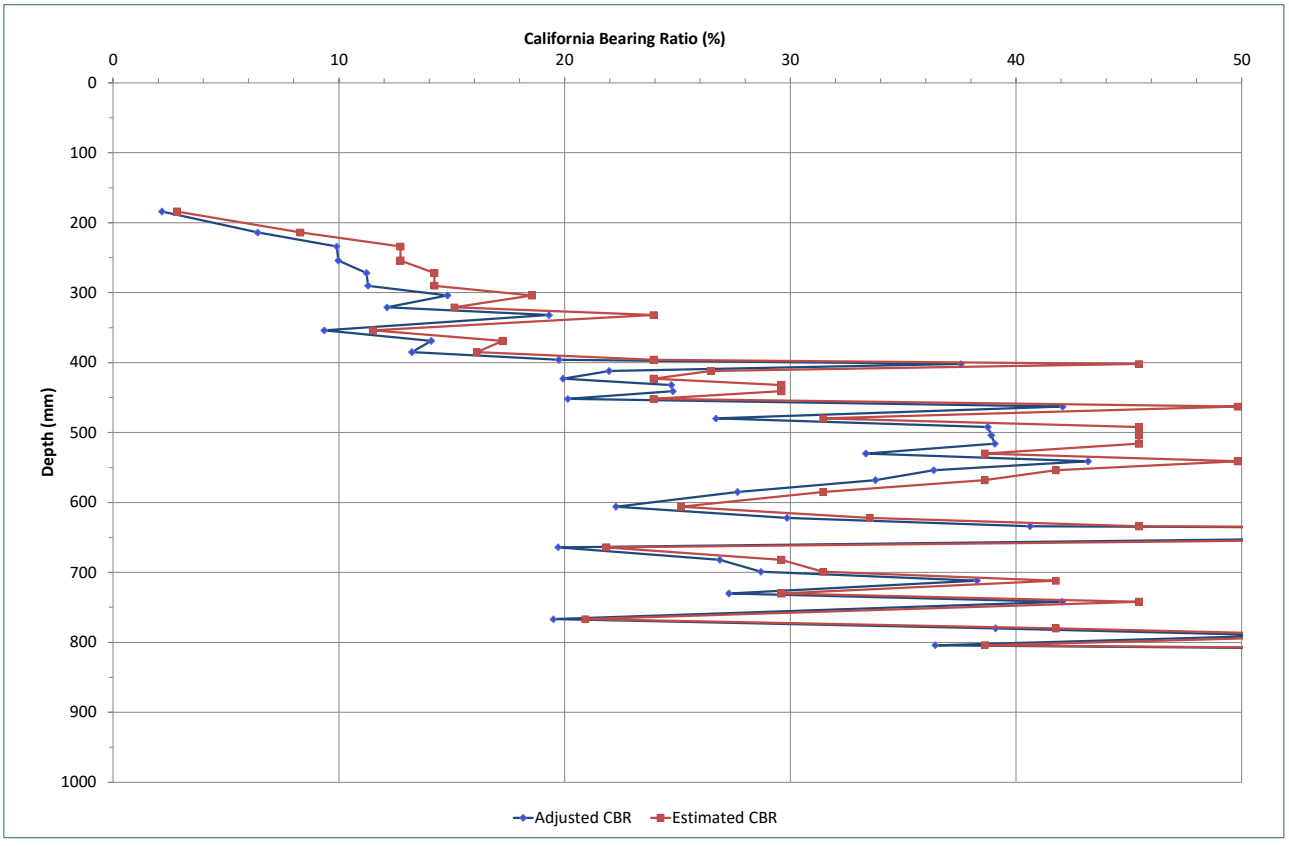
Notes:

1. CBR Value calculated using Jones C R and J Rolt (1991), "*Operating instructions for the TRL dynamic cone penetrometer*" (2nd edition). Information Note. Crowthorne: Transport Research Laboratory, as follows:

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057\ \text{Log}_{10}(\text{DPI})$$

2. Adjusted CBR vaules obtined from Table 4.2 of Simon Done and Piouslin Samuel (2006), "*Measuring Road Pavement Strength and Designing Low Volume Sealed Roads using the Dynamic Cone Penetrometer*" Unpublished TRL Project Report UPR/IE/76/06 Project Record No R7783.

The CBR Adjustment Factors are applied to unpaved roads on the assumption that the effect of moisture will be a maximum at the top surface and will reduce linearly to zero at a depth of 1000 mm.



TRL Dynamic Cone Penetration Test Results

DCP108

Cumulative Blow Count	Penetration (mm)	Penetration Index (DPI) mm/blow	Estimated CBR[1] (%)	Adjusted CBR[2] (%)
0	60			
1	105	45.0	5.4	4.0
2	141	36.0	6.8	5.1
3	164	23.0	11.0	8.3
4	190	26.0	9.6	7.4
5	215	25.0	10.1	7.8
6	220	5.0	55.1	42.6
7	222	2.0	145.1	112.4

DCP108

Project:	Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility: PDZ
Project No.	2111006.001
Client:	LanzaTech UK Limited
Test No.	DCP108
Test Date:	28/03/2023
Surface Moisture:	Moderate
Soil Type	Made Ground: Slightly gravelly silty clay with low cobble content.

Notes/Comments

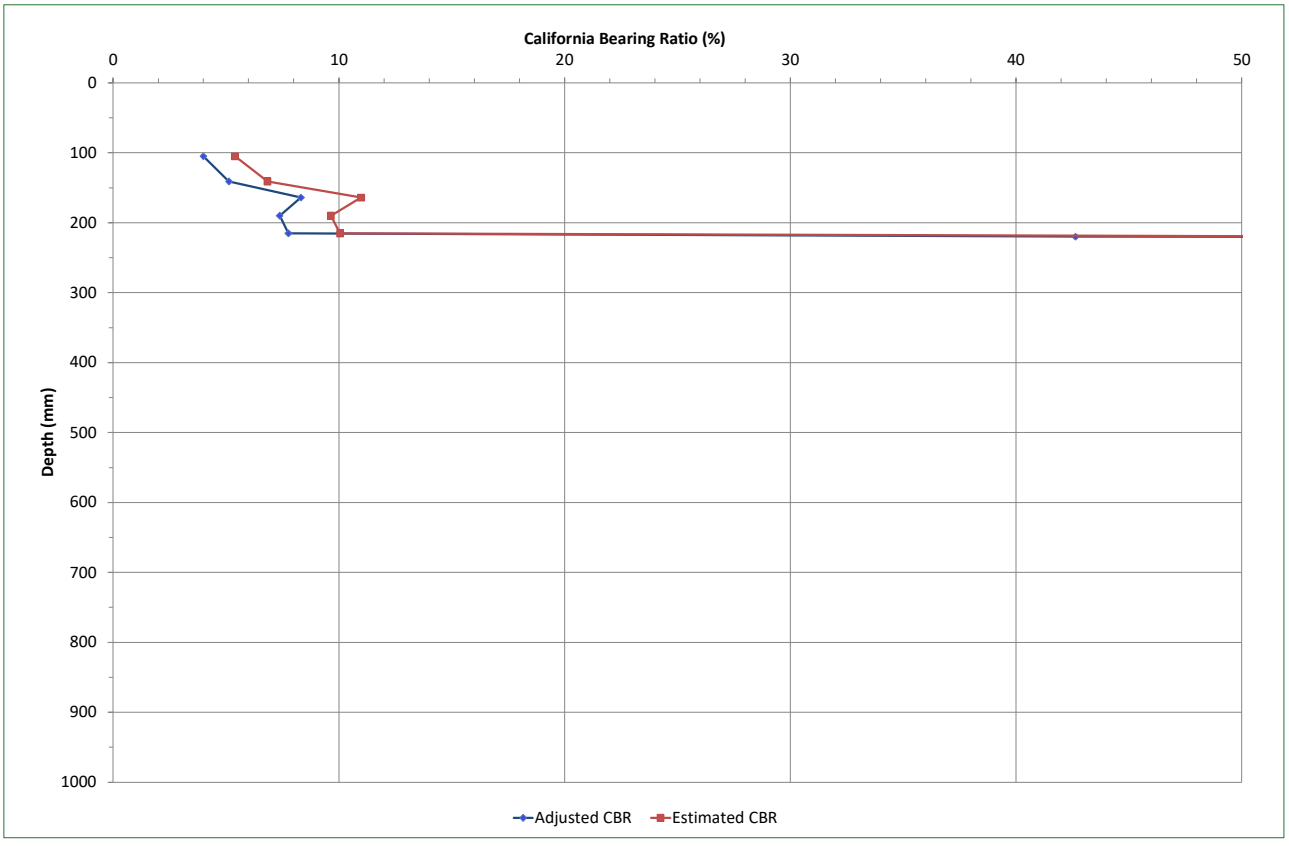
Notes:

1. CBR Value calculated using Jones C R and J Rolt (1991), "*Operating instructions for the TRL dynamic cone penetrometer*" (2nd edition). Information Note. Crowthorne: Transport Research Laboratory, as follows:

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057\ \text{Log}_{10}(\text{DPI})$$

2. Adjusted CBR vaules obtined from Table 4.2 of Simon Done and Piouslin Samuel (2006), "*Measuring Road Pavement Strength and Designing Low Volume Sealed Roads using the Dynamic Cone Penetrometer*" Unpublished TRL Project Report UPR/IE/76/06 Project Record No R7783.

The CBR Adjustment Factors are applied to unpaved roads on the assumption that the effect of moisture will be a maximum at the top surface and will reduce linearly to zero at a depth of 1000 mm.



TRL Dynamic Cone Penetration Test Results

DCP108A

Cumulative Blow Count	Penetration (mm)	Penetration Index (DPI) mm/blow	Estimated CBR[1] (%)	Adjusted CBR[2] (%)
0	55			
1	121	66.0	3.6	2.7
2	175	54.0	4.5	3.4
3	205	30.0	8.3	6.4
4	242	37.0	6.6	5.2
5	280	38.0	6.5	5.1
6	324	44.0	5.5	4.4
7	365	41.0	6.0	4.9
8	402	37.0	6.6	5.5
9	430	28.0	8.9	7.4
10	464	34.0	7.3	6.1
11	490	26.0	9.6	8.2
12	512	22.0	11.5	9.9
13	540	28.0	8.9	7.7
14	572	32.0	7.7	6.8
15	594	22.0	11.5	10.2
16	609	15.0	17.3	15.3
17	615	6.0	45.4	40.4
19	640	12.5	20.9	18.7
21	672	16.0	16.1	14.6
22	690	18.0	14.2	12.9
23	720	30.0	8.3	7.6
24	750	30.0	8.3	7.7
25	762	12.0	21.8	20.3
26	810	48.0	5.0	4.8
27	845	35.0	7.0	6.7
28	872	27.0	9.3	8.9
29	892	20.0	12.7	12.3
30	904	12.0	21.8	21.2
31	921	17.0	15.1	14.8
32	932	11.0	23.9	23.5

DCP108A

Project:	Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility: PDZ
Project No.	2111006.001
Client:	LanzaTech UK Limited
Test No.	DCP108A
Test Date:	28/03/2023
Surface Moisture:	Moderate
Soil Type	Made Ground: Slightly gravelly silty clay with low cobble content.

Notes/Comments

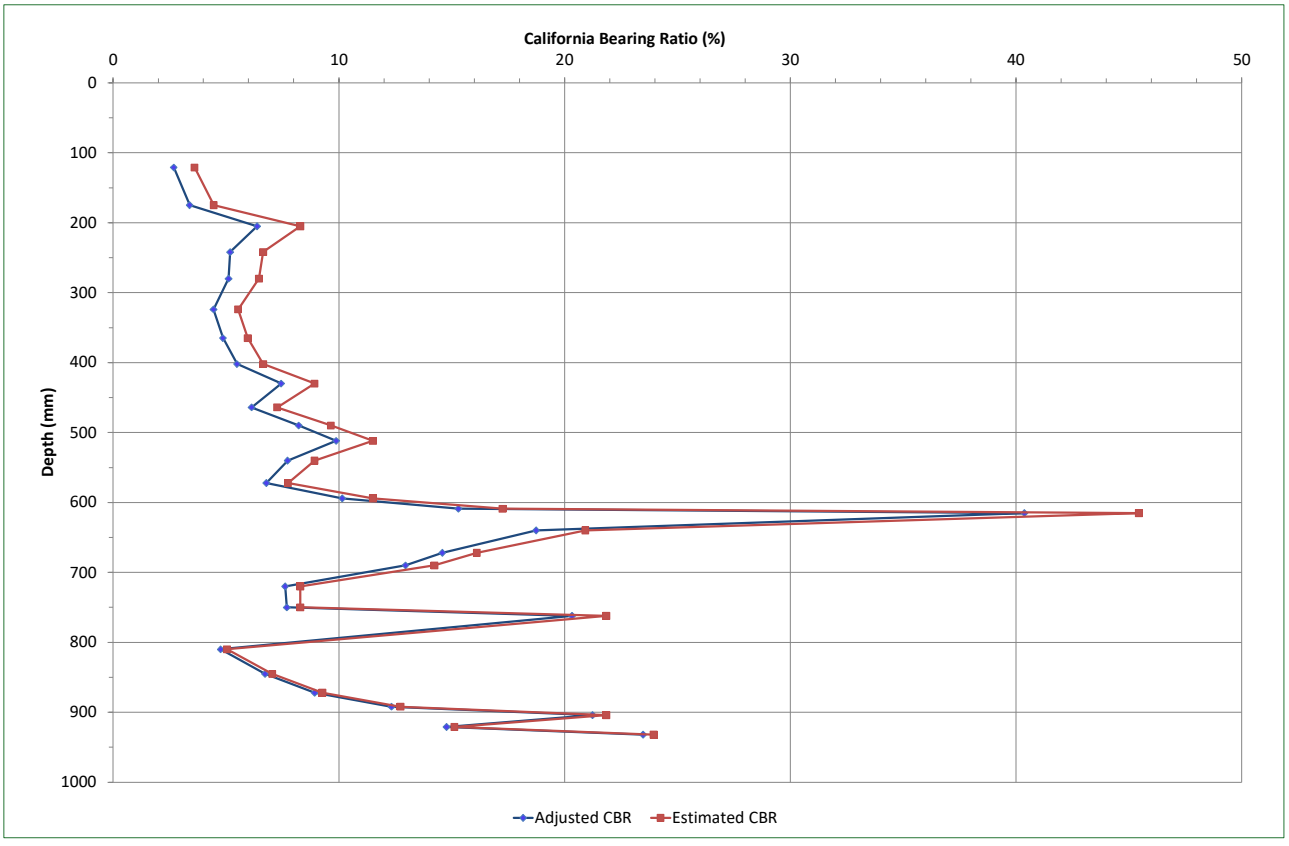
Notes:

1. CBR Value calculated using Jones C R and J Rolt (1991), "*Operating instructions for the TRL dynamic cone penetrometer*" (2nd edition). Information Note. Crowthorne: Transport Research Laboratory, as follows:

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057\ \text{Log}_{10}(\text{DPI})$$

2. Adjusted CBR vaules obtined from Table 4.2 of Simon Done and Piouslin Samuel (2006), "*Measuring Road Pavement Strength and Designing Low Volume Sealed Roads using the Dynamic Cone Penetrometer*" Unpublished TRL Project Report UPR/IE/76/06 Project Record No R7783.

The CBR Adjustment Factors are applied to unpaved roads on the assumption that the effect of moisture will be a maximum at the top surface and will reduce linearly to zero at a depth of 1000 mm.



TRL Dynamic Cone Penetration Test Results

DCP109

Cumulative Blow Count	Penetration (mm)	Penetration Index (DPI) mm/blow	Estimated CBR[1] (%)	Adjusted CBR[2] (%)
0	142			
1	224	82.0	2.9	2.2
2	276	52.0	4.6	3.7
3	315	39.0	6.3	5.0
4	362	47.0	5.2	4.2
5	396	34.0	7.3	6.0
6	427	31.0	8.0	6.7
7	460	33.0	7.5	6.3
8	492	32.0	7.7	6.6
9	530	38.0	6.5	5.6
10	581	51.0	4.7	4.2
11	642	61.0	3.9	3.5
12	684	42.0	5.8	5.3
13	724	40.0	6.1	5.6
14	764	40.0	6.1	5.7
15	799	35.0	7.0	6.6
16	830	31.0	8.0	7.6
17	861	31.0	8.0	7.7
18	890	29.0	8.6	8.3
19	910	20.0	12.7	12.4
20	922	12.0	21.8	21.3
21	934	12.0	21.8	21.4
22	941	7.0	38.6	38.0
23	950	9.0	29.6	29.2

DCP109

Project:	Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility: PDZ
Project No.	2111006.001
Client:	LanzaTech UK Limited
Test No.	DCP109
Test Date:	28/03/2023
Surface Moisture:	Moderate
Soil Type	Made Ground: Slightly gravelly silty clay with low cobble content.

Notes/Comments

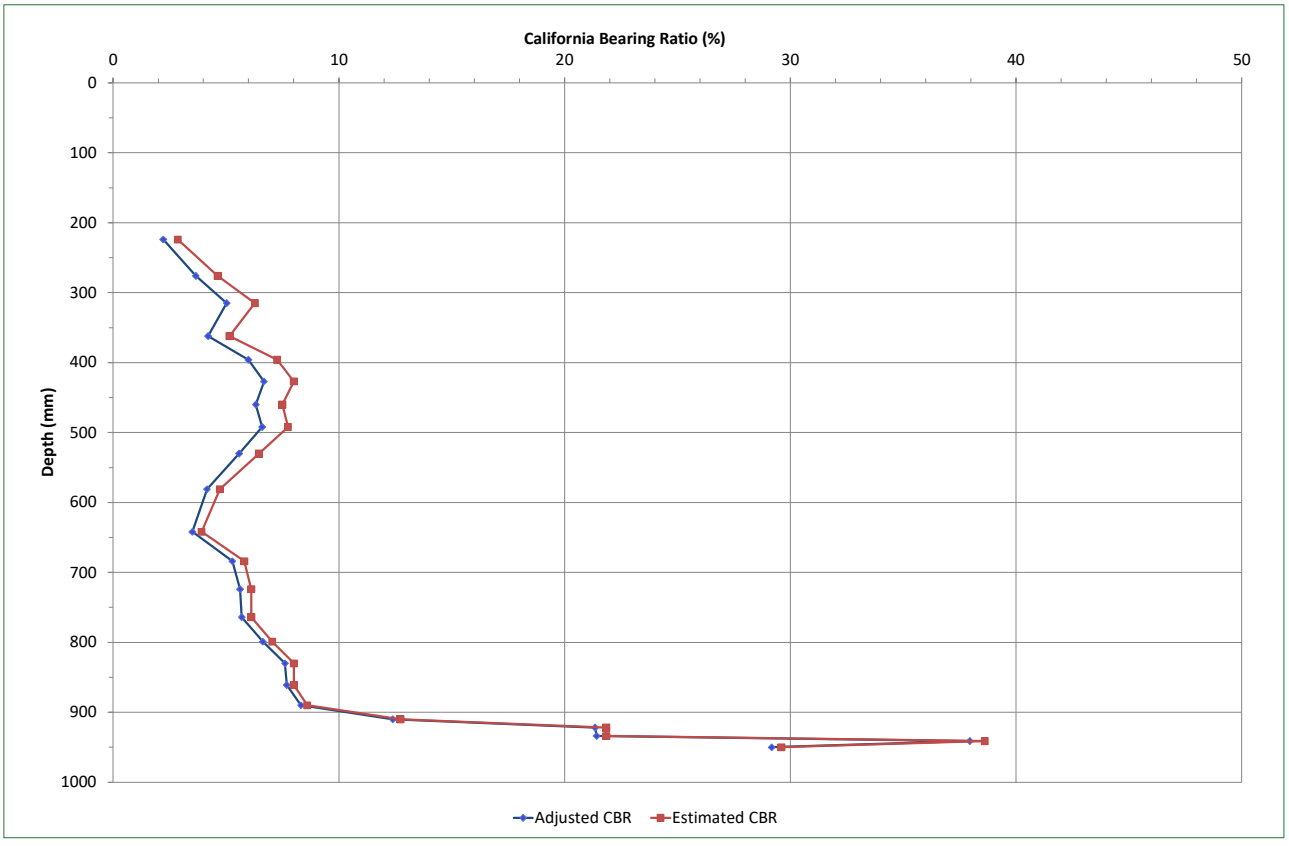
Notes:

1. CBR Value calculated using Jones C R and J Rolt (1991), "*Operating instructions for the TRL dynamic cone penetrometer*" (2nd edition). Information Note. Crowthorne: Transport Research Laboratory, as follows:

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057\ \text{Log}_{10}(\text{DPI})$$

2. Adjusted CBR vaules obtined from Table 4.2 of Simon Done and Piouslin Samuel (2006), "*Measuring Road Pavement Strength and Designing Low Volume Sealed Roads using the Dynamic Cone Penetrometer*" Unpublished TRL Project Report UPR/IE/76/06 Project Record No R7783.

The CBR Adjustment Factors are applied to unpaved roads on the assumption that the effect of moisture will be a maximum at the top surface and will reduce linearly to zero at a depth of 1000 mm.



TRL Dynamic Cone Penetration Test Results

DCP110

Cumulative Blow Count	Penetration (mm)	Penetration Index (DPI) mm/blow	Estimated CBR[1] (%)	Adjusted CBR[2] (%)
0	132			
1	234	102.0	2.3	1.8
2	321	87.0	2.7	2.2
3	341	20.0	12.7	10.3
4	352	11.0	23.9	19.4
5	384	32.0	7.7	6.4
6	432	48.0	5.0	4.2
7	445	13.0	20.1	16.8
8	455	10.0	26.5	22.3
9	465	10.0	26.5	22.4
10	489	24.0	10.5	8.9
11	519	30.0	8.3	7.1
12	537	18.0	14.2	12.3
13	553	16.0	16.1	14.0
14	562	9.0	29.6	25.8
15	584	22.0	11.5	10.1
16	601	17.0	15.1	13.4
17	620	19.0	13.4	12.0
18	641	21.0	12.1	10.8
19	682	41.0	6.0	5.4
20	729	47.0	5.2	4.8
21	772	43.0	5.7	5.3
22	802	30.0	8.3	7.8
23	830	28.0	8.9	8.5
24	851	21.0	12.1	11.6
25	882	31.0	8.0	7.7
26	911	29.0	8.6	8.4
27	927	16.0	16.1	15.8
28	951	24.0	10.5	10.3

DCP110

Project:	Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility: PDZ
Project No.	2111006.001
Client:	LanzaTech UK Limited
Test No.	DCP110
Test Date:	28/03/2023
Surface Moisture:	Moderate
Soil Type	Made Ground: Slightly gravelly silty clay with low cobble content.

Notes/Comments

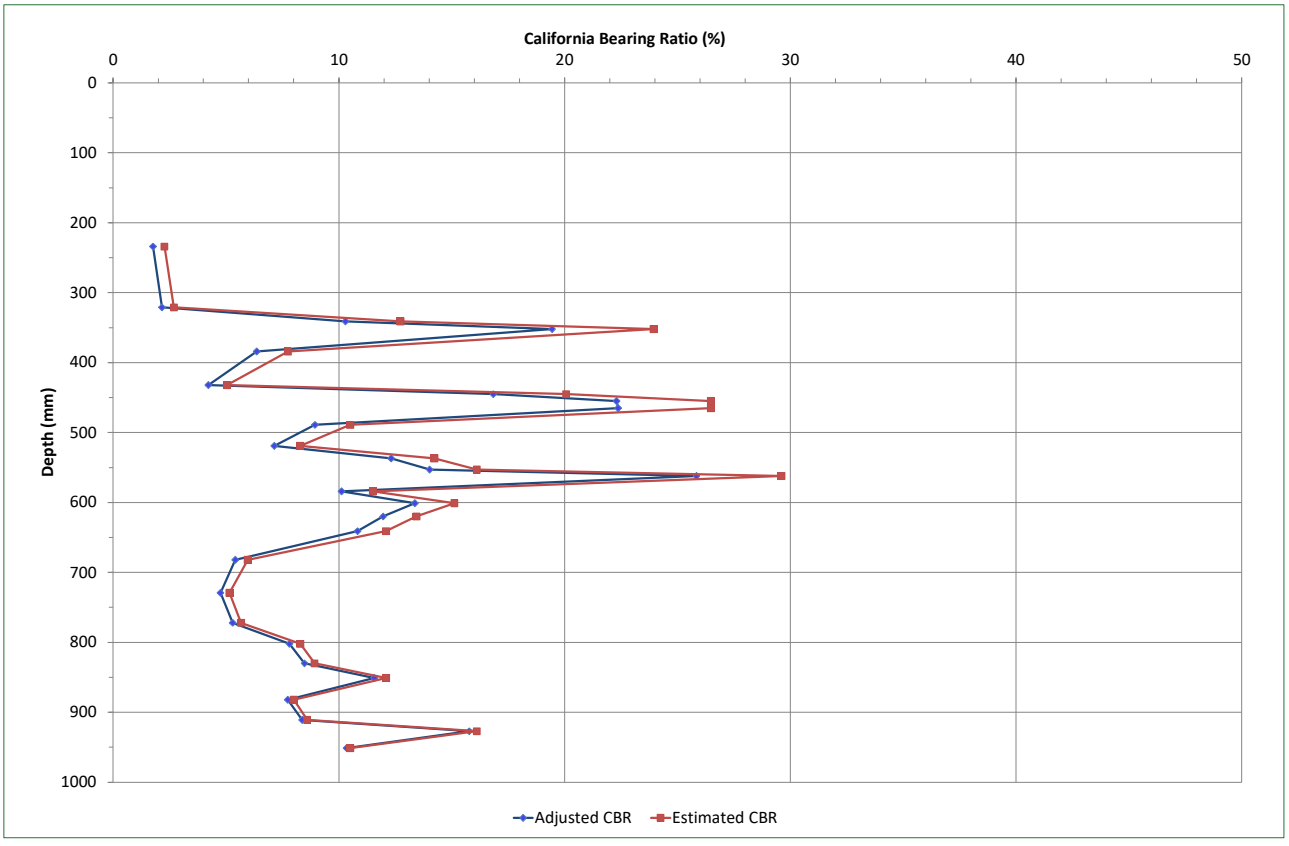
Notes:

1. CBR Value calculated using Jones C R and J Rolt (1991), "*Operating instructions for the TRL dynamic cone penetrometer*" (2nd edition). Information Note. Crowthorne: Transport Research Laboratory, as follows:

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057\ \text{Log}_{10}(\text{DPI})$$

2. Adjusted CBR vaules obtined from Table 4.2 of Simon Done and Piouslin Samuel (2006), "*Measuring Road Pavement Strength and Designing Low Volume Sealed Roads using the Dynamic Cone Penetrometer*" Unpublished TRL Project Report UPR/IE/76/06 Project Record No R7783.

The CBR Adjustment Factors are applied to unpaved roads on the assumption that the effect of moisture will be a maximum at the top surface and will reduce linearly to zero at a depth of 1000 mm.



TRL Dynamic Cone Penetration Test Results

DCP111

Cumulative Blow Count	Penetration (mm)	Penetration Index (DPI) mm/blow	Estimated CBR[1] (%)	Adjusted CBR[2] (%)
0	97			
1	164	67.0	3.5	2.7
2	195	31.0	8.0	6.1
3	220	25.0	10.1	7.8
4	239	19.0	13.4	10.5
5	257	18.0	14.2	11.2
6	280	23.0	11.0	8.7
7	304	24.0	10.5	8.4
8	324	20.0	12.7	10.2
9	342	18.0	14.2	11.5
10	354	12.0	21.8	17.8
11	382	28.0	8.9	7.3
12	396	14.0	18.6	15.3
13	410	14.0	18.6	15.4
14	424	14.0	18.6	15.5
15	434	10.0	26.5	22.1
16	442	8.0	33.5	28.1
17	450	8.0	33.5	28.2
18	460	10.0	26.5	22.3
19	471	11.0	23.9	20.3
20	482	11.0	23.9	20.3
21	494	12.0	21.8	18.6
22	502	8.0	33.5	28.7
23	522	20.0	12.7	11.0
24	546	24.0	10.5	9.1
25	566	20.0	12.7	11.1
26	586	20.0	12.7	11.2
27	612	26.0	9.6	8.6
28	632	20.0	12.7	11.4
29	664	32.0	7.7	7.0
30	696	32.0	7.7	7.1
31	714	18.0	14.2	13.0
32	730	16.0	16.1	14.9
33	757	27.0	9.3	8.6
34	780	23.0	11.0	10.3
35	792	12.0	21.8	20.5
36	801	9.0	29.6	27.9
37	820	19.0	13.4	12.7
38	849	29.0	8.6	8.2
39	870	21.0	12.1	11.6
40	891	21.0	12.1	11.7
41	921	30.0	8.3	8.1

DCP111

Project:	Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility: PDZ
Project No.	2111006.001
Client:	LanzaTech UK Limited
Test No.	DCP111
Test Date:	28/03/2023
Surface Moisture:	Moderate
Soil Type	Made Ground: Slightly gravelly silty clay with low cobble content.

Notes/Comments

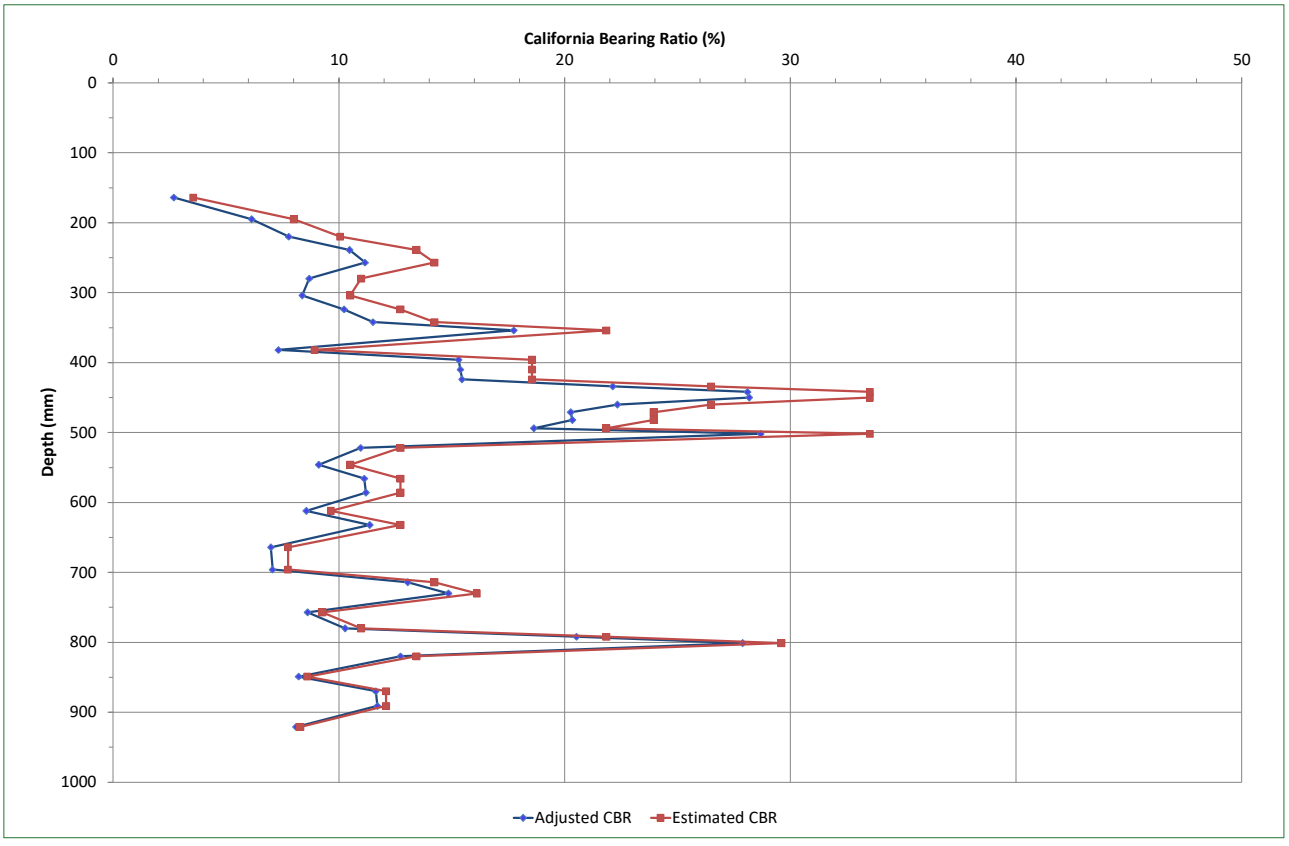
Notes:

1. CBR Value calculated using Jones C R and J Rolt (1991), "*Operating instructions for the TRL dynamic cone penetrometer*" (2nd edition). Information Note. Crowthorne: Transport Research Laboratory, as follows:

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057\ \text{Log}_{10}(\text{DPI})$$

2. Adjusted CBR vaules obtined from Table 4.2 of Simon Done and Piouslin Samuel (2006), "*Measuring Road Pavement Strength and Designing Low Volume Sealed Roads using the Dynamic Cone Penetrometer*" Unpublished TRL Project Report UPR/IE/76/06 Project Record No R7783.

The CBR Adjustment Factors are applied to unpaved roads on the assumption that the effect of moisture will be a maximum at the top surface and will reduce linearly to zero at a depth of 1000 mm.



TRL Dynamic Cone Penetration Test Results

DCP112

Cumulative Blow Count	Penetration (mm)	Penetration Index (DPI) mm/blow	Estimated CBR[1] (%)	Adjusted CBR[2] (%)
0	125			
1	184	59.0	4.1	3.1
2	226	42.0	5.8	4.5
3	254	28.0	8.9	7.0
4	276	22.0	11.5	9.1
5	290	14.0	18.6	14.7
6	306	16.0	16.1	12.9
7	317	11.0	23.9	19.2
8	330	13.0	20.1	16.2
9	347	17.0	15.1	12.3
10	354	7.0	38.6	31.4
11	360	6.0	45.4	37.0
12	376	16.0	16.1	13.2
13	390	14.0	18.6	15.3
14	404	14.0	18.6	15.4
15	412	8.0	33.5	27.8
16	434	22.0	11.5	9.6
17	455	21.0	12.1	10.2
18	482	27.0	9.3	7.9
19	505	23.0	11.0	9.4
20	532	27.0	9.3	8.0
21	561	29.0	8.6	7.5
22	590	29.0	8.6	7.6
23	616	26.0	9.6	8.6
24	639	23.0	11.0	9.8
25	664	25.0	10.1	9.1
26	690	26.0	9.6	8.8
27	712	22.0	11.5	10.5
28	737	25.0	10.1	9.3
29	764	27.0	9.3	8.6
30	794	30.0	8.3	7.8
31	820	26.0	9.6	9.1
32	842	22.0	11.5	11.0
33	872	30.0	8.3	8.0
34	900	28.0	8.9	8.7
35	937	37.0	6.6	6.5

DCP112

Project:	Project Dragon - Sustainable Aviation Fuel (SAF) Production Facility: PDZ
Project No.	2111006.001
Client:	LanzaTech UK Limited
Test No.	DCP112
Test Date:	28/03/2023
Surface Moisture:	Moderate
Soil Type	Made Ground: Slightly gravelly silty clay with low cobble content.

Notes/Comments

Notes:

1. CBR Value calculated using Jones C R and J Rolt (1991), "*Operating instructions for the TRL dynamic cone penetrometer*" (2nd edition). Information Note. Crowthorne: Transport Research Laboratory, as follows:

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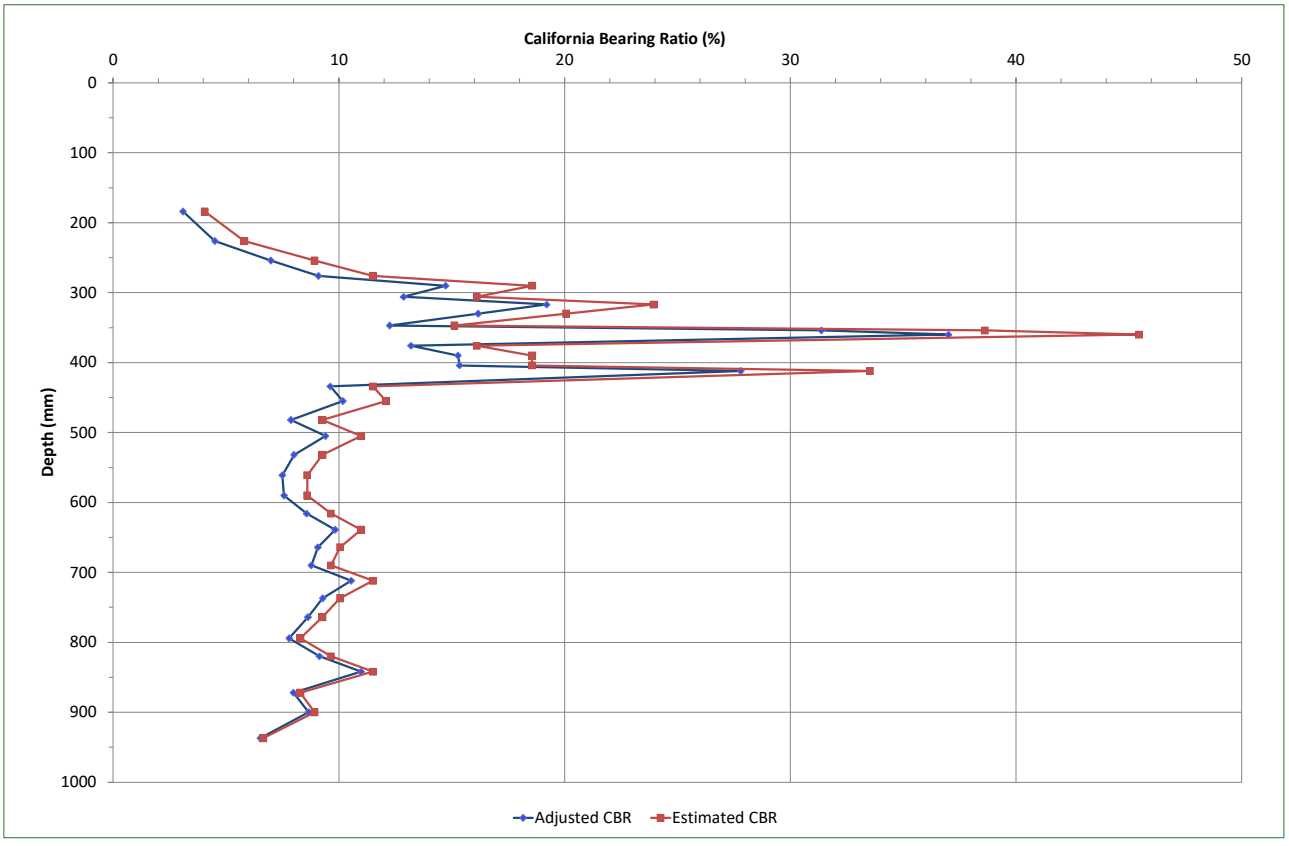
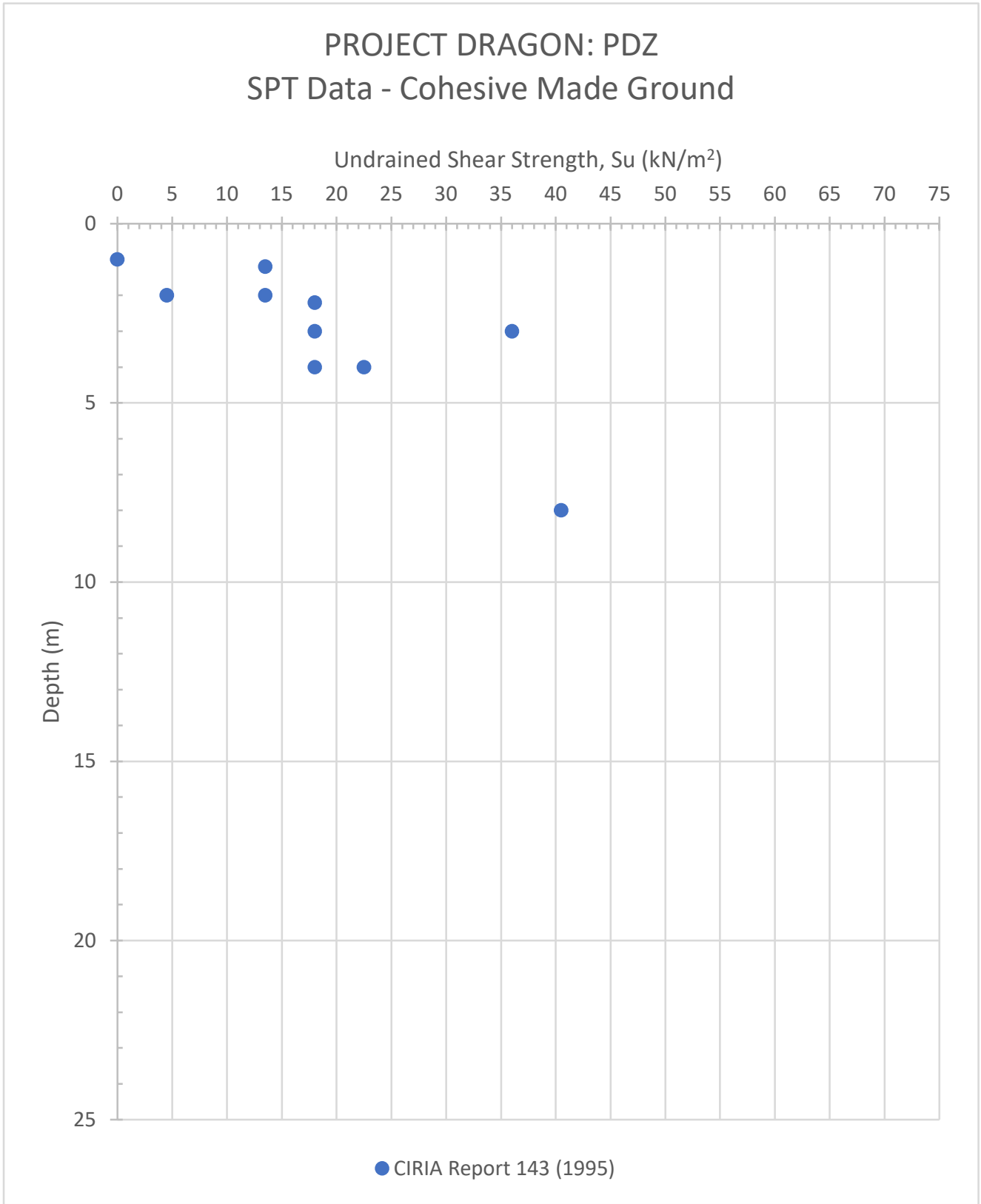
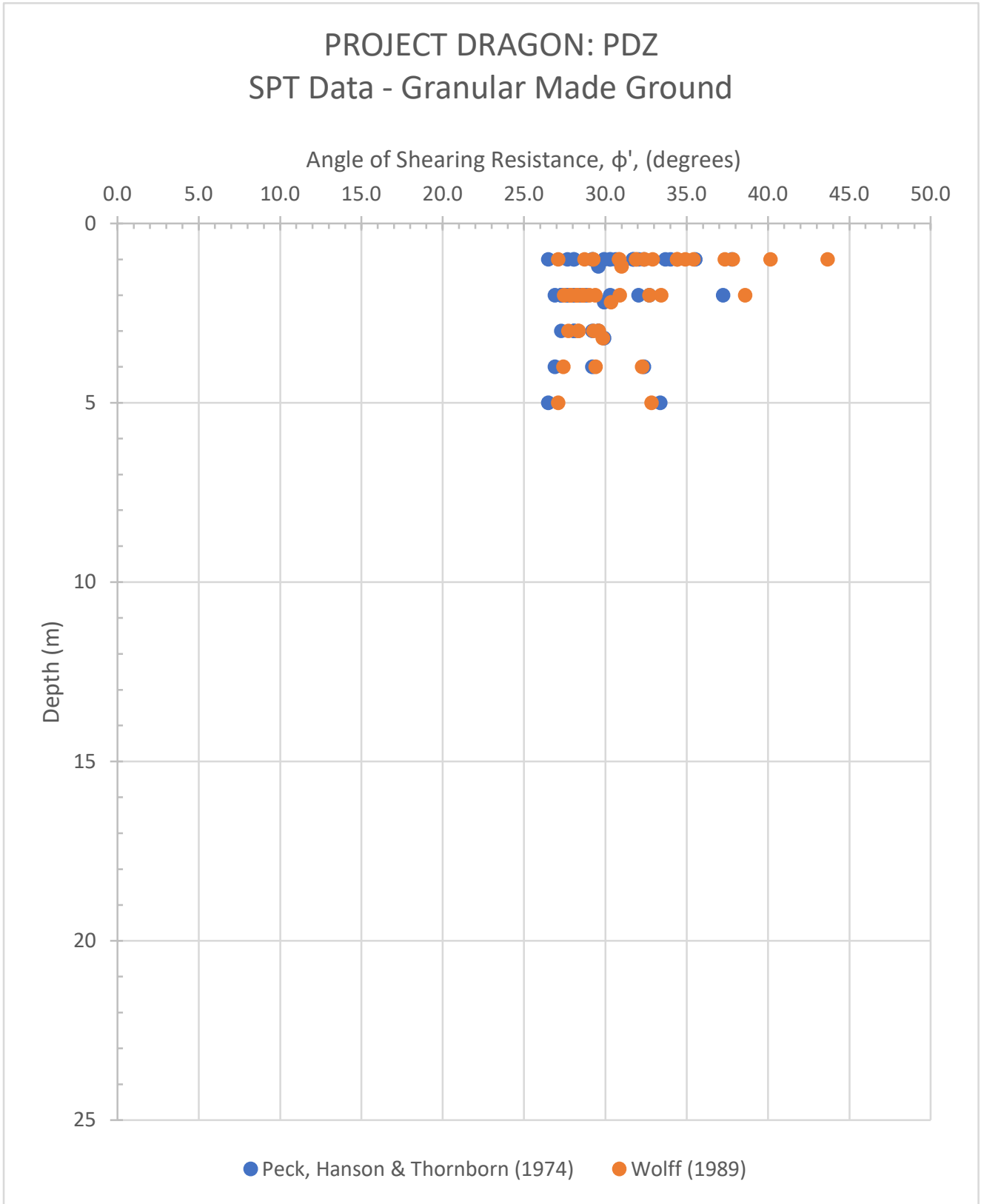
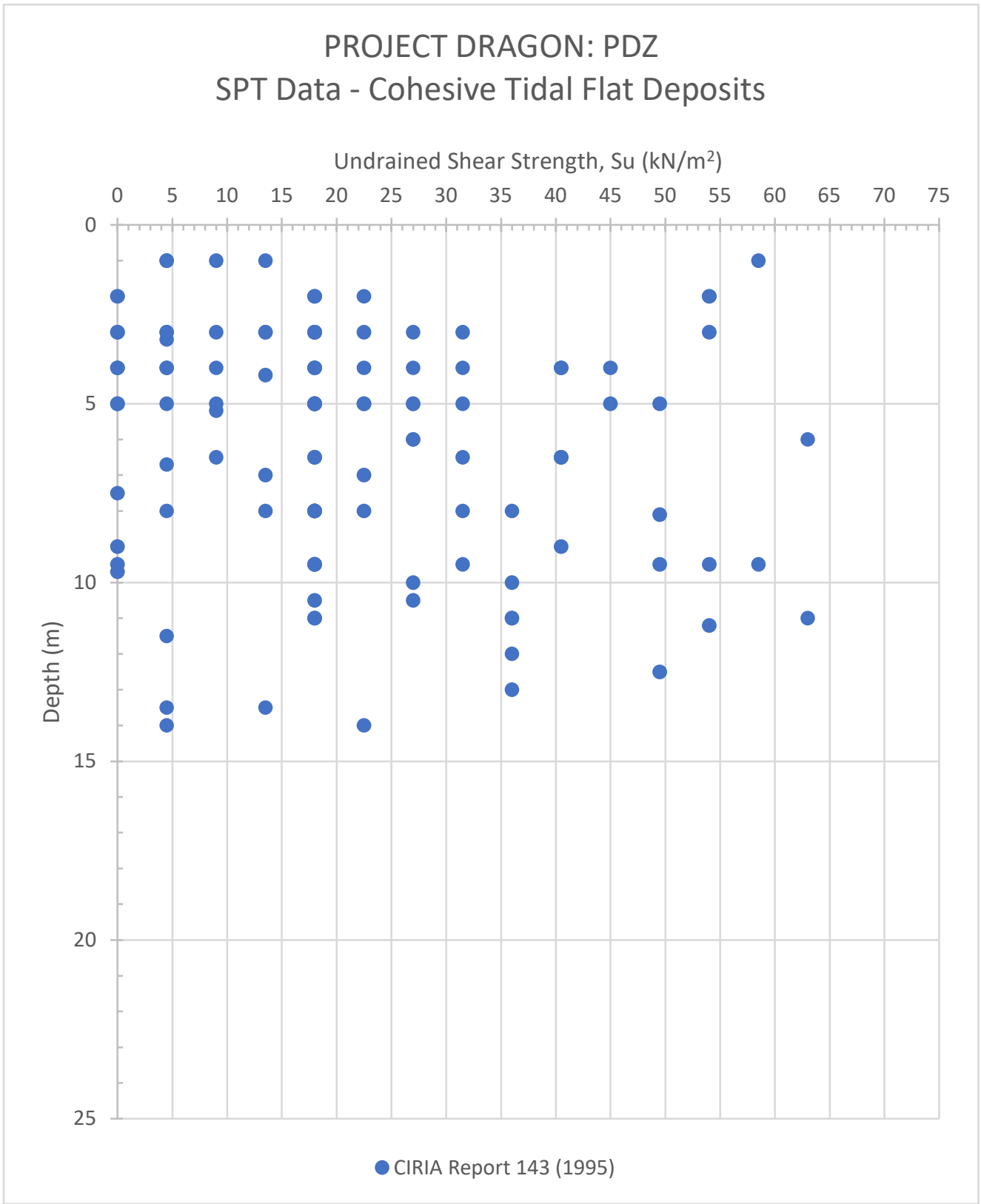


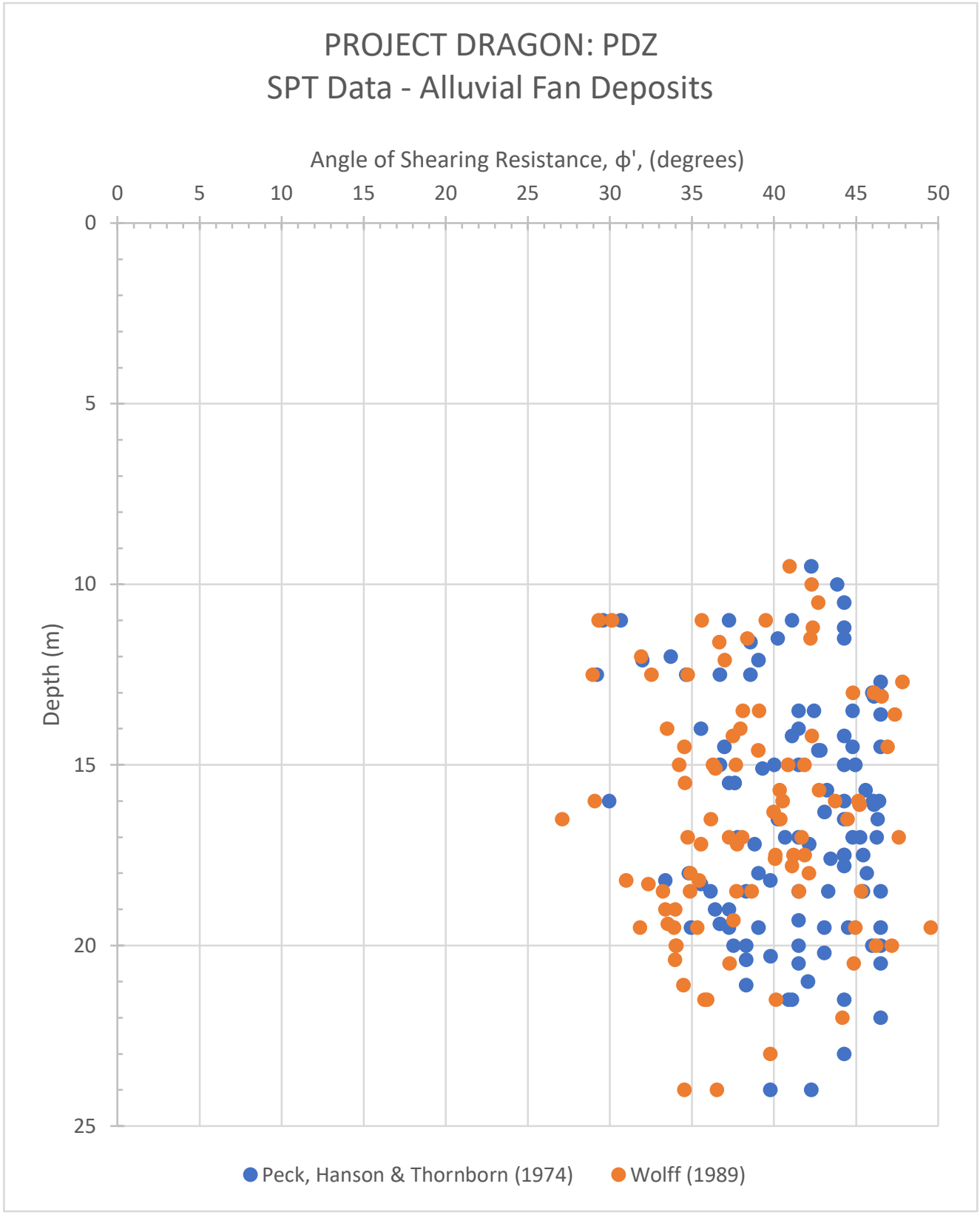
Appendix O

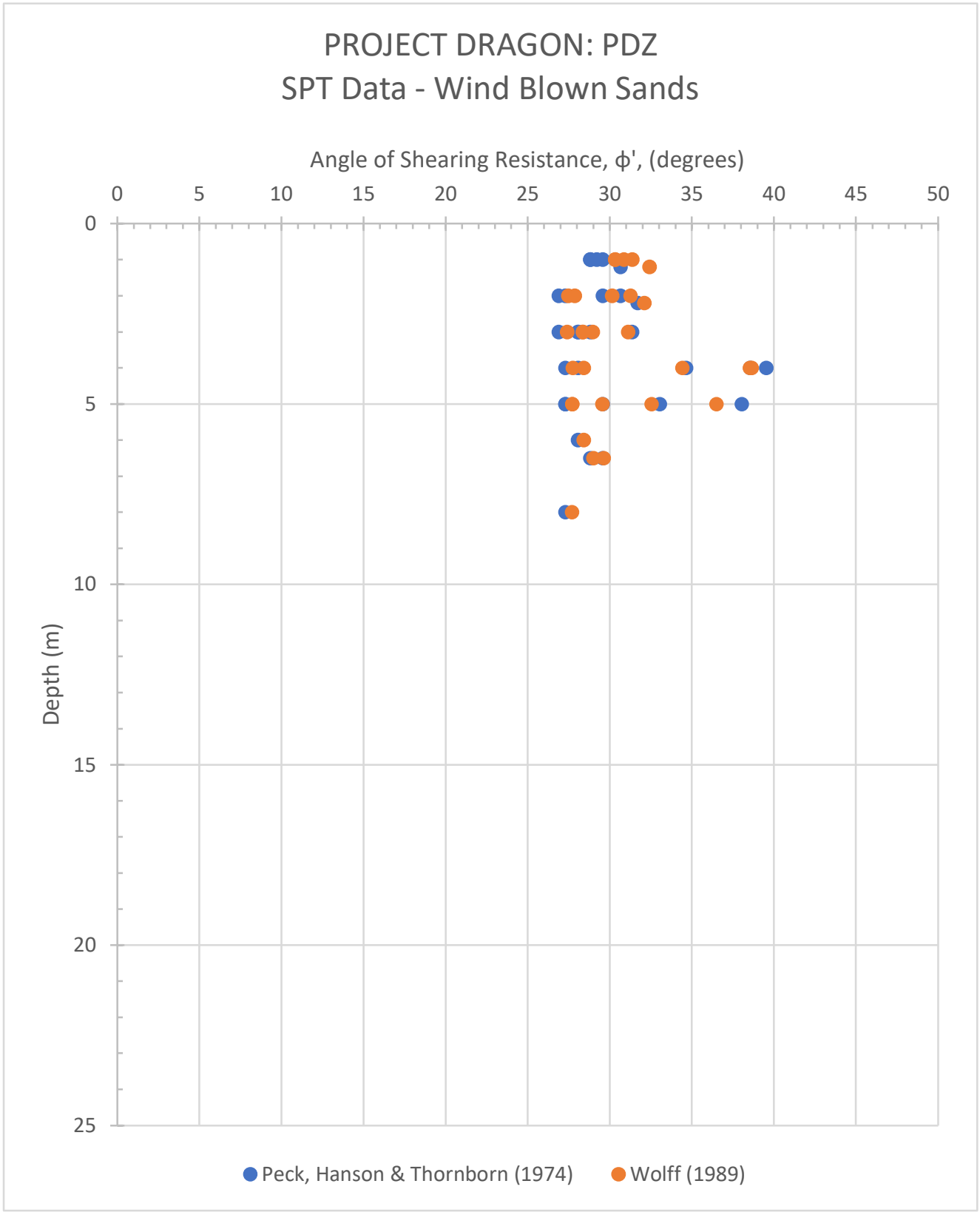
Strength Data -
SPT Corelation


PROJECT DRAGON: PDZ
SPT Data - Cohesive Made Ground
Undrained Shear Strength, Su (kN/m²)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
Depth (m)
0
5
10
15
20
25
CIRIA Report 143 (1995)


PROJECT DRAGON: PDZ
SPT Data - Granular Made Ground
Angle of Shearing Resistance, ϕ', (degrees)
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
Depth (m)
0
5
10
15
20
25
Peck, Hanson & Thornborn (1974)
Wolff (1989)


PROJECT DRAGON: PDZ
SPT Data - Cohesive Tidal Flat Deposits
Undrained Shear Strength, Su (kN/m²)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
Depth (m)
0
5
10
15
20
25
CIRIA Report 143 (1995)


PROJECT DRAGON: PDZ
SPT Data - Alluvial Fan Deposits
Angle of Shearing Resistance, ϕ', (degrees)
0
5
10
15
20
25
30
35
40
45
50
Depth (m)
0
5
10
15
20
25
Peck, Hanson & Thornborn (1974)
Wolff (1989)


PROJECT DRAGON: PDZ
SPT Data - Wind Blown Sands
Angle of Shearing Resistance, ϕ', (degrees)
0
5
10
15
20
25
30
35
40
45
50
Depth (m)
0
5
10
15
20
25
Peck, Hanson & Thornborn (1974)
Wolff (1989)