

NANT Y CAFN INDUSTRIAL UNITS, SEVEN SISTERS

GROUND INVESTIGATION REPORT (FACTUAL ACCOUNT and INTERPRETATIVE ASSESSMENT)

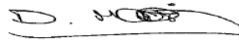
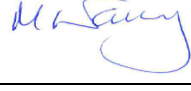
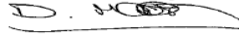
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REPORT STRUCTURE

TITLE	VOLUME No
DESK STUDY AND FIELD RECONNAISSANCE	H3091-23/N1
GROUND INVESTIGATION REPORT (FACTUAL ACCOUNT and INTERPRETATIVE ASSESSMENT)	H3091-23/N2

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**EXECUTIVE SUMMARY**

A summary of the findings of the assessment is presented below.

SECTION	DETAILS
Site location	800 m southwest of Seven Sisters. National Grid Reference SN 810078
Fieldwork and Lab	5 boreholes and field testing [hand vane, dynamic probing, dynamic cone penetrometer and soakaway testing] Geotechnical, geochemical and geoenvironmental testing. Groundwater and gas monitoring over three month period.
Proposed Development	Six new industrial units with associated parking, swale and soft landscaping.
Ground Conditions	Thin layer of Made Ground or Topsoil as ground surfacing. General sequence of Till overlying probable Coal Measures. Alluvium encountered along route of historic brook.
Engineering Geological Model	The natural Till should be a suitable founding stratum for the proposed construction. A 1 m deep strip foundation with a width of up to 1 m, for example, should achieve a net safe bearing capacity of approximately 190 kPa. Checks should be made to ensure lower strength Alluvium is not within the building footprint. If present, foundations depths should be increased so that all foundations are based within the Till. Similarly, foundation depths may need to be increased in accordance with NHBC (2024). Shallow groundwater should be anticipated. Unable to calculate soil infiltration rate from soakaway testing due to low permeability ground conditions and shallow groundwater. Concrete aggressivity should use DS-1 and AC1. A CBR of 2-3 % should be suitable for pavements and roads, below any surface Topsoil material. Coal Authority report notes acceptably free from coal mining related risk.
Geoenvironmental Generic Quantitative Risk Assessment (GQRA)	Low risk presented to human health and controlled waters from contaminants analysed. Low to moderate gas generation potential, with low risk. Gas monitoring program limited due to shallow groundwater and CS2 (Type D development) gas protection measures recommended.
Recommendations	Check extent of Alluvium within building footprint. Supplementary ground gas monitoring during prolonged dry spells ie groundwater levels below response zone depth.



1 INTRODUCTION

SOCOTEC UK Limited (SOCOTEC) was commissioned in November 2023 by Neath Port Talbot County Borough Council (NPT) to carry out a ground investigation to provide geoenvironmental and geotechnical parameters for the design and construction of an industrial estate at the Nant Y Cafn site. It should be noted, however, that no vehicle access was available to the area of the proposed building location, and therefore in respect of any comments or conclusions relating to potential foundations for the building, this report should be regarded as preliminary only at this stage.

The scope of the investigation was specified by SOCOTEC and comprised boreholes, field testing, monitoring, laboratory testing and reporting. The fieldwork was carried out on 13 December 2023, 3 January and 12 February 2024. Soakaway testing was carried out supplementary to the main investigation on 7 and 8 May 2024.

The investigation was performed in accordance with the general requirements of BS 5930:2015+A1 (2020), BS EN 1997-2 (2007), BS EN ISO 22475-1 (2021) and other relevant related standards identified. The information is also presented in digital data format as defined in AGS 4.0.4 (2017).

This report presents a description of the ground investigation work carried out together with the factual records of the fieldwork, monitoring and laboratory testing. It comprises the Factual Account section of a Ground Investigation Report (GIR), as defined in the UK Specification for Ground Investigation draft Third Edition (2022), also identified as the Factual Report section in BS 5930:2015+A1 (2020). The report also includes a discussion of the ground conditions and engineering parameters determined, together with proposals for any further investigation and a geoenvironmental assessment. Other aspects of the project are reported as shown on the Report Structure page.

2 SITE SETTING

2.1 Location and Description

The site of the proposed Nant-Y-Cafn workshops is located near Seven Sisters, approximately 12 km northeast of Neath Railway Station, at National Grid Reference SN 810078, see Site Location Plan in Appendix A.



The site is irregular in shape, measuring approximately 55 by 90 m at its widest points. The ground surface comprises overgrown hummocky and waterlogged scrubland, bisected by a rolled hardcore track from the site entrance in the west to the southeastern corner. The site is generally level, increasing in elevation towards the eastern boundary.

The site is bounded to the north by further hummocky scrubland, to the east by an agricultural field sloping upwards to the east, to the south by car parking facilities for MW Phillips Chemist and associated surgery, and to the west by Dulais Road, beyond which the land use is primary residential. To the southeast, the hardcore track navigates to a privately owned area of land which includes a pond, located 50 m south of the site boundary. Concrete blocks obstruct further access along Dulais Road at the northernmost corner of the site.

Further details on the site are provided within the Desk Study (Volume N1).

2.2 Published Geology

The published geological map for the area, (BGS Sheet 231, 1979), and the BGS GeoIndex Onshore online viewer (2024) show the site located on superficial deposits comprising recent Devensian Till, including clay, silt, sand and gravel. Alluvium is shown to be present approximately 80 m to the west of the site and follows the northeast southwest trend of the Dulais River.

The Till is underlain by the South Wales Middle Coal Measures Formation composed of coal-bearing siltstones and sandstones. The bedrock is indicated to dip approximately 10 degrees to the south.

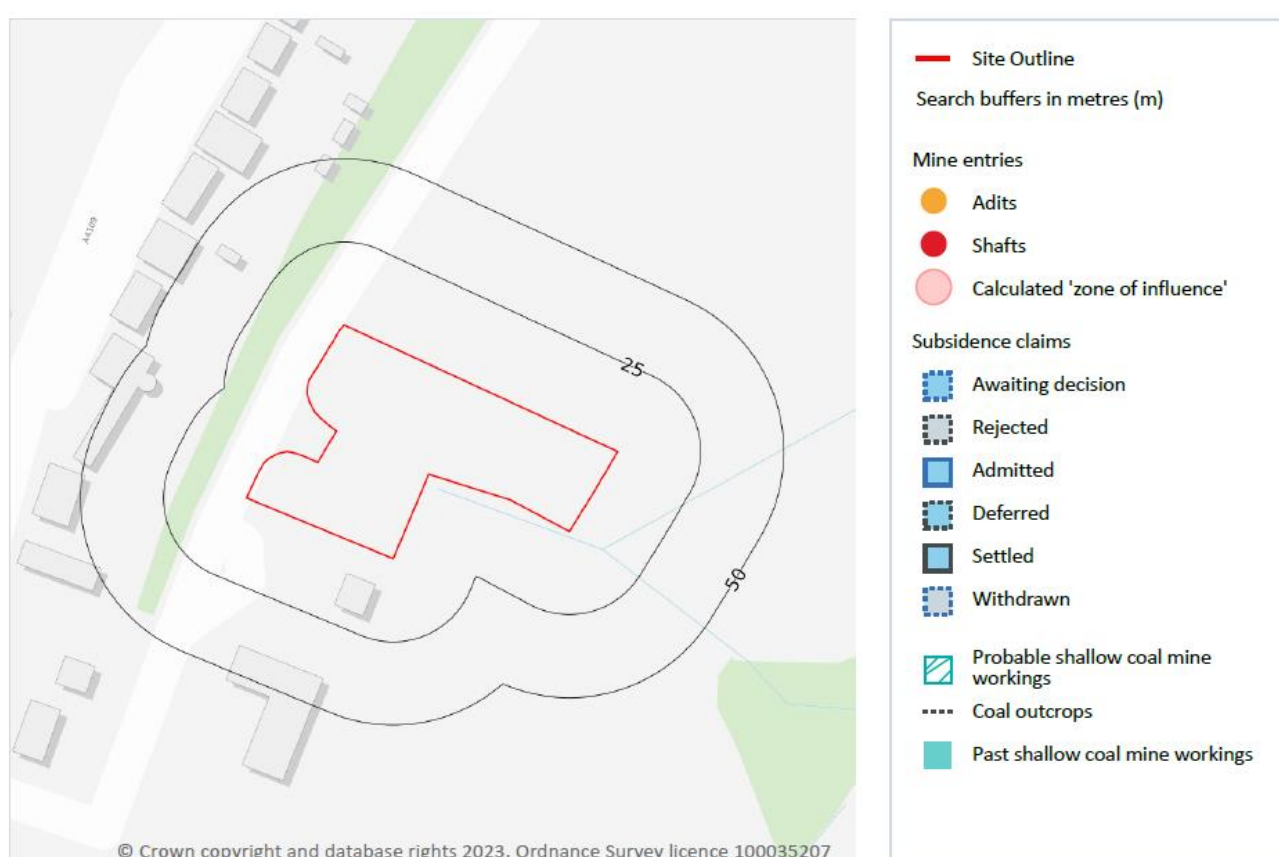
Artificial Ground is shown to be located approximately 30 m south of the site.

2.3 Coal Mining

The nearest recorded coal seam, which appears to be the Red Vein, is located approximately 67 m west southwest of the site. The coal seam is indicated to be offset approximately 64 m south by an inferred north south trending fault, the downthrow of which is unknown. The offset Red Vein coal seam is inferred to continue towards the east and northeast (located approximately 48 m south of the site) and is again offset by further inferred faulting, located approximately 45 m southeast and 60 m east of the site. No coal seams are shown to be underlying the proposed development.

The Coal Authority report presented in Volume N1 notes that there are no mine entries recorded within 20 m of the site see Figure 1. It confirms that the site is located within an area for which a license to remove coal by underground methods has been granted. However, there are currently no planned future underground workings proposed, and the Coal Authority report also confirms that the site does not lie within the likely zone of physical influence for any planned future workings.

Figure 1 Extract from CON29 GS-31H-7GE-T9P-57C from Volume N1



The Coal Authority report concludes that the property is considered to be acceptably free from coal mining related risk, and that 'No further action is required with regards to past coal mining'.



3 FIELDWORK

3.1 General

The exploratory hole and field test locations were selected by SOCOTEC and set out from local features. The positions were surveyed by SOCOTEC to National Grid and Ordnance Datum, and the locations are shown on the Exploratory Hole Location Plan in Appendix A.

All exploratory hole locations were surveyed for underground services, prior to any excavation, using a Cable Avoidance Tool (CAT). Hand dug service inspection pits were then excavated to a depth of 1.2 m with simultaneous scanning using a CAT for the borehole locations.

3.2 Exploratory Holes

The exploratory holes are listed in Table 1.

TABLE 1 SUMMARY OF EXPLORATORY HOLES

TYPE	QUANTITY	DEPTH RANGE (m)	REMARKS
Cable percussion boring	1	2.30	Terminated due to hard materials
Dynamic (windowless) sampling	4	0.80 to 3.41	Terminated due to hard materials. WSN04 terminated at base of inspection pit due to no rig access to location.
Hand dug inspection pits	2	0.90 to 1.20	Excavated for soakaway testing.

The exploratory hole logs are presented in Appendix B. These include descriptions of the strata encountered together with details of the equipment and methods used, sampling and field testing carried out, water depths and other field observations. Explanations of the terms and abbreviations used on the logs are given in the Key to Exploratory Hole Records in Appendix B, along with other explanatory information. The geological material descriptions are in accordance with BS 5930:2015+A1 (2020), following BS EN ISO 14688-1 (2018) and BS EN ISO 14689 (2018) for soils and rocks, respectively.

Standard penetration tests (SPT) in the boreholes were carried out in accordance with BS EN ISO 22476-3+A1 (2011). The SPT hammer energy ratio certificates are included in Appendix



B and the results are presented on the logs without any corrections to the measured blow-counts or derived N values.

Geotechnical samples were transferred from site to the Bridgend office of SOCOTEC for temporary retention. Samples taken for geoenvironmental testing were transferred directly from site to the SOCOTEC environmental chemistry laboratory.

Photographs of dynamic sample liners are presented in Appendix G.

3.3 Field Testing

The field (in situ) testing carried out is listed in Table 2 and the results presented in Appendix C, unless otherwise stated.

TABLE 2 SUMMARY OF FIELD TESTS

TYPE	QUANTITY	REMARKS
Dynamic probing	2	Type DPSH-B. Maximum depth of 3.41 m Presented in Appendix B
Hand Vane	1	Field vane test presented on WSN03 log in Appendix B
Dynamic cone penetrometer	6	TRL Probe
Soakaway testing	2	Generally following the BRE 365 method, although carried out in small, hand-dug inspection pits. It should be noted that groundwater seepage was observed at 0.65 and 0.80 m in these pits, which is likely to have affected the test results.

3.4 Groundwater and Ground Gas Monitoring

Ground gas and groundwater monitoring instrumentation was installed in selected boreholes specified by SOCOTEC; details are shown on the logs and summarised in Appendix D.

Monitoring carried out by SOCOTEC after the main fieldwork period is listed in Table 3. The records are included in Appendix D.

**TABLE 3 SUMMARY OF MONITORING**

TYPE	REMARKS
Groundwater and gas monitoring visit	5 January 2024
Groundwater only – gas monitoring cancelled due to shallow groundwater	12 January 2024
Groundwater and gas monitoring WSN01; Groundwater only BHN01 and WSN03	24 January 2024
Groundwater only – gas monitoring cancelled due to shallow groundwater	12 February 2024
Groundwater monitoring visit – gas box fault	26 February 2024
Groundwater and gas monitoring BHN01; Groundwater only WSN01. Groundwater monitoring completed; gas monitoring terminated due to water inflow WSN03	6 March 2024
Groundwater and gas monitoring BHN01; Groundwater only WSN03. Groundwater monitoring completed; gas monitoring terminated due to water inflow WSN01	13 March 2024 (addition to the initial monitoring programme)
Groundwater only monitoring visit	20 March 2024 (addition to the initial monitoring programme)

On several of the visits shallow groundwater, either below ground level or flooded within the headworks, prevented gas monitoring from being carried out at some or all locations.

3.5 Groundwater Sampling

Sampling of groundwater from the installation in borehole WSN01 was carried out by SOCOTEC following the main fieldwork period on 24 January 2024. The results of subsequent laboratory testing on the samples are included in Appendix F. WSN03 and BHN01 installations had insufficient water within the installations for sampling and a slow recharge rate.

4 LABORATORY TESTING

4.1 Geotechnical Testing

Geotechnical laboratory testing of selected samples was scheduled by SOCOTEC. The main testing was carried out at the SOCOTEC laboratory with Geochemical testing carried out by DETS, in accordance with test methods as stated within the test reports. The completed testing is listed in Table 4 and the results are presented in Appendix E.

**TABLE 4 SUMMARY OF GEOTECHNICAL LABORATORY TESTS**

TEST TYPE ¹	QUANTITY	REMARKS
Classification/index tests		
Water content	5	
Atterberg limits	5	
Particle size distribution	3	By sieving and sedimentation
Geochemical tests		
pH and sulphate contents	4	BRE SD1 Suite D

Note 1: Test type names based on Thomas Telford (2022) Table 15.4 and Bill K.

4.2 Geoenvironmental Testing

Geoenvironmental laboratory testing was scheduled by SOCOTEC on selected soil samples recovered during the fieldwork, and water samples taken by SOCOTEC from the installations. The testing was carried out by SOCOTEC at the environmental chemistry laboratory, in accordance with test methods as stated within the test reports. The completed testing is listed in Table 5 and the results are presented in Appendix F.

TABLE 5 SUMMARY OF GEOENVIRONMENTAL LABORATORY TESTS

TYPE	QUANTITY	REMARKS
Suite E soil suite	6	Metals (As, B, Cd, Cr, Cu, Pb, Hg, Ni, Zn), pH, Water soluble sulphate (as SO ₄), Soil organic matter, Total Petroleum Hydrocarbons Criteria Working Group (TPH CWG), Speciated polycyclic aromatic hydrocarbons (US EPA 16 PAHs), Volatile organic compounds (VOCs), Phenols, Cyanide (total), Asbestos screen.
Suite F water suite	1	Metals (As, B, Cd, Cr, Cu, Pb, Hg, Ni, Zn), pH, sulphate (as SO ₄), Total Petroleum Hydrocarbons Criteria Working Group (TPH CWG), Speciated polycyclic aromatic hydrocarbons (US EPA 16 PAHs), Volatile organic compounds (VOCs), Phenols, Cyanide (total)



5 GROUND CONDITIONS AND GROUNDWATER

5.1 Strata Encountered

Descriptions of the strata encountered are given on the exploratory hole records. The downward succession encountered is broadly uniform across the site and is summarised in Table 6. The downward succession of strata is shown on a schematic geological cross-section presented as Section 1 in Appendix A.

TABLE 6 SUMMARY OF GROUND CONDITIONS

STRATUM	TOP (m)	TOP (mOD)	THICKNESS RANGE (m)	REMARKS
Made Ground	0.00	136.9 to 140.6	0.15 to 0.80	Ground surfacing at BHN01 and WSN02. Thin layer in SAN01 and SAN02 which may be plough disturbance.
Topsoil	0.00	136.9 to 137.7	0.10 to 0.30	Ground surfacing at WSN01, WSN03 and WSN04
Alluvium	0.10 to 0.40	137.6 to 140.6	0.50 to 1.90	WSN03, SAN01 and SAN02, possible route of former stream.
Till	0.30 to 0.50	136.6 to 136.9	0.90 to 2.70	BHN01, WSN01, WSN04
Probable South Wales Middle Coal Measures	1.50 to 3.00	133.9 to 135.8	0.40 to 0.80	BHN01 and WSN01, possibly WSN03. Base not encountered

The site shows a general sequence of Till overlying probable Coal Measures (not proven by rotary coring). The site surfacing varies depending on the previous use, with Made Ground encountered near to the constructed roadway entrance and the edge of the field, and Topsoil elsewhere.

Alluvium was encountered in the east and is likely to relate to the historic route of a brook or stream that was subsequently culverted (see Volume N1). It is possible that this Alluvium follows the historic path of the brook and, if so, may be encountered near to the eastern end of the proposed new building.

5.2 Evidence of Contamination

Olfactory and visual evidence of hydrocarbon contamination was not encountered in any of the exploratory holes.

5.3 Made Ground / Topsoil

The term *Made Ground* has been used to classify all anthropogenic (man-made) materials present. Although the standard defines Made Ground as referring to non-engineered material, the difficulty of assessing which materials have been placed in accordance with an engineering specification often precludes the distinction. Strata identified as Made Ground on the borehole logs, and in the discussion of ground conditions here, include manufactured materials (e.g. concrete), imported 'soils' (e.g. granular fill) and *in situ* soils that have been disturbed in some way by construction or other human activity.

The material recovered from the Made Ground encountered in BHN01 comprised predominantly granular material, which appears to have been used on site to extend the roadway. Clay was encountered in WSN02 at the surface and may relate to a mix of natural and imported material that has been placed at the edge of the roadway. SAN01 and SAN02 show elements of man-made material such as brick and ceramic within a slightly sandy gravelly clay. These may be related to previous ploughing events building up material at the boundary of the field. SAN01 is located on a higher ground level which may have been deliberately placed.

Topsoil comprising soft or firm greyish brown locally slightly gravelly silty clay with occasional rootlets was encountered within the west of the field and south and east of the site entrance.

No geotechnical testing was carried out of this material.

5.4 Alluvium

Alluvium was encountered in WSN03 only and comprised soft brown mottled grey slightly sandy slightly gravelly clayey silt. This becomes stiff grey slightly gravelly clayey silt below approximately 1.75 to 2.00 m. There was no recovery of material from 2.00 to 2.40 m and this, coupled with the higher SPT and hand vane results, is considered to indicate a potential change, the borehole passing



through the base of the Alluvium, possibly into a stronger material. However, the possibility that the Alluvium extends to a greater depth cannot be discounted.

The results of the field and laboratory tests are summarised in Table 7.

TABLE 7 SUMMARY OF MATERIAL PROPERTIES – ALLUVIUM

PARAMETER	NO OF RESULTS	TYPICAL RANGE OF VALUES	REMARKS
Liquid limit, W_L	2	47 and 48	
Plastic limit, W_P	2	31	
Plasticity index, PI	2	16 and 17	
Moisture content, w %	2	32	
Modified Plasticity Index, I_p %	2	13 and 15	Low volume change potential
Atterberg limits classification	2	Silt of medium (CIM) plasticity, see Figure A5.	
Particle size distribution	1	Fines content 58% with silt content 40%, i.e. shrinkable soil.	
SPT N60 value	1	4	See Figure A4
Hand vane, kPa	1	85 (peak), 31 (residual)	In situ hand shear vane at estimated base of strata, average of 3 readings

The SPT carried out within the shallower, softer zone of the Alluvium recorded an SPT 'N' value of 4. The hand vane, carried out on a sample from the base of the strata (in the lower stiffer zone of the Alluvium), indicates a high strength material. This could indicate a transition to the Till below.

The moisture contents for both tests are just higher than the associated plastic limit, see Figure A6.

5.5 Till

The Till comprises firm becoming stiff light brown mottled grey locally slightly sandy or slightly gravelly clay. Where encountered the gravel comprises angular to subangular fine to coarse sandstone and mudstone.

The results of the field and laboratory tests are summarised in Table 8.

**TABLE 8 SUMMARY OF MATERIAL PROPERTIES – TILL**

PARAMETER	NO OF RESULTS	TYPICAL RANGE OF VALUES	REMARKS
Liquid limit, W_L	3	32 to 55	
Plastic limit, W_P	3	22 to 29	
Plasticity index, PI	3	11 to 26	
Moisture content, w %	3	17 to 27	
Modified Plasticity Index, I'_p %	3	3 to 24	Low to medium volume change potential
Atterberg limits classification	3	Clay of low (CIL) and medium (CIM), see Figure A5.	
Particle size distribution	1	Fines content 55%, with clay content 18%, i.e. shrinkable soil.	
SPT N60 value	3	1 to 41	See Figure A4

The plasticity results shown two of the results with moisture contents below the corresponding plastic limit, indicating a stronger material than the overlying Alluvium, see Figure A6.

Published correlations between SPT 'N' value and strength using an f_1 value of 4.5 (Stroud and Butler, 1975) suggest an undrained shear strength for the clay of 5 kPa, increasing to 95 then about 200 kPa with increasing depth, see Figure A4. This indicates a very low strength in places (possible variable boundary with the Alluvium), increasing to high and very high strength with depth. The lowest SPT result (5 kPa) crosses over the depth of a water strike (1.60 m) and may also indicate locally softened material.

The higher strengths agree with the consistency assessed from sample inspection, and with the results of the plasticity and moisture content data.

5.6 South Wales Middle Coal Measures Formation

The material recovered below the Till comprised grey sand and gravel or clayey gravel of sandstone, indicating potentially a weathered layer at the top of the South Wales Middle Coal Measures Formation, or possibly weak rock that has been fragmented by the drilling process.

The results of the field and laboratory tests are summarised in Table 9.

**TABLE 9 SUMMARY OF MATERIAL PROPERTIES – COAL MEASURES**

PARAMETER	NO OF RESULTS	TYPICAL RANGE OF VALUES	REMARKS
Particle size distribution	1	Fines content 53% with clay content 20%	
SPT N60 value	6	19 to >200	Range includes test refusals extrapolated, see Figure A5
Dynamic probing (super heavy)	2	Continuation of dynamic sample holes; reached refusal (50 blows) within 100 to 300 mm.	

The SPT carried out within the granular material recorded SPT 'N' values of 18 and 28, with four SPT recording greater than 50 blows without achieving the 300 mm test drive (ie. refusal). This indicates a medium dense to very dense relative density, with an increase in density with depth at each location, see Figure A6. This correlates with the refusal of the dynamic probe test that was undertaken after the dynamic sample borehole had been terminated.

5.7 Groundwater

Three groundwater entries into the boreholes during drilling were recorded as either seepage or slow inflow and are summarised in Table 10. These may not represent equilibrium due to the short period over which the holes were open.

TABLE 10 SUMMARY OF GROUNDWATER ENTRIES

HOLE ID	DEPTH OF STRIKE (m)	DEPTH AFTER 20 MINUTES (m)	GROUNDWATER DEPTH (mOD)	STRATUM
WSN01	1.74 (water level determined after lower part of liner sample from 1.20-2.00m noted as wet)	1.86	135.6 to 136.3	Till
WSN02	0.60	No rise	136.3	Made Ground
WSN03	1.60 (water level determined after lower part of liner sample from 1.20-2.00m noted as wet)	1.77	137.2 to 137.7	Alluvium
SAN01	0.80	No rise, seepage	139.81	Alluvium
SAN02	0.90	0.65	137.89 to 138.14	Alluvium

Groundwater monitoring standpipes were installed in three locations. The results of the monitoring carried out on eight occasions between January and March 2024 are summarised in Table 11.

**TABLE 11 SUMMARY OF INSTALLATION AND MONITORING**

HOLE ID	RESPONSE ZONE (m)	GROUNDWATER DEPTH (m)	GROUNDWATER DEPTH (mOD)	STRATUM
BHN01	1.50 to 2.30	0.91 to 1.68	135.6 to 136.3	Probable Coal Measures
WSN01	1.00 to 2.00	0.30 to 1.05	135.8 to 136.6	Till
WSN03	0.50 to 1.20	0.00 to 0.53	137.2 to 137.7	Alluvium

The response zones within the Till and probable Coal Measures showed a similar pattern over the monitoring period, indicating these may be in continuity with each other. These two wells showed an overall increase in water level, see Figure D4.

The Alluvium response zone showed a generally shallowing trend, with water level at surface on several visits. It remains a possibility that some of the shallow groundwater may be surface run-off as the headworks were flooded on several visits and water may have entered the pipes during the monitoring.

6 PROPOSED WORKS

From information provided by NPT the proposed development comprises:

- Construction of six adjoining single storey units for light industrial usage
- Associated car parking allocated to the units
- Swale
- Anticipated to be lightly loaded structures, probably portal frames.

No landscaping is noted within the information provided and it is assumed for the purposes of this assessment that the end use site surfacing will be hardstanding.



7 GEOTECHNICAL ENGINEERING ASSESSMENT

7.1 Scope of Geotechnical Investigation

7.1.1 General

The required *Scope of Works* was part of an email issued by NPT (dated 20 November 2023). The *Scope of Works* indicated that “final interpretive reports with enough information to allow the D&B contractor to fully design the building, external works and any SUDs required as their SAB applications dictates.” As indicated in Section 1 of this report, however, it is essential to note that at the time of this investigation no vehicular access was possible to the area in which the footprint of the proposed building will be situated due to overgrown vegetation, waterlogged hummocky ground and concrete blocks and a lamppost restricting access. As such, the information on the ground conditions, and the associated discussion set out in the following sections, has been based on the findings of the exploratory holes situated in the general area of the proposed car park. While this may be of some use for preliminary design purposes in respect of the adjacent building, the D&B contractor should assume that an additional phase of investigation will be required to confirm the relevant parameters for final design.

7.1.2 Rationale

The ground investigation was designed by SOCOTEC to assess both geotechnical and geoenvironmental aspects of the site. From a geotechnical perspective the exploratory holes were positioned on a non-targeted basis to provide a spread of information across the site. In the tender offer, the proposed intrusive investigation was specified as follows:

- Five boreholes to provisional depths of between 5.00 and 6.00 m mbgl, or bedrock, if encountered.
- Monitoring standpipes in three of the boreholes.
- In situ SPTs in the boreholes.
- In situ DCP tests
- In situ vane tests in the borehole inspection pits.
- Six groundwater monitoring visits to be carried out at fortnightly intervals.
- Geotechnical Laboratory testing.



- Chemical Laboratory testing.

Based on the above Scope of Works, and the general investigation objectives, SOCOTEC proposed the following laboratory testing rationale:

- Sufficient testing to allow for characterisation of ground conditions parameters for the strata encountered, emphasis on depths likely to impact proposed foundation solution.
- BRE SD1 testing based on encountered ground conditions and likely depth for concrete on site.

Soakaway testing for the swale location was required to be carried out as an in situ test to confirm the supposition that the fine soil would not be suitable for a Sustainable Drainage System (SuDS). Two pits were excavated and tests carried out in the proposed area of the swale in accordance with the spacing recommended within BRE 365.

7.1.3 Constraints

This geotechnical assessment is based on the data available at the time of writing.

- The location and the design of the borehole installations were provided by SOCOTEC. The response zones were generally set below groundwater levels, which suited level monitoring and sampling, for which the installations were primarily intended. Selected shallow installations were intended for gas monitoring, however, the groundwater information recorded within these wells can also be utilised within the geotechnical assessment.
- No vehicle access to field for proposed building location due to overgrown vegetation, waterlogged hummocky ground and concrete blocks and a lamppost preventing access.

7.1.4 Post-investigation Monitoring Programme Rationale

A monitoring programme was undertaken to measure groundwater levels for geotechnical purposes. The monitoring programme was adjusted following Visit 4 to accommodate the reporting program completion requirement of end March 2024. Two supplemental visits were also added.



7.2 Foundations

Currently no loading information has been provided for the proposed industrial buildings, although it is assumed they will impose relatively light loads. It is also emphasised that, as no investigation of the area of the proposed building location, any comments below should therefore be taken as preliminary at this stage, as they assume that the ground conditions beneath the proposed building can be roughly extrapolated from the ground conditions found in nearby parts of the site. This may be appropriate for preliminary design but will need to be verified prior to designs being finalised.

Considering the ground conditions summarised in Section 5, the most notable features that are likely to influence foundation options are:

- **Made Ground:** limited presence on site local to the existing roadway entrance. The typical variability of Made Ground makes it unsuitable for foundation construction and should be avoided if encountered within the building footprint.
- **Presence of trees:** The ground may be influenced by the presence of trees within and to the south of the construction area, meaning any clay dominated materials beneath the site, such as the fine-grained Glacial Till, could possibly undergo volume changes (i.e., shrinkage and swelling) as a reaction to moisture content variations driven by the trees. As these volume changes result in settlement and heave in near-surface materials, the presence of trees influences the type and depth of foundation that may be appropriate for lightly loaded structures, as well as determining other precautions that may need to be adopted.
- **Alluvium:** potential for softened fine grained Alluvium to be present in the eastern end of the proposed building, following the historic path of a brook.
- **Shallow groundwater:** groundwater, up to ground level, was encountered within the monitoring wells.

All foundations should be designed to transfer loads of the proposed development to suitable natural strata. No foundations should be based in Made Ground, or in the alluvial materials which are likely to have a low bearing capacity and high compressibility characteristics.

For preliminary design purposes it is considered that the industrial units to be constructed could be supported by either conventional spread foundations, for example strip foundations, or short piles, extending to within the upper part of the Till. The minimum foundation depth should be at least 1.0 m



but may need to be deeper should alluvial materials be found in the area of the building. In addition, foundation depths should be finalised after consultation with standards for Building near trees as described by the NHBC (2024). Recommended minimum foundation depth is calculated by the type and size of trees present, their distance from the construction, and the volume change potential of the materials (see NHBC, 2024). The NHBC guidance regarding whether floor slabs need to be suspended, and other precautions to take against heave, also need to be considered.

The test results indicate that the Till is likely to have an approximate shear strength generally of 90 kPa or more and, as such, are likely to provide an appropriate bearing capacity to support the structure.

Adopting an undrained shear strength of approximately 90 kPa at a depth of 1 m, for example, a strip foundation with a width of up to 1 m should achieve a net safe bearing capacity of approximately 190 kPa.

Should higher structural loads be envisaged, requiring a greater bearing capacity than those quoted above, there are options of extending foundation depth within the Till, or the use of piles to a suitable depth. A piled foundation option may also be considered as a cost-effective alternative should spread foundations need to be deepened, or if the control of surface water or shallow groundwater might make the digging of foundation excavations more complex. Should the option of a piled foundation be considered, further advice regarding suitable piling techniques and working loads should be sought from a specialist contractor.

7.3 Chemical Considerations for Buried Concrete

7.3.1 Assessment Principles

Concrete used in foundations, or in any other structures in contact with the ground or groundwater, can deteriorate over time due to an aggressive chemical environment, particularly in respect of acidic conditions or the presence of sulphates. Water-soluble sulphates are especially important as they are more mobile, therefore increasing the likelihood of contact with sub-surface concrete. In certain geological strata sulphide minerals, such as iron pyrite, can also present a risk as they can potentially generate additional sulphates through oxidation, should they become exposed to air.



All buried concrete should be designed in accordance with the BRE Special Digest (SD1): 2005, to ensure it is suitably resistant to the chemical environment present. This Digest sets out a method for defining a 'Design Sulphate' (DS) class and an 'Aggressive Chemical Environment for Concrete' (ACEC) class for a selected location, based on the assessment of the following factors:

1. **Site setting:** whether the site is underlain by natural materials (or Made Ground derived from clean, natural materials), or otherwise by Made Ground that may contain chemical residues associated with industrial activities (i.e., a 'brownfield' site).
2. **Groundwater mobility:** Whether groundwater is likely to be mobile or relatively static.
3. **Sulphate concentrations:** Water-soluble sulphate (WS) in the ground and, where appropriate, in the groundwater beneath the site. Also, concentrations of magnesium where the site is considered to have a brownfield setting.
4. **Acidity:** pH levels in the ground and groundwater. Where pH is less than 5.5, concentrations of nitrate and chloride should also be assessed, as these may indicate the presence of nitric or hydrochloric acid, which would enhance any sulphate concentrations present.
5. **The presence of pyrite:** Where pyrite is suspected, the measurement of total sulphur (TS) and total (i.e., acid-soluble) sulphate (AS) should be undertaken. These are used to estimate concentrations of 'oxidisable sulphide' (OS) which, if substantial, can indicate the presence of pyrite. Where present, and where it might become exposed, the DS class may need to be determined from the 'Total Potential Sulphate' (TPS), which is derived from the TS content.

DS and ACEC classes are determined from the 'characteristic' values of WS, pH and, where applicable, TPS. Characteristic values are based on the worst-case measured values, the mean of the worst two values, or the mean of the worst 20% of values, depending on the size of the data set.

7.3.2 Laboratory Testing

It is considered that the relevant characteristics of this site are as follows:

- *The site is generally underlain by natural strata only.*



- *The strata directly underlying the site are not considered likely to contain pyrite.*
- *Pyrite may be present in the underlying strata (especially in the Coal Measures Formation).*

The above site attributes have been used to devise the following laboratory test rationale:

- *One soil sample of Alluvium tested for pH value, WS, AS and TS.*
- *Two soil samples of the Till tested for pH value, WS, AS and TS.*
- *One soil sample of probable Coal Measures tested for pH value, WS, AS and TS.*
- *One groundwater sample tested for pH value and WS within the chemical testing suite.*

Testing included dependent options as required. The test results are summarised in Table 12, together with calculated values for TPS and OS, and characteristic values for pH, WS and TPS (see remarks).

TABLE 12 SUMMARY OF SULPHATE RELATED TEST RESULTS – COMBINED STRATA

PARAMETER	RANGE	CHARACTERISTIC VALUE	REMARKS
pH	5.8 to 7.6	5.8	Characteristic value based on lowest result.
WATER SOLUBLE SULPHATE IN SOIL (SO ₄ mg/l)	<10 to 20	20	Characteristic value based on highest result.
WATER SOLUBLE SULPHATE IN GROUNDWATER (SO ₄ mg/l)	26	26	Single result
ACID SOLUBLE SULPHATE (SO ₄ %)	<0.01	N/A	
TOTAL SULPHUR (%)	0.01 to 0.04	N/A	
TOTAL POTENTIAL SULPHATE (SO ₄ %)	0.03 to 0.12	0.12	TPS estimated as three times the total sulphur concentration. Characteristic value based on highest result.
OXIDISABLE SULPHIDE (%)	0.03 to 0.12	N/A	Oxidisable sulphide = TPS - total sulphur. Very low sulphur values gave all results exceeding <0.3%, indicating probable absence of pyrite.

7.3.3 Site Assessment

Based on the relevant site attributes, and adopting the characteristic values from the laboratory test data, as summarised above, the following DS and ACEC classes can be determined from Tables C1 and C2 in BRE (2005):

- *The characteristic WS of 20 and 26 mg/l, for soil and groundwater respectively, indicates a DS class of **DS-1**.*
- *Based on a DS class of DS-1 (noted above), adopting a characteristic pH value of 5.8, and assuming a mobile groundwater regime, an ACEC class of AC-1 is considered applicable. Should foundations be constructed wholly in the shallow Till deposits, which are predominantly fine grained and likely to possess low permeability characteristics, groundwater may be considered static, and an ACEC class of AC-1s could be adopted.*

The preliminary assessment given above should be validated by additional testing in the area of the proposed building.

7.4 Pavement Design

Six dynamic cone penetrometer tests were carried out to derive CBR values within the proposed areas for car parking. The tests were carried out from ground level.

The test results indicated equivalent CBR values generally between 3.5 and 46 % to depths of up to 1 m. However, some of the high values may be due to coarse gravel within the Made Ground and the Till. It is therefore recommended that a CBR of 2 to 3% be taken for design of roads and hardstanding where Made Ground is to be left in place or onto Till, following Topsoil removal. Localised soft spots should be anticipated, however, which will require the removal and replacement by suitable granular materials. The CBR value should be verified with further testing when the formation level has been established.

7.5 Sustainable Drainage Systems (SuDS)

Infiltration, or soakaway, testing was required for proposed SuDS design. For infiltration based SuDS to drain effectively, the site surfacing and underlying ground conditions need to be free draining.



The site comprised a shallow groundwater table and low permeability natural soils, both of which conditions are unsuitable for discharge of water into the ground.

Two soakaway tests were carried out in the area of the proposed swale.

- Both pits encountered shallow groundwater at 0.8 and 0.9 m.
- SAN01 noted seepage at 0.8 m depth, which has been used as the base of the soakage zone for the purpose of the test. SAN02 showed a rise in the groundwater level to 0.65 m, which is used as the base of the soakage zone. It should be appreciated that soakage would only have occurred in both pits through the sidewalls due to the water table at the base.
- Both soakaway tests terminated after 19 hours without reaching 25% effective soakage depth. No soil infiltration rate is able to be calculated.
- SAN02 reached 50% effective depth within 24 hours, as per BRE 365 recommendation for storm inflow. However, this was based on a soakage zone of ground level to 0.65 m and may comprise insufficient volume for total rainfall in a design storm. Local conditions should be considered for any design calculations.

7.6 Foundation Construction

While detailed guidance on temporary works is beyond the scope of this report, it is recommended that the following general observations be taken into consideration.

- Inspection of the foundation excavations should be carried out prior to construction to determine if any softened or alluvial material is present. Should this be encountered removal and replacement by suitable material should be considered.
- Excavation of Made Ground and superficial materials for the proposed foundations should be generally within the scope of conventional backhoe excavators. Should a piled option be adopted, consideration should be given to the possibility of encountering cobbles or boulders in the Made Ground, should it be present, or Till.
- All open excavations should be made safe by suitable fencing around their perimeter, and excavation sides should be battered to an appropriate safe angle, or otherwise supported in order to prevent failure. No entry to excavations should be undertaken without the development of a full risk assessment.



- It is considered likely that groundwater at the site may be encountered close to formation level for shallow foundations. Should groundwater be encountered, or surface run-off be allowed to enter excavations, such water should be removed from excavations as soon as possible to avoid deterioration of the exposed materials. Sump pumping methods may be feasible, depending on the extent of the excavation. Specialist advice on groundwater control may be required. Such issues would not be so much of an issue with a piled foundation option.

7.7 Geotechnical Summary

The natural Till should be a suitable founding stratum for the proposed construction. A 1 m deep strip foundation with a width of up to 1 m, for example, should achieve a net safe bearing capacity of approximately 190 kPa. Checks should be made to ensure lower strength Alluvium is not within the building footprint. If present, foundations depths should be increased so that all foundations are based within the Till. Similarly, foundation depths may need to be increased in accordance with NHBC (2024). Shallow groundwater should be anticipated.

Concrete aggressivity should use DS-1 and AC1.

A CBR of 2-3 % should be suitable for pavements and roads, below any surface Topsoil material.

8 GEOENVIRONMENTAL ASSESSMENT

8.1 Assessment Basis

In line with existing legislation and the current regime for contaminated land, the site has been assessed using the tiered risk-based approach detailed in the Environment Agency's Land Contamination Risk Management Guidance. To undertake this assessment, it is necessary to define a conceptual model for the site that identifies the potential sources of contamination, the receptors and the pathways that can connect them. For there to be a risk from contamination, there must first be a source, a receptor, and a pathway by which the receptor can be exposed to the contaminant, i.e. a contaminant linkage. This assessment has been based on a conceptual site model initially developed in a desk study issued by SOCOTEC (Report No. H3091-23/N1, dated March 2024).



8.2 Potential Site Sources of Contamination, Pathways and Receptors

The desk study report covering the site area, noted in Section 8.1, included a preliminary conceptual site model (CSM) and risk assessment.

The CSM in the desk study identified the following potential sources:

- Made Ground aggregate from access road construction.
- Shallow mine workings and coals seams.

Potential pathways were identified in the desk study as dermal contact, ingestion, the inhalation of contaminated dust, the downward migration of leachate to the groundwater and the migration of ground gases.

The potential receptors were deemed to be the neighbouring and future land users, together with construction workers and subsequent maintenance workers, surface water and the groundwater beneath the site (Secondary A and B aquifers). It may be noted that, while land users are unlikely to be in close proximity of any construction activities, they represent a potential receptor to any contaminated materials that might, for example, remain exposed following construction.

A preliminary risk assessment was incorporated into the CSM in the desk study, and this defined the majority of the risks as low, with the following exceptions for which the risk was assessed as moderate to low:

- Dermal contact with Made Ground aggregate affecting construction workers or future site users.
- Ground gases from shallow mine working and coal seams affecting construction workers or future site users.
- The inhalation and ingestion of contaminated dust affecting construction workers and future site users.

The risk from radon gas at the site is shown in the desk study to be low. No radon protection measures are required as, based on British Geological Survey data, the site is in a lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level).



The preliminary CSM and risk assessment included in the desk study have been developed further, using the findings of the intrusive investigation and associated laboratory testing, and are presented in Appendix H.

8.3 Scope of Geo-environmental Investigation

8.3.1 General

The required *Scope of Works* was part of an email issued by NPT (dated 20 November 2023). The *Scope of Works* indicated that “final interpretive reports with enough information to allow the D&B contractor to fully design the building, external works and any SUDs required as their SAB applications dictates.”

8.3.2 Rationale

The ground investigation was designed by SOCOTEC to assess both geotechnical and geoenvironmental aspects of the site. From a geoenvironmental perspective the exploratory holes were positioned on a non-targeted basis. In the tender offer, the proposed geoenvironmental intrusive investigation was specified as follows:

- Five boreholes to provisional depths of between 5.00 and 6.00 mbgl, or bedrock, if encountered.
- Monitoring standpipes in three of the boreholes.
- Six gas monitoring visits to be carried out at fortnightly intervals.
- Chemical Laboratory testing.

Based on the above Scope of Works, and the general investigation objectives, SOCOTEC proposed the following laboratory testing rationale:

- One sample per position tested, targeting Made Ground plus natural where encountered.
- Test suites to include heavy metals and metalloids, US EPA 16 PAH, pH, cyanide, asbestos, TPHCWG and VOC.
- Groundwater testing (one per installation) to determine water quality and risk to receptors.



In addition, the monitoring visits were used as an opportunity to check gas concentrations in the monitoring pipes that had been installed.

8.3.3 Constraints

This geoenvironmental assessment is based on the data available at the time of writing.

- The location and the design of the borehole installations were provided by SOCOTEC. The response zones were generally set below groundwater levels, which suited the groundwater level monitoring and sampling, for which the installations were primarily intended. Selected shallow installations were intended for gas monitoring, however, the groundwater information recorded within these wells can also be utilised within the geotechnical assessment.
- The location and the design of the borehole installations were provided SOCOTEC. Some response zones were set below groundwater levels, which suited the groundwater level monitoring and sampling, for which those installations were primarily intended. Shallow wells were designed for gas monitoring, as standpipes situated above the water table were required to assess potential ground gas risk and potential contaminant linkage. Several monitoring visits resulted in no gas monitoring being carried out due to shallow groundwater impacting the monitoring equipment, resulting in a reduced set of monitoring data. Therefore, the ground gas risk assessment is predominantly representative of the air above the water column and not of the soil gases.

8.3.4 Post-investigation Monitoring Programme Rationale

A monitoring / sampling programme was undertaken to measure groundwater levels and ground gas concentrations (methane, carbon dioxide, and oxygen) in all the boreholes, and to recover groundwater samples. The monitoring programme was adjusted following visit 4 to accommodate the reporting program completion requirement of end March 2024 and two additional visits were added.

- Eight gas monitoring visits, details per visit are summarised in Table 3
 - BHN01 – three gas monitoring visits completed
 - WSN01 - four gas monitoring visits completed, two stopped due to water flow
 - WSN03 - one gas monitoring visit completed
- One groundwater sampling visit on 24 January 2024.



- WSN01 sampled and tested.
- WSN03 and BHN01 had insufficient water for sampling.

8.3.5 Zoning and Averaging Areas

For this geoenvironmental assessment, the site has been considered as a whole based on the small size of the site historical land use being the same.

8.4 Generic Assessment Criteria

8.4.1 General

This section presents the second tier of assessment and uses generic qualitative risk assessment (GQRA) criteria along with assumptions detailed herein to evaluate the risks presented by the identified contaminant linkages to the future land-use receptors.

The GQRA involves comparing contaminant concentrations observed at the site with appropriate Generic Assessment Criteria (GAC) for the intended future land use, in order to identify contaminants of concern and determine whether further assessment of risk or risk management is required. The assessment criteria used depends upon the source media and the receptor under consideration. The GACs are available for a number of receptor types and further description of SOCOTEC's adopted criteria are provided below.

8.4.2 Human Health Screening Criteria

On completion of the construction of new industrial units, the ongoing use of the site will be within an industrial estate. Therefore, for the assessment of potential risk, the land use scenario of 'Commercial' has been adopted.

The potential risks to human health in the intended end use have been evaluated using human health criteria comprising:

- Category 4 Screening Levels (C4SLs)
- Suitable for Use Levels

- Soil Guideline Values (SGVs)

A conservative approach using human health screening criteria derived with 1% SOM have been used. The actual range of values tested are 3.69 to 7.38 %.

In accordance with the requirements of the LCRM guidance, SOCOTEC have adopted the precautionary approach and where GACs for the contaminants have values in the more than one published document, C4SLs take precedent.

8.4.3 Controlled Water Screening Criteria

A preliminary Tier 2 assessment of the analysis results for the groundwater samples recovered has been undertaken, which has involved the comparison of groundwater sample concentrations against relevant screening values for the receptors listed below:

- Groundwater (Secondary A aquifer of the Till and the South Wales Middle Coal Measures bedrock).

The concentrations recorded in the groundwater samples have been compared to the UK Drinking Water Standards (DWS) and the Environment Agency's Freshwater Environmental Quality Standards (EQS) published in the document, The River Basin Districts Typology, Standards and Groundwater Threshold Values (Water Framework Directive) (England and Wales) Directions 2015.

8.4.4 Ground Gases Screening Criteria

The ground gas risk assessment has been undertaken in accordance with British Standard BS8485:2015 and normative reference CIRIA C665 (CIRIA, 2007).

8.5 Risks to Human Health

The maximum recorded concentrations of contaminants in soils on site have been compared with the commercial C4SLs and, where C4SLs are not available, GAC (1% SOM) in Table H1 in Appendix H of this report.



This table shows that the concentrations of the contaminants of concern (CoCs) have all been recorded below the relevant GACs indicating that there is not, potentially, an unacceptable risk to human health, with regards to soil contamination, in the proposed future site use. No asbestos fibres were detected in any of the samples screened.

The assessment criteria referred to above are based on chronic risks and, therefore, are not strictly applicable to potential acute risks that would be relevant to construction or maintenance workers. Nevertheless, given the low contaminant concentrations found, the ground conditions encountered and the lack of a significant sources of contamination, the risk to construction and future maintenance workers is considered to be generally low. All potential occupational hygiene risk should be assessed by the contractor and controlled by an appropriate Construction Phase Safe Systems of work. Such controls are likely to include adopting good hygiene procedures and having a discovery strategy in place.

8.6 Risks to Adjacent Land Users

The potential pathways for dispersion of airborne contamination and the inhalation of transient dusts (which would allow off site migration of contamination) are unlikely to be active in the site's current state given the largely vegetated surface and low concentrations of contaminants in the site soil. Once developed the site will be covered with an increased area of hardstanding, with limited areas of soft landscaping which will reduce the mobilisation of windborne dusts from exposed soil surfaces.

Levels of dust may increase during the construction phase works, whilst excavating and drilling through the soils although, given the generally low concentrations of contaminants in the predominantly natural soils, the likelihood of exposure is considered negligible.

There is a potential for offsite receptors to be exposed to contaminants in the groundwater, due to the lateral migration of groundwater through the site. This risk is assessed in the following sections.

8.7 Groundwater Contaminants

For the purposes of the generic risk assessment, groundwater samples have been assessed by comparison against adopted screening values for the groundwater receptor identified at the site (i.e., the Secondary A aquifers) and the River Dulais which may be in hydraulic continuity with the shallow groundwater.



The target concentrations (Ct) have been based on either Environmental Quality Standards (EQS), UK Drinking Water Standards (DWS) or, where both are available, the most conservative of the two.

To determine whether there is a source of contamination at a concentration posing a risk to the quality of controlled waters, contaminant concentrations recorded in samples of groundwater taken from borehole installations have been compared to their respective target concentrations (Ct) in Tables H2 and H3 in Appendix H.

8.8 Risks to Controlled Waters

The assessment for the concentrations of contaminants in the groundwater at WSN01 within the Till recorded the following exceedances of the screening criteria:

- EQS:
 - Nickel
 - Zinc
- UKDWS:
 - TPH (Aromatic >C21-C35, total aliphatic)

8.9 Relevant Pollutant Linkages – Groundwater

The exceedances of the Freshwater EQS values recorded in the site groundwater consist of nickel and zinc. The exceedances are marginal and only just above the relevant screening values. However, it should be noted that the Freshwater EQS values for these metals are based on the bioavailable fraction and not the total, so that assessment against the total concentration is considered to be highly conservative. As the total concentrations of these metals marginally exceeded the EQS, it is probably likely that the bioavailable fraction would be below the EQS value and unlikely to present a risk to surface water receptors.

The concentrations of nickel and zinc recorded in the groundwater are likely to be representative of the superficial aquifer across the wider site area and are unlikely to have been impacted by the vertical migration of mobile nickel and zinc leached from the site soil. The soil values for analysed metals were low across the site and at concentrations typically representative of natural soils.



The closest surface water body to WSN01 is the culvert that runs through the site, and the tributary to the south that is probably in hydraulic continuity with the natural groundwater in the superficial aquifer. Nevertheless results are considered likely to be in line with general background concentrations for the groundwater in the wider area and the river, and this could be assessed further by sampling and analysis of the river water, particularly upstream from the site.

The elevated TPH (C₂₁ – C₃₅ aromatic hydrocarbon) concentration which exceeded the DWS value in the groundwater sample from WSN01 indicates that any groundwater taken from abstraction points could potentially pose a risk if used as drinking water. However, there are no groundwater extractions identified with a 2 km radius of the site (SOCOTEC 2024). In addition, the aromatic hydrocarbons in the C₂₁-C₃₅ range comprises the heavier, poly-cyclic hydrocarbons which are more likely to be retarded and less mobile.

The specific source or sources of these hydrocarbons is unclear as an onsite source has not been identified. However, moderately elevated aromatic C₂₁-C₃₅ aromatic hydrocarbons had been recorded in the site soil at WSN4 1.20 m.

It is considered that the migration of groundwater on the site is likely to be towards the adjacent River Dulais, possibly via the local tributaries and the culvert.

8.10 Permanent Ground Gases

The assessment methodology detailed in British Standard BS8485 require the calculation of a Gas Screening Value (GSV), which considers the peak concentrations of methane and carbon dioxide with respect to the borehole flow rate. A 'characteristic situation' (CS) can then be determined from the calculated GSV. The site's characteristic situation then corresponds to a set of appropriate gas protection score for the CS for a specific land use type or combination of types where there is a multipurpose development.

8.10.1 Summary of Investigation of Permanent Ground Gases

The investigation was scoped to study the gas regime of the site and assess the risk presented by any ground gases to construction works whilst excavating and conducting boring works in the



construction phase (the overall risk is considered low to moderate). The below provides an overview of the results of the partial ground gas monitoring visits carried out following the ground investigation:

- Methane was recorded above the limit of detection (0.1% v/v) on two of the monitoring visits at WSN01 (0.6 and 0.7 % v/v, 6 and 13 March 2024). All other readings were below the limit of detection.
- Carbon dioxide concentrations (0.2 to 3.4 % v/v) were recorded above the instruments limit of detection (0.1% v/v) in all monitored installations on 5 January and 6 March 2024.
- Significantly depleted oxygen (<10% v/v) was not recorded in any of standpipes during any of the monitoring visits.
- The maximum flow rate recorded in the monitoring programme was 4.1 l/hr on one occasion (BHN01, 5 January 2024), all other readings were between 0.1 and 0.3 l/hr; and
- Ground gas monitoring was undertaken during periods of variable atmospheric pressures in the range 991 to 1017 mb. Only one visit carried out <1000 mb.
- Shallow groundwater was encountered in several locations limiting the ability to carry out gas monitoring. Some monitoring visits were terminated due to water inflow and only peak gas readings were obtained. Other visits were unable to obtain any gas readings. WSN03 had a fully saturated response zone for all visits.

8.10.2 Findings of Risk from Permanent Ground Gases

Based on the results of the monitoring visits carried out, the maximum recorded gas concentration was 3.4 % carbon dioxide. As the monitoring pipe response zones were either partially or completely saturated, however, the monitoring results may not be representative of ground gas conditions and, as such, it is not considered appropriate to characterise the site in accordance with standard guidance (i.e. BS8485).

In accordance with Table 4 of BS8485 for the proposed land use sensitivity as a large industrial /retail park style (Type D) the gas protection score and measures would be:

- Alluvium (WSN03 – only one visit completed with saturated response zone)
 - GSV methane = <0.001
 - GSV carbon dioxide = <0.001



- CS 1 – no gas protection measures required.
 - Minimum gas protection score - 0
- Till (WSN01 – four visits completed, some terminated early due to groundwater)
 - GSV methane = <0.001
 - GSV carbon dioxide = <0.001
 - CS 1 – no gas protection measures required.
 - Minimum gas protection score - 0
- Probable Coal Measures (BHN01 – three visits completed)
 - GSV methane = 0.004
 - GSV carbon dioxide = 0.14
 - CS 1, though with >1 % methane consideration to CS2 should be considered.
 - Minimum gas protection score – 1.5
- Where a gas resistant membrane is required, it should meet the requirements specified in Clause 7.2.4 of BS8485.

The concentrations of ground gases appear to be reflective of the ground conditions encountered where generally moderate grade natural sources of ground gases such as alluvium, containing organic matter content were encountered at shallow depth in the areas investigated. However, these natural soils do not generally tend to have high gas generation rates (CL:AIRE Research Bulletin 17 (RB17)).

In general, the results are likely to be influenced by the groundwater rather than being fully representative of gas concentrations in the ground. Potential longer term variations in ground gas conditions and worst case scenario pressure variations are therefore not represented.

The shallow Alluvium strata retain the potential to generate ground gases such as methane but may be removed prior to construction as not a suitable founding material. This would limit the gas generation potential but not remove it entirely from the site. The Till shows higher gas readings, which may be due to dissolved gases within the groundwater. Carbon dioxide in natural soils such as Glacial Deposits can often be recorded up to 15 % in monitoring wells (RB17) but does not pose a potential risk to development. The underlying Coal Measures shows higher methane results, although the overlying impermeable Till will limit the pathway.

It is recommended that further remedial measures are required to reduce the potentially unacceptable risk presented by ground gases. Where there is incomplete monitoring data available or no monitoring,



the approach for common scenario taken in RB17 for organic soils such as alluvium (and <1m of Made Ground) over natural soils such as Till i.e. the same scenario which we have on site, is to install gas protection measures.

Based on the gas regime and slightly elevated concentrations above 1 % v/v of methane from the Coal Measures, given the lack of ground gas data available to support otherwise, gas protection measures are recommend being installed in the proposed commercial development in accordance with Characteristic Situation 2 for a Type D building with a minimum gas protection score of 1.5 points.

Due to the reduce ground gas data set as a consequence of shallow groundwater submerging the response zones of the monitoring standpipes it is recommended a supplementary programme of ground gas monitoring at a later date during prolonged dry spells. This would support the data obtained in the investigation and validate the ground gas regime and characterisation situation recommended for the development.

8.11 Summary of Site Investigation Findings and Updated Conceptual Model

Following the GQRA, the Preliminary CSM provided in the preliminary risk assessment presented in the desk study report has been updated and refined as presented in Appendix H.

The ground investigation and subsequent assessment have not indicated levels of soil contamination that would represent an unacceptable risk to human health.

The analysis of a groundwater sample has indicated slight exceedances of the Freshwater EQS screening levels for nickel and zinc in WSN01. However, it is considered, that as the EQS values for these metals has been based on the bioavailable fraction, and not the total, it is highly conservative. As the total concentrations of these metals marginally exceeded the EQS, it is probable that the bioavailable fraction would be below the EQS value and unlikely to present a risk to surface water receptors.

In general, the risk to surface waters (i.e., the River Dulais, tributary and culvert) is considered generally low, although the assessment of background levels in the wider aquifer up hydraulic gradient, and the river water upstream and downstream from the site, would provide further confidence in respect of this conclusion.



The groundwater sample from WSN01 also recorded a slightly elevated concentration of C21-C35 hydrocarbons which exceeded the UK Drinking Water Standards. The potential risk presented to potable water abstractions is considered be low as there are no known nearby potable water abstraction points within a 2km radius and the low permeability Glacial Till may restrict vertical migration into the groundwater in the bedrock.

A review of the ground conditions, organic content of the site soil and potential sources of ground gas in the updated PCSM indicate the site is of low to moderate gas generation potential (i.e., considered unlikely to generate hazardous ground gases) and presents a low risk. A limited gas monitoring programme has indicated methane concentrations locally > 1 % and maximum carbon dioxide concentrations of 0.3 %. These findings indicate that gas precaution measures are likely to be required to sever the ingress pathway and mitigate the potential risks presented to future site users by ground gases. It is recommended that gas protection measures for a gas regime CS2 (Type D development), 1.5 points are designed and installed by a suitably qualified contractor. A separate risk assessment for construction workers should be undertaken.

The remedial measures outlined in this report should be developed into a Remediation Strategy to document the design and installation of the gas protection measure in the proposed development. This should be submitted to the Local Authority and Environment Agency for comment and / or approval before proceeding with construction.

It is recommended a supplementary programme of ground gas monitoring undertaken at a later date during prolonged dry spells to potentially enable monitoring to be undertaken when the groundwater levels in the standpipes have reduced beneath the response zone. This would support the data obtained in the investigation and validate the ground gas regime and characterisation situation recommended for the development.

The potential risks presented to construction workers from contaminants in the ground and ground water, or from ground gases, are considered generally low, but should be assessed and controlled as part of the contractor's risk assessment for the works. Such controls may include confined space working arrangements such as excavations, wearing personal protective equipment such as gloves, providing welfare and washing facilities and maintaining good hygiene standards such as washing hands before eating, smoking/vaping or drinking after coming into contact with site soils.



Due to the limited nature of all site investigations and the constraints of the investigation identified, there always remains the possibility that previously undiscovered contamination may be encountered during the subsequent development of the site.

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- BS EN ISO 14688-2:2018: Geotechnical investigation and testing - Identification and classification of soil - Part 2 Principles for a classification.
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- BS EN ISO 22476-3:2005+A1: 2011: Geotechnical investigation and testing - Field testing - Part 3 Standard penetration test.
- CS 229: 2020: Data for pavement assessment. Design Manual for Roads and Bridges. Highways England.
- Stroud, M.A. and Butler, F.G. (1975). The standard penetration test and the engineering properties of glacial materials, Conf. on the engineering behaviour of glacial materials, Univ. of Birmingham, pp. 124-135. U.K.
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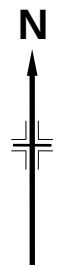
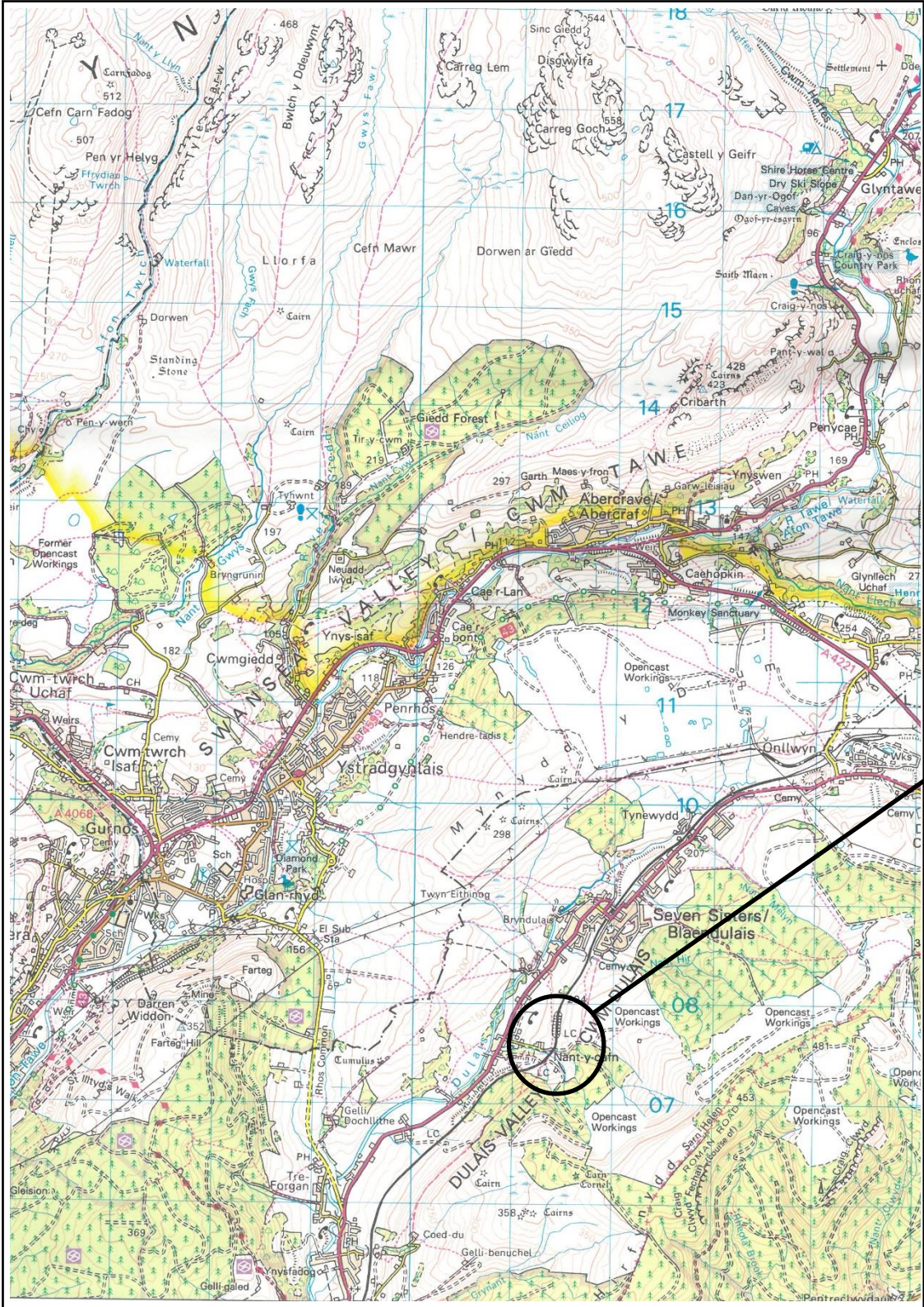


APPENDIX A

FIGURES AND DRAWINGS

Site Location Plan	A1
Exploratory Hole Location Plan	A2
Proposed Plan & Elevations – <i>from client</i>	A1279-101
Site Location Plan – <i>from client</i>	A1280-100
Cross Section Plan	A3
Cross Section	Section 1
SPT N Value - Level Profile	Figure A4
Plasticity Chart	Figure A5
Moisture Content and Atterberg Limits Profile	Figure A6
Undrained Shear Strength Profile	Figure A7

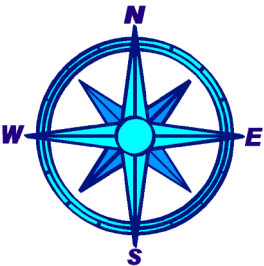
Site Location Plan



THE
SITE

Reproduced from the 2016 Ordnance Survey 1:50 000 scale Landranger Map No 160 by permission of Ordnance Survey on behalf of The Controller of His Majesty's Stationery Office, © Crown copyright, SOCOTEC UK Limited. All rights reserved. Licence Number 100006060

Notes: Scale 1:50 000	Project Nant y Cafn Project No. H3091-23/N Carried out for Neath & Port Talbot County Council	Figure A1
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Notes:
Site Plan created using Professional
incorporating Bing Maps included under
licence with Bentley Ltd.

Scale:
1:500

Surveyed By:
SOCOTEC UK Limited

Surveyed Date:
03/01/2024 and 14/05/2024

- Key:
- Cable percussion borehole
 - Dynamic sample borehole
 - Dynamic sample borehole with dynamic probe follow-on
 - Dynamic cone penetrometer test
 - Soakaway trial pits

EXPLORATORY HOLE
LOCATION PLAN



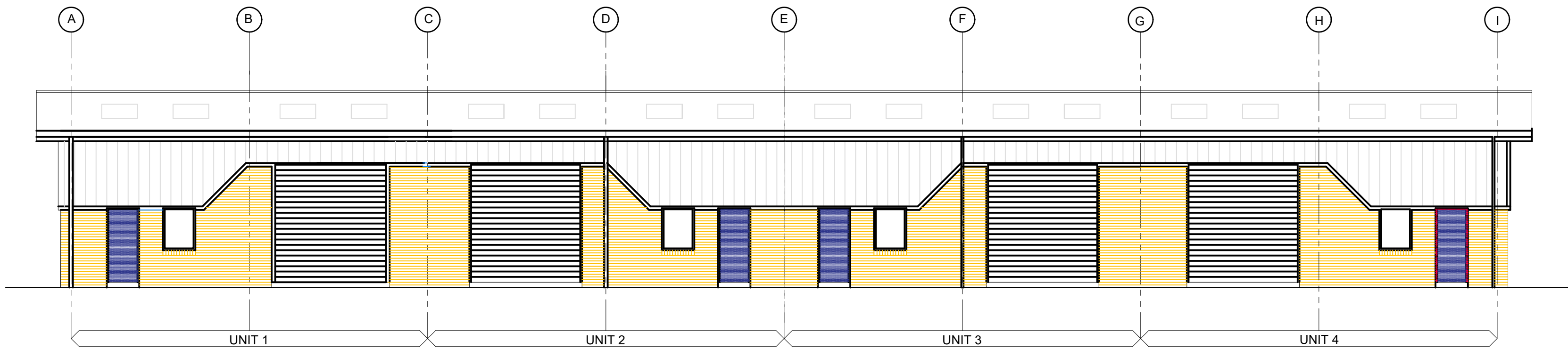
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H3091-23_N

Project Title:
Nant Y Cafn Industrial Units

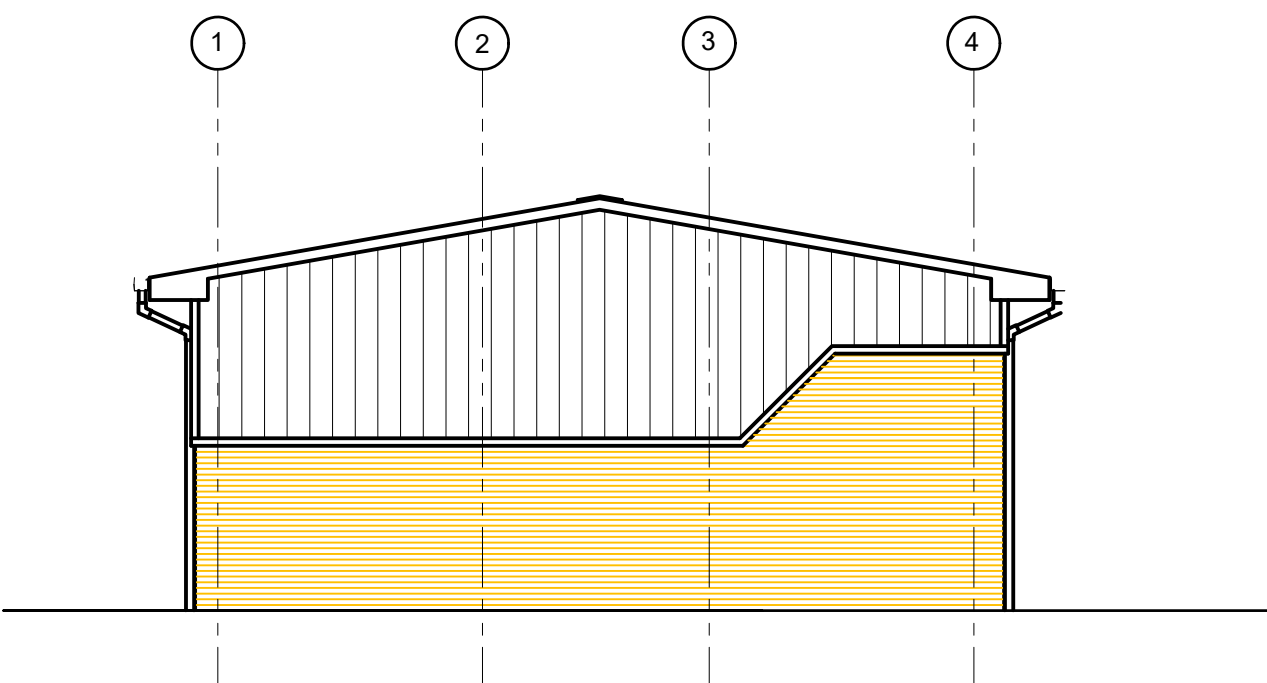
Client:
Neath & Port Talbot County Council

Figure:

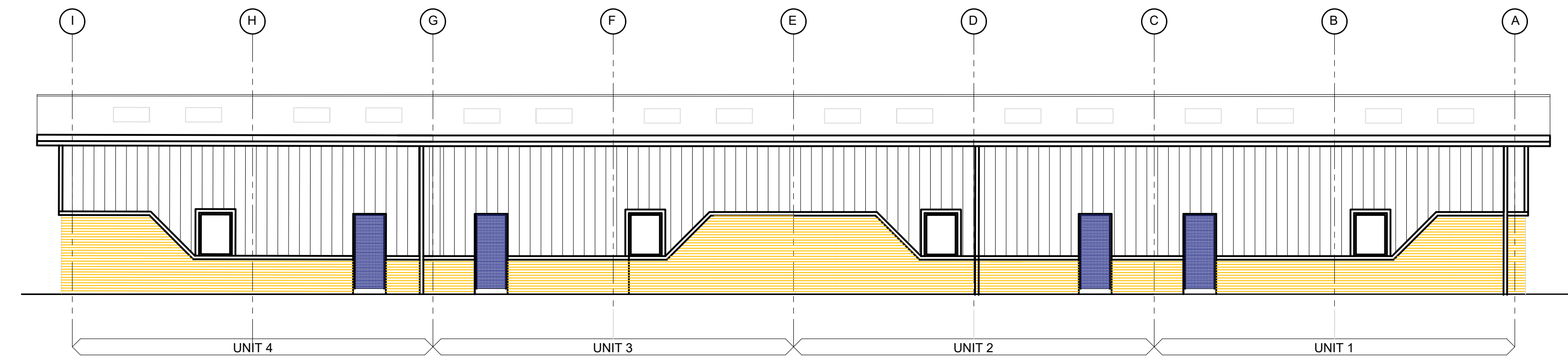
Rev
Dwg No
Project



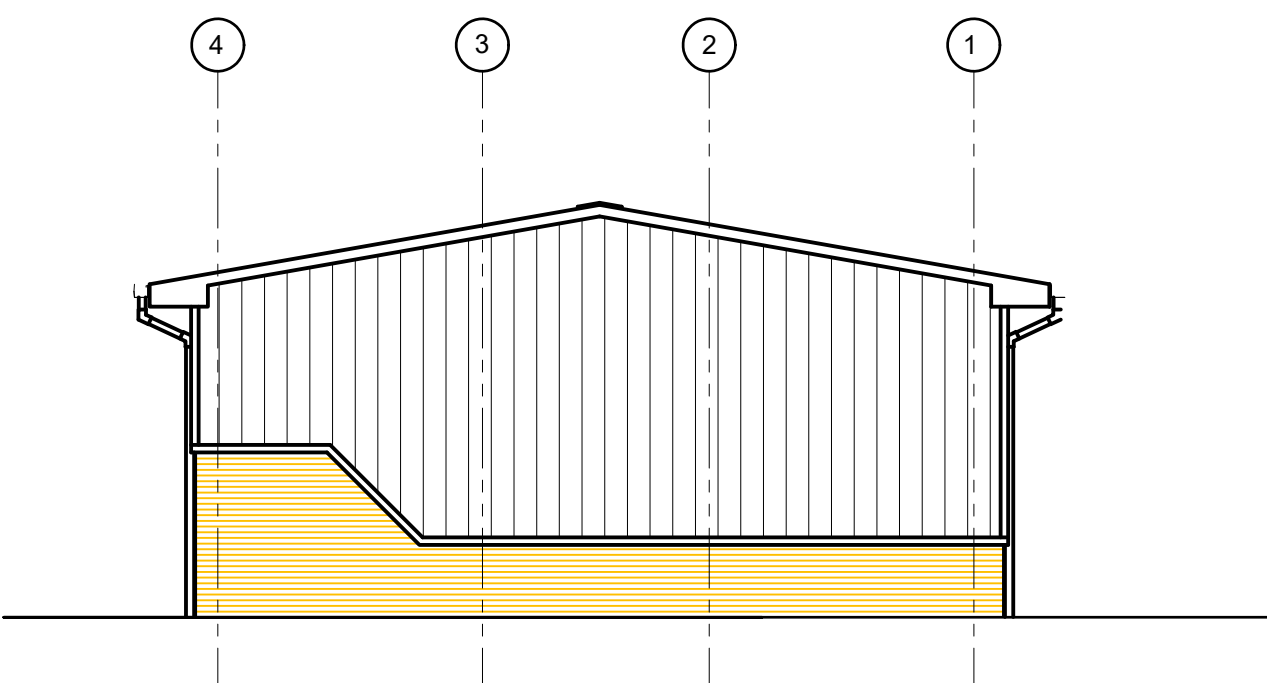
FRONT ELEVATION



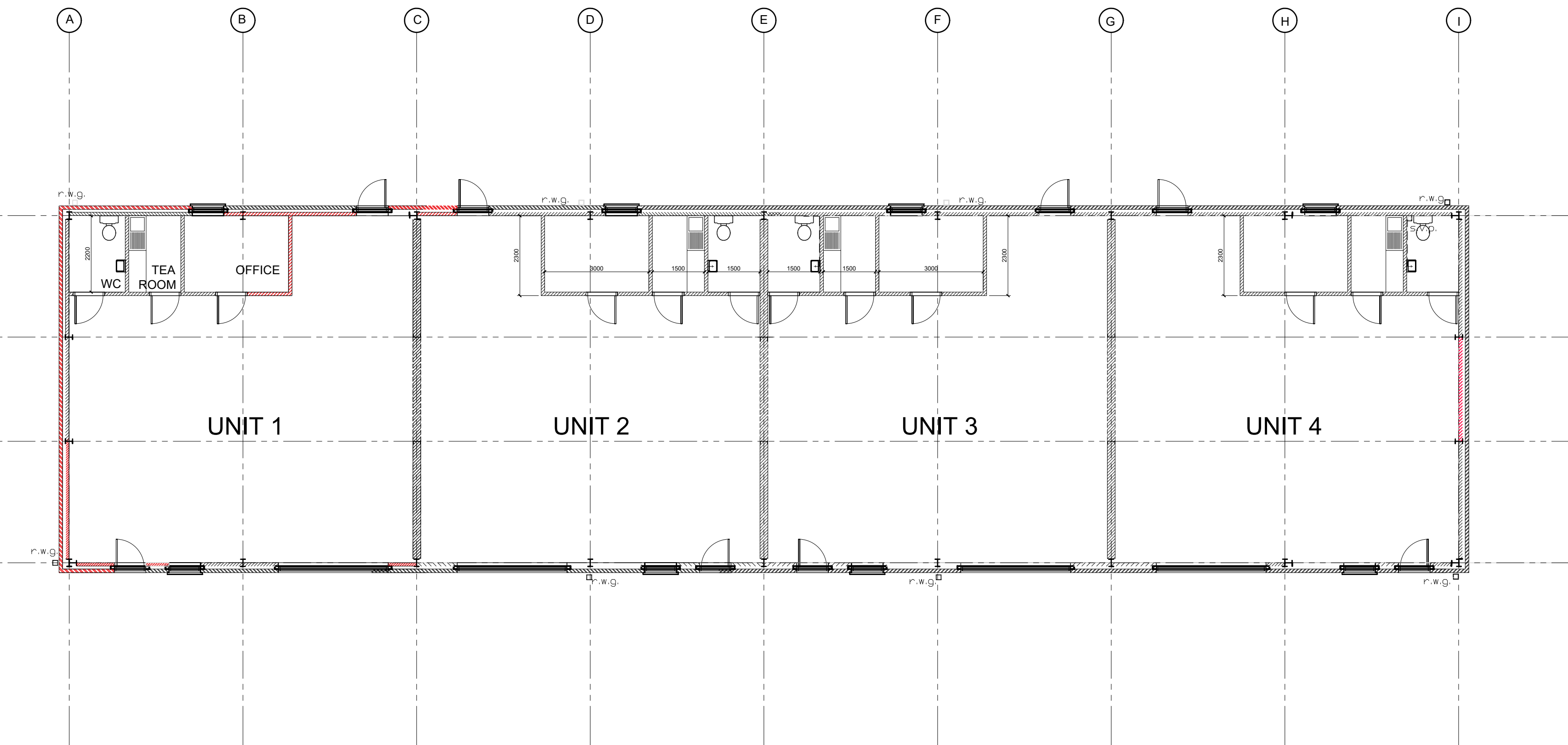
SIDE ELEVATION



REAR ELEVATION



SIDE ELEVATION



EXTERNAL FINISHES

- External walls - Approved Face brickwork and European Profile powder coated insulated wall cladding with colour code trims.
- Roof - European Profile powder coated insulated roofing sheets to match wall cladding with European Profile translucent rooflights inset as shown.
All rain watergoods to be colour coded steel.
- Windows & Doors - Powder coated steel / aluminium to match colour coded trims etc.
Powder coated steel roller shutter doors to match all doors and windows.

NOTES

- All dimensions in millimetres unless otherwise stated.

Rev	Details	Dr	Ch	Apr	Date
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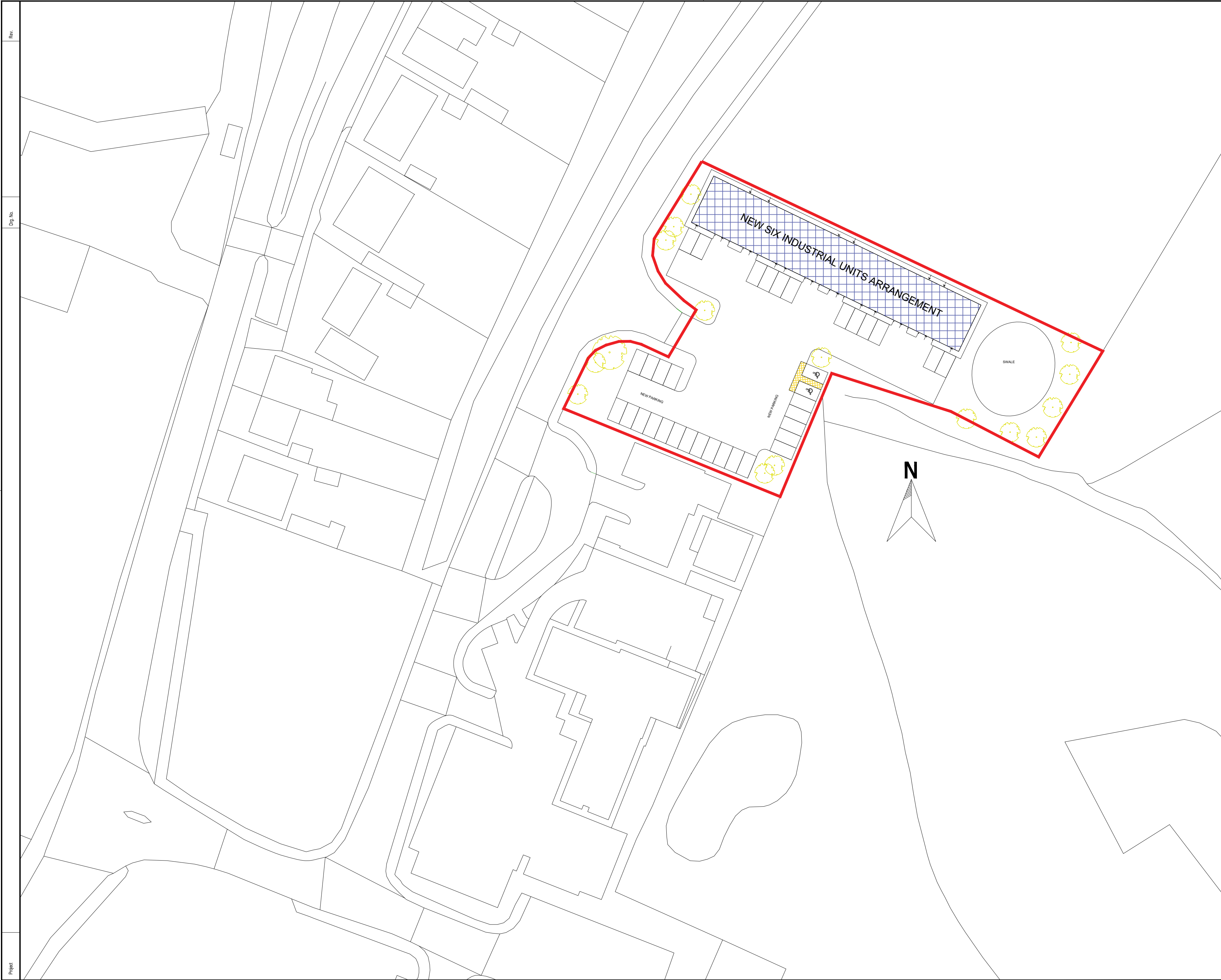
Neath Port Talbot
Castell-nedd Port Talbot
County Borough Council Cyngor Bwrdeistref Sirol
Making a difference Gwahaniaeth er gwell

PROPERTY & REGENERATION
Nicola Pearce BSc(Hons) DipTP MRTPI
DIRECTOR OF ENVIRONMENT AND REGENERATION
THE QUAYS, BRUNEL WAY
BAGLAN ENERGY PARK SA11 2GG
www.npt.gov.uk

Project
NEW INDUSTRIAL UNITS
CWMGORS WORKSHOPS
CWMGORS

Drawing Title
PROPOSED PLAN & ELEVATIONS

File No.		Property Ref. No.			
Drawn	WGH	Checked		Approved	
Date	APR 23	Date		Date	
Scales	1:100@A1				
Drawing No. A1279 - 101					Rev.



NOTES

1. All dimensions in millimetres unless otherwise stated.

Rev	Details	Dr	Ch	Apr	Date
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Neath Port Talbot
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County Borough Council Cyngor Bwrdeistref Sirol
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BAGLAN ENERGY PARK SA11 2GG
www.npt.gov.uk

Project
NEW INDUSTRIAL UNITS
NANT Y CAFN
SEVEN SISTERS

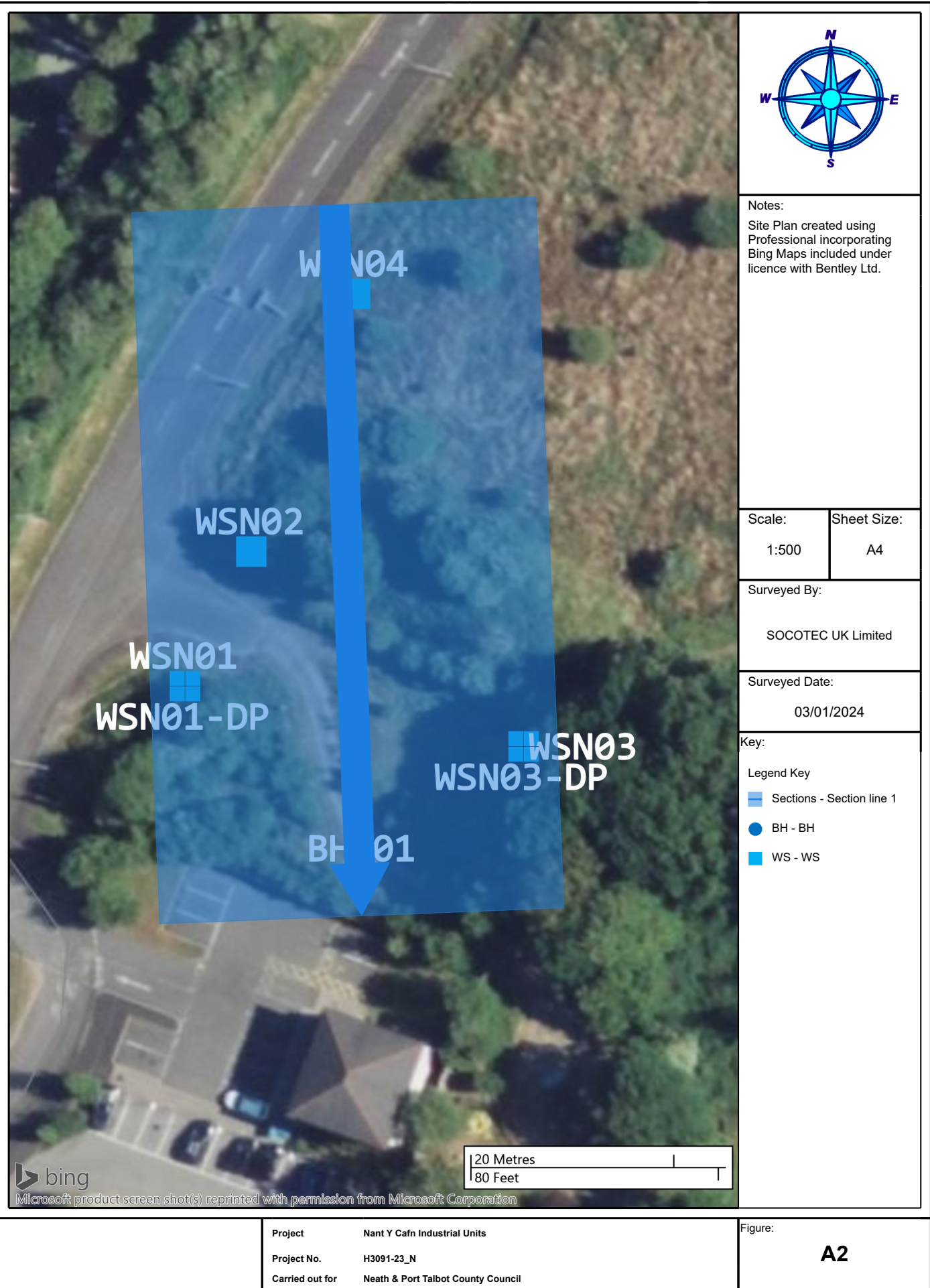
Drawing Title
SITE LOCATION PLAN

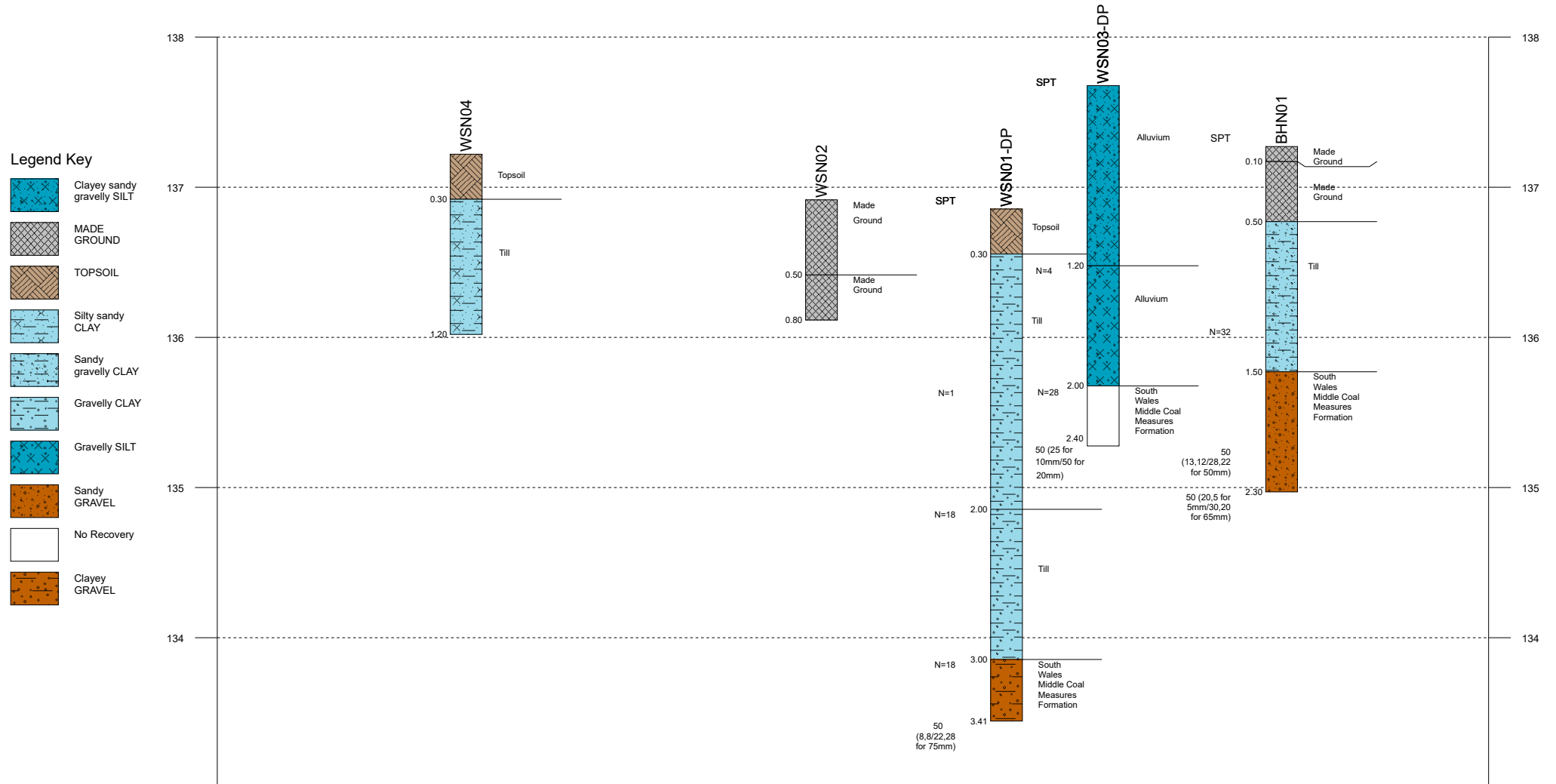
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Scales	1:500@A2				
Drawing No. A1280 -100					Rev.



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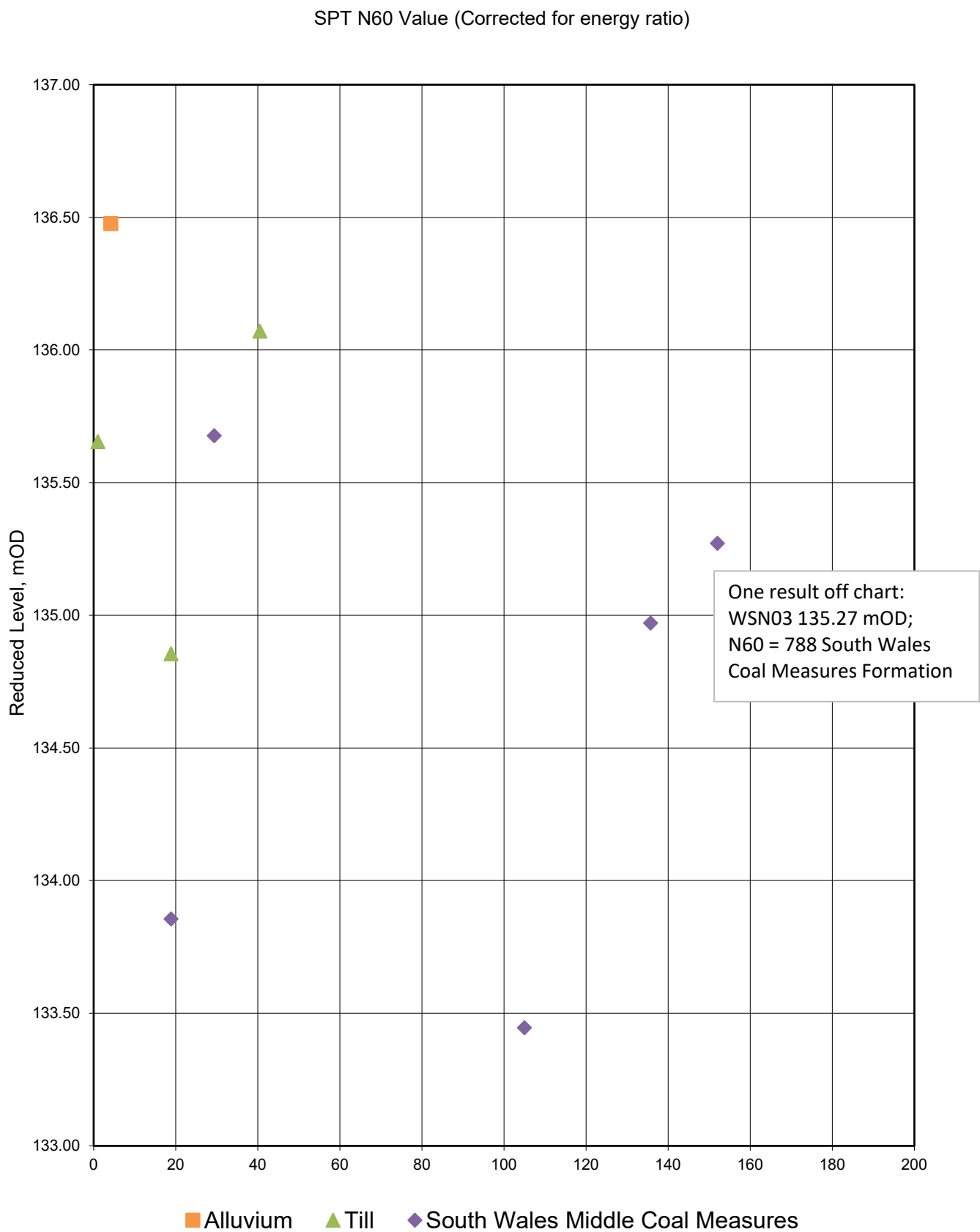
Exploratory Hole Location Plan



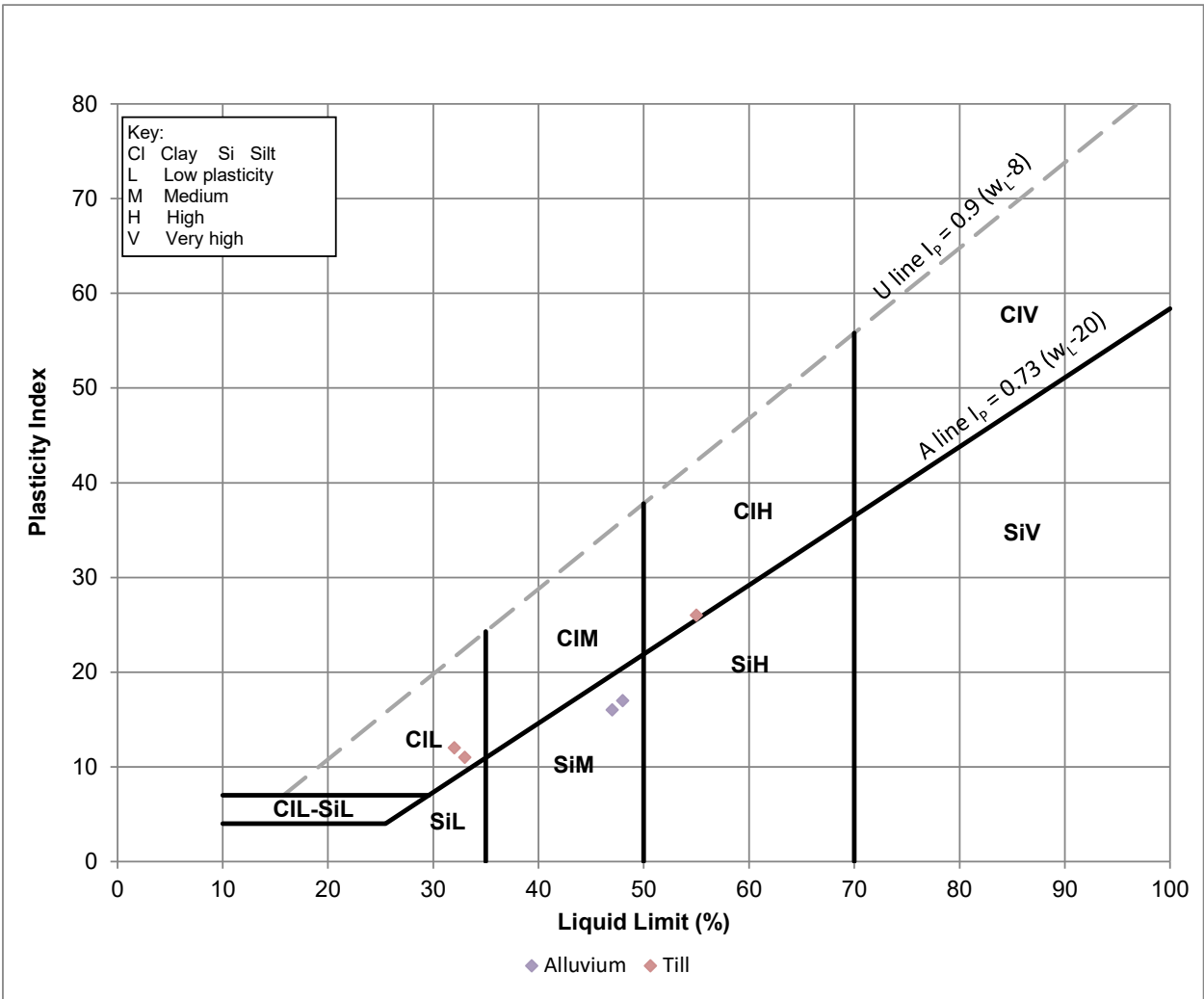


Chainage (m)	0.00	6.81	21.11	32.03	45.16	46.61	47.46	49.57	52.02	53.33	64.68	68.92
Offset (m)		0.81	7.94	10.16	17.09	17.92	18.77	19.62	20.47	21.32	22.17	
Elevation (mAOD)		137.22	137.01	136.92	136.86	136.81	136.75	136.69	136.63	136.57	136.27	

SPT N Value - Level Profile



Plasticity Chart



Notes:

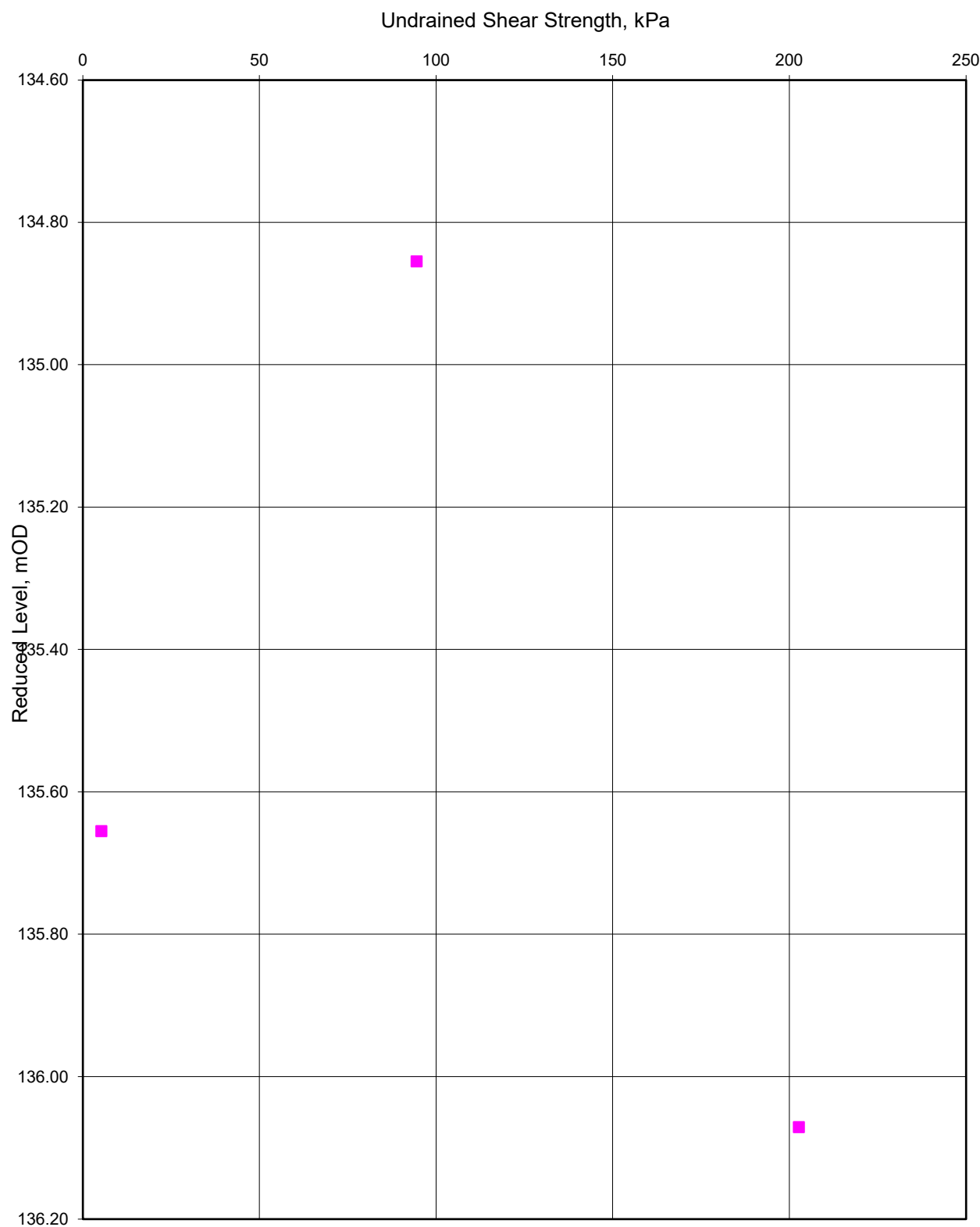
Project Nant Y Cafn Industrial Units
Project No. H3091-23_N
Carried out for Neath & Port Talbot County Council

Figure
A5

Undrained Shear Strength Profile



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■ Cu derived from SPT N Value ($N \times 4.5$)

Prepared: 24/11/2004 09:23

Notes:	Project	Nant Y Cafn Industrial Units	Figure A7
	Project No.	H3091-23_N	
	Carried out for	Neath & Port Talbot County Council	



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APPENDIX B

EXPLORATORY HOLE RECORDS

Key to Exploratory Hole Records	Key
Hammer Energy Ratio Certificates	04 and LEGACY ST
Borehole Logs	BHN01
Borehole Logs (Dynamic Sampling)	WSN01, WSN03 and WSN04
Dynamic Probing Logs	WSN01 and WSN03
Trial Pit Logs	SAN01 and SAN02

Key to Exploratory Hole Records

SAMPLES

Undisturbed

U	Driven tube sample	} nominally 100 mm diameter and 100% recovery unless otherwise stated
UT	Driven thin wall tube sample	
TW	Pushed thin wall tube sample	
P	Pushed piston sample	
CBR	CBR mould sample	
BLK	Block sample	
C	Core sample (from rotary core) taken for laboratory testing.	

Disturbed

D	Small sample (including samples recovered from SPT)
B	Bulk sample
LB	Large Bulk sample (comprising more than one container as required)

Other

W	Water sample	
G	Gas sample	
ES	Soil sample	} Environmental chemistry samples (in more than one container where appropriate)
EW	Water sample	

Comments to samples

Sequential sample reference numbers are assigned to every sample taken during hole construction.

NR - No Recovery. Used where tube sampling has been attempted but no sample obtained (for whatever reason).

Samples not shown on exploratory hole logs:

- subsamples / specimens taken for on-site testing, eg point load testing
- samples taken from borehole installations (ie water or gas) after hole construction

DYNAMIC SAMPLING

	Dynamic sampling includes 'window' and 'windowless' sampling methods, with and without a sample liner respectively
DYS	Dynamic sampling range showing tube / liner recovery (rec.) and diameter. Material retained as separate samples.
L	Retained complete liner sample (with sample reference number)

IN SITU/FIELD TESTS

SPT S or SPT C	Standard Penetration Test, open shoe (S) or solid cone (C). The Standard Penetration Test is defined in BS EN ISO 22476-3:2005+A1:2011. The open shoe configuration is used without a sample liner unless shown otherwise. Samples recovered by SPT open shoe are shown as type D. The incremental blow counts are given in the Field Records column; each increment is 75 mm unless stated otherwise and any penetration under self-weight in mm (SW) is noted. Where the full 300 mm test drive is achieved the total number of blows for the test drive is presented as N = ** in the Test column. Where the test drive blows reach the limiting value (usually 50) the total blow count beyond the seating drive is given (without the N = prefix). See Note 7 also.
IV	<i>in situ</i> field vane shear strength, peak (p) and remoulded (r), kPa
HV	Hand vane shear strength, peak (p) and remoulded (r), kPa
PP	Pocket penetrometer test, converted to shear strength, kPa
KFH, KRH, KPI	Permeability tests : KFH = falling head, KRH = rising head, KPI = packer inflow (water pressure test). Results presented on separate report sheets.
PID	VOC concentration using hand-held photo-ionisation detector, ppmv

DRILLING RECORDS

Classification of discontinuity state - as defined in BS 5930:2015+A1:2020

TCR	Total Core Recovery, %
SCR	Solid Core Recovery, %
RQD	Rock Quality Designation, %
If	Fracture spacing, mm - presented as minimum, mode (or 'typical' value) and maximum spacing.
FI	Fracture Index - presented as number of fractures per metre.
NI	Non-intact - used to indicate where the core is fragmented (ie non-Solid Core).
NA	Not-applicable - used where a measurement is inappropriate (eg for non-rock materials, zones of no recovery)
NIDD	Non-intact Drilling Induced – used to indicate where rock believed to be non-fractured in the ground has been recovered as Non-intact due to the drilling process. (Used only where specified)
NDP	No Discontinuities Present – used to indicate where core is non-fractured. (Used only where specified as alternative representation to showing a single If value for the depth range of non-fractured core.)
CRF	Core Recovered in the Following run (length in m) – used to indicate length adjustment to TCR (and SCR, RQD and If accordingly) where slipped/dropped core from a core run has been recovered in the subsequent run.
AZCL	Assessed Zone of Core Loss – used to indicate estimated depth range corresponding to core loss (for TCR<100 %). Assumed to be at the start of the core run where no judgement is possible. Not shown for core loss less than 5 %.
Flush returns – presented as estimated percentage in the Records column, with colour where relevant.	



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Key to Exploratory Hole Records

GROUNDWATER



Groundwater entry



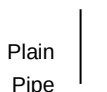
Depth to groundwater after observation period

INSTALLATIONS

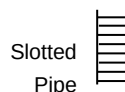
Any installations are shown on the Exploratory Hole Record in the rightmost Backfill column with appropriate graphic.

Standpipe/ piezometer

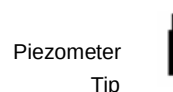
SP	Standpipe
SPIE	Standpipe piezometer
PPIE	Pneumatic piezometer
EPIE	Electronic piezometer



Plain
Pipe



Slotted
Pipe



Piezometer
Tip

Inclinometer or Slip Indicator

ICE	Biaxial inclinometer
ICM	Inclinometer tubing for use with probe
SLIP	Slip indicator



Pressure Cells

Settlement Points

ESET	Electronic settlement cell/gauge
ETM	Magnetic extensometer settlement point



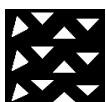
EPCE	Electronic embedment pressure cell
PPCE	Electronic push-in pressure cell



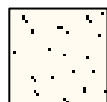
INSTALLATION / BACKFILL LEGENDS

A legend describing the installation is shown in the rightmost column. Legend symbols used to describe the backfill materials are indicated below.

Macadam



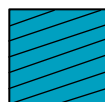
Concrete



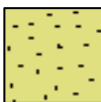
Grout



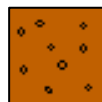
Bentonite



Sand



Gravel



Arisings

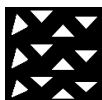


STRATUM LEGENDS

The legend symbols used for graphical representation of soils, rocks and other materials on the borehole logs are shown below. For soils with significant proportions of secondary soil types, a combination of two or more symbols is used.

Note that the Made Ground / Fill stratum legend does not differentiate between engineered and non-engineered anthropogenic materials.

Macadam



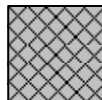
Concrete



Topsoil



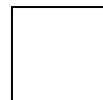
Made Ground / Fill



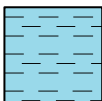
Peat



Void or No Information



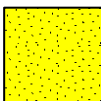
Clay



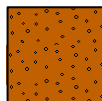
Silt



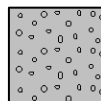
Sand



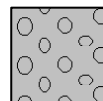
Gravel



Cobbles



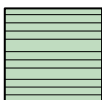
Boulders



Coal



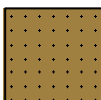
Mudstone



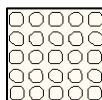
Siltstone



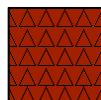
Sandstone



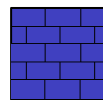
Conglomerate



Breccia



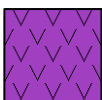
Limestone



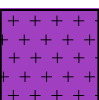
Chalk



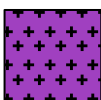
Igneous
(Fine)



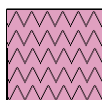
Igneous
(Med)



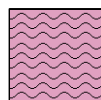
Igneous
(Coarse)



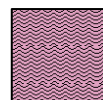
Metamorphic
(Fine)



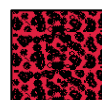
Metamorphic
(Med)



Metamorphic
(Coarse)



Tuff





Key to Exploratory Hole Records

NOTES

- 1 **Geological materials** are described in accordance with BS 5930:2015+A1:2020, which is compliant with BS EN ISO 14688-1:2018 and 14689-1:2018 for soils and rocks respectively.
- 2 The **consistency** determined during description for fine soils (clay and silt) is reported for strata where undisturbed samples are available. Where the logger considers that the samples may not be representative of the in situ condition, for whatever reason, the reported consistency may be omitted, or qualified using the terms *Probably*, where the logger is reasonably confident of the assessment, or *Possibly*, where there is less certainty.
- 3 The presence of **very coarse particles** (cobbles and boulders) is included in the stratum descriptions on logs using the proportional terminology of BS 5930 where possible. However, due to their relatively large size in relation to the diameter of boreholes, and volumes of samples recovered, these records may not be fully representative of their size and frequency in the ground. Where sample mass precludes a reliable estimate of the proportion of very coarse particles, their presence may be described using undefined qualitative terms, eg occasional, frequent, etc, or by noting the number of cobbles/boulders observed.
- 4 The **declination of bedding and joints** is given with respect to the normal to the core axis, ie perpendicular to the direction of drilling. In a vertical borehole this will therefore correspond to the dip.
- 5 The assessment of **SCR, RQD and Fracture Spacing** excludes all non-natural fractures (ie drilling induced) where these can be positively identified.
- 6 Observations of discernible **groundwater entries** during the advancement of the exploratory hole are given at the foot of the log and in the Legend column. The absence of a recorded groundwater entry should not, however, be interpreted as a groundwater level below the base of the borehole. Under certain conditions groundwater entry may not be observed, for instance, drilling with water flush or overwater, or boring at a rate faster than water can accumulate in the borehole. Similarly, where water entry observations do exist, groundwater may also be present at higher elevations in the ground than where recorded in the borehole. In addition, where appropriate, water levels in the hole at the time of recovering individual samples or carrying out in situ tests and at shift changes are given in the Records column.
- 7 The borehole logs present the results of **Standard Penetration Tests** recorded in the field without correction or interpretation. However, in certain ground conditions (eg high hydraulic head or where very coarse particles are present) some judgement may be necessary in considering whether the results are representative of in situ mass conditions.
- 8

Date	Time
Casing	Water

 Overnight pauses in hole progress are shown by a horizontal line together with records of casing depth and water level at the start and end of shift, together with the corresponding date and time. Casing depths and water levels are also shown at the time of tube sampling and Standard Penetration Tests.

REFERENCES

- 1 BS EN ISO 14688-1:2018 : Geotechnical investigation and testing - Identification and classification of soil. Part 1 Identification and description. British Standards Institution
- 2 BS EN ISO 14689 : 2018 : Geotechnical investigation and testing - Identification and classification of rock. British Standards Institution
- 3 BS EN ISO 22476-3:2005+A1 : 2011 : Geotechnical investigation and testing - Field testing. Part 3 Standard penetration test. British Standards Institution
- 4 BS 5930:2015+A1:2020 : Code of practice for ground investigations. British Standards Institution



JB Site Investigations Ltd
Ramparts Business Park
Berwick upon Tweed
TD15 1TB
Tel: 01289 304646

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

SPT Hammer Ref: 04
Test Date: 14/02/2023
Report Date: 14/02/2024
File Name: 04.spt
Test Operator: 66

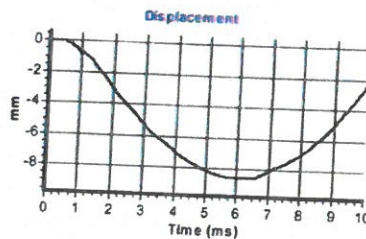
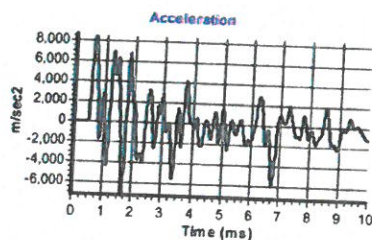
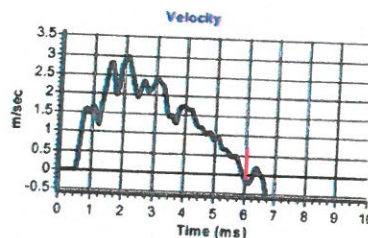
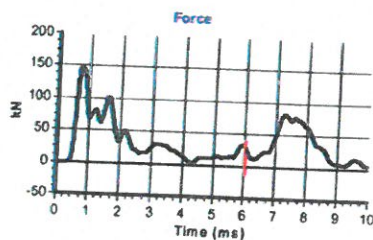
Instrumented Rod Data

Diameter d_r (mm): 54
Wall Thickness t_r (mm): 6.1
Assumed Modulus E_a (GPa): 208
Accelerometer No.1: 6178
Accelerometer No.2: 5843

SPT Hammer Information

Hammer Mass m (kg): 63.5
Falling Height h (mm): 760
SPT String Length L (m): 999.0

Comments / Location



Calculations

Area of Rod A (mm^2): 918
Theoretical Energy E_{theor} (J): 473
Measured Energy E_{meas} (J): 358

Energy Ratio E_r (%): **76**

Signed: Neil Redfern
Title: Operations Director



SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Socotec uk
Progress close
Binley
Coventry
CV3 2TF

SPT Hammer Ref: LEGACYST
Test Date: 12/10/2023
Report Date: 12/10/2023
File Name: LEGACYST.spt
Test Operator: DP

Instrumented Rod Data

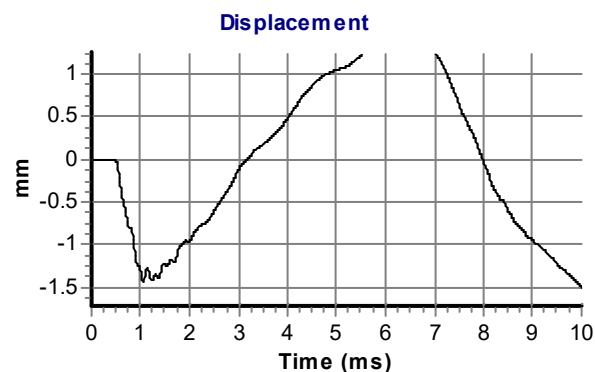
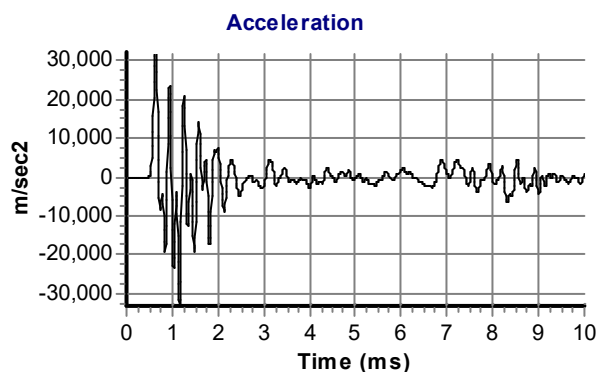
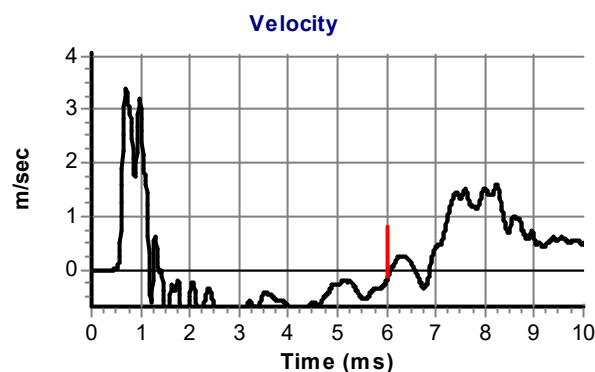
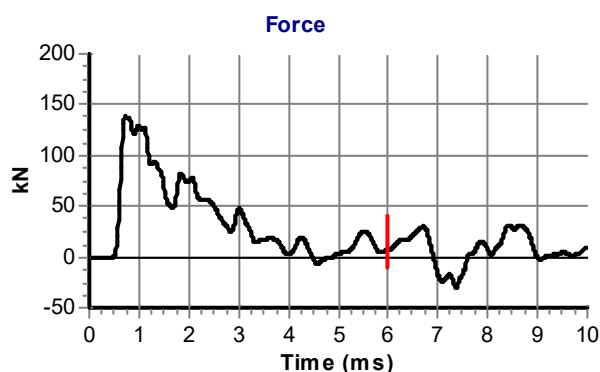
Diameter d_r (mm): 54
Wall Thickness t_r (mm): 6.6
Assumed Modulus E_a (GPa): 208
Accelerometer No.1: 72570
Accelerometer No.2: 72571

SPT Hammer Information

Hammer Mass m (kg): 63.5
Falling Height h (mm): 760
SPT String Length L (m): 15.0

Comments / Location

TEST



Calculations

Area of Rod A (mm²): 983
Theoretical Energy E_{theor} (J): 473
Measured Energy E_{meas} (J): 297

Energy Ratio E_r (%): **63**

Signed: D.Perrett
Title: Drilling Supervisor

Borehole Log



Checked MW	Depth		Dates		Method		Equipment		Rig Crew		Logger		Logged		Hole		Casing		Depth Related Remarks		Ground Level	
	0.00 - 1.20 1.20 - 2.30		13 Dec 23 - 13 Dec 23 13 Dec 23 - 13 Dec 23		Hand excavated inspection pit Cable percussion boring		Insulated Hand Tools Dando 2000		MH MH		HP HP		13 Dec 23 13 Dec 23		Depth 2.50 Dia. (mm) 150		Depth 1.60 Dia. (mm) 150		Depth Remarks		Coordinates National Grid 137.27 mOD E 281083.05 N 207799.21	
Approved MW																						

0	Date Time		Samples			Field Tests			Samp / Test		Coring		TCR % SCR % RQD %		Water added		Depth		Level	Legend	Strata Description		Chisel.	Water Entry	Backfill																																																																																																																																																																																																																																																																																																
	Casing	Water	Depth	Type & No.	Records	Depth	Type	Records	Casing	Water	Depth (Diameter)			Flush details	(Thickness)		Main	Detail			Flush cover																																																																																																																																																																																																																																																																																																				
0	13 Dec 23	0800	0.10	ES 1														(0.10)	+137.17		Dark brown silty angular to subangular fine to coarse GRAVEL of sandstone. Frequent rootlets. (MADE GROUND)					0.20																																																																																																																																																																																																																																																																																															
			0.20 - 0.50	B 2																								1.20 - 1.65	SPT S	N=32 (2,1/2,2,15,13) ID JB04 Er 76%	(0.40)	+136.77		Greyish brown sandy angular to subangular fine to coarse GRAVEL of sandstone. Sand is fine to coarse. (MADE GROUND)																																																																																																																																																																																																																																																																																							
			0.40	ES 3																																																																																																																																																																																																																																																																																																																					
			0.50 - 1.00	B 4																																																																																																																																																																																																																																																																																																																					
1			1.20	D 5													(1.00)			Firm light brown mottled grey slightly sandy slightly gravelly CLAY with occasional cobbles. Gravel is very angular to subangular fine to coarse of sandstone and mudstone. Cobbles are subangular of sandstone and mudstone. (TILL)					1.50																																																																																																																																																																																																																																																																																																
			1.20	D 6																																																																																																																																																																																																																																																																																																																					
			1.50 - 2.00	B 7																																																																																																																																																																																																																																																																																																																					
2	13 Dec 23	1200	2.00 - 2.30	D 8														(0.80)	+135.77		Very dense grey very clayey fine to coarse SAND AND GRAVEL. Gravel is angular to subangular of sandstone. (Probable SOUTH WALES COAL MEASURES)						2.30																																																																																																																																																																																																																																																																																														
			2.30	D 9																									2.00 - 2.28	SPT S	50 (13,12/28,22 for 50mm) ID JB04 Er 76%	1.60	2.30 - 2.52	SPT S	50 (20.5 for 5mm/30,20 for 65mm) ID JB04 Er 76%	1.60																																																																																																																																																																																																																																																																																					
3			END OF EXPLORATORY HOLE																																																																																																																																																																																																																																																																																																																						

Borehole Log



Checked	Depth		Dates		Method	Equipment	Rig Crew	Logger	Logged	Hole		Casing		Depth Related Remarks		Ground Level	Coordinates	National Grid
	MW	0.00 - 1.20 1.20 - 3.41	12 Dec 23 - 12 Dec 23 12 Dec 23 - 12 Dec 23	Hand excavated inspection pit Dynamic windowless sampling						Insulated Hand Tools Dando Terrier Legacy	DB/PB DB/PB	HP HP	13 Dec 23 13 Dec 23	Depth 2.00 3.41	Dia. (mm) 97 75			
Approved	MW																	

Date	Time	Samples			Field Tests			Samp / Test		Coring Depth (Diameter)	TCR % SCR % RQD %	Water added Flush details	Depth (Thickness)	Level	Legend	Strata Description		Chisel.	Water Entry	Backfill																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
		Casing	Water	Depth	Type & No.	Records	Depth	Type	Records							Casing	Water				Main	Detail																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
13 Dec 23	0800		0.10 - 0.40 0.20 0.30	B 1 ES 2 D 3									(0.30) 0.30	+136.56		Firm greyish brown slightly gravelly silty CLAY. Gravel is angular to subrounded fine to coarse of sandstone. (TOPSOIL)			Flush cover 0.20																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
			0.70 - 1.20	B 4									(1.70)			Firm brown mottled orange slightly gravelly CLAY. Gravel is angular to subangular fine to coarse of sandstone. (TILL)			1.00																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
			1.20 - 1.65 1.20 - 2.00 1.20 1.20 1.20 - 2.00	D 6 B 7 W 1 ES 5 DYS	69% rec, dia 85mm	1.20 - 1.65	SPT S	N=1 (2,0/0,0,0,1) ID Legacyst Er 63%					2.00	+134.85		Stiff brown gravelly CLAY. Gravel is angular to subangular fine to coarse of sandstone. (TILL)			2.00																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
			2.00 - 2.45 2.00 - 3.00 2.00 - 3.00	D 10 B 8 DYS	75% rec, dia 75mm	2.00 - 2.45	SPT S	N=18 (1,1/2,2,7,7) ID Legacyst Er 63%	Damp				(1.00)							2.00 SP																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
13 Dec 23	1100 Damp		3.00 - 3.41 3.00 3.00 - 3.41 3.41	D 11 D 12 D 9 DYS D 13	80% rec, dia 75mm	3.00 - 3.45	SPT S	N=18 (2,2/3,2,7,6) ID Legacyst Er 63%	Damp				3.00	+133.85		Medium dense grey clayey angular to subangular fine to coarse GRAVEL of sandstone. (Probable SOUTH WALES COAL MEASURES)					3.41																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
						3.41 - 3.71	SPT S	50 (8,8/22,28 for 75mm) ID Legacyst Er 63%	Damp				3.41	+133.44		END OF EXPLORATORY HOLE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						

Borehole Log



Checked	Depth	Dates	Method			Equipment	Rig Crew	Logger	Logged	Hole		Casing		Depth Related Remarks		Ground Level		
	0.00 - 0.80	13 Dec 23 - 13 Dec 23	Hand excavated inspection pit			Insulated Hand Tools	DB/PB	HP	13 Dec 23	Depth	Dia. (mm)	Depth	Dia. (mm)	Depth	Remarks	Coordinates	136.92 mOD	
Approved																	National Grid	E 281072.76
MW																	N 207831.83	

Date	Time	Samples			Field Tests			Samp / Test		Coring Depth (Diameter)	TCR % SCR % RQD %	Water added Flush details	Depth (Thickness)	Level	Legend	Strata Description		Chisel.	Water Entry	Backfill
		Casing	Water	Depth	Type & No.	Records	Depth	Type	Records							Casing	Water			
13 Dec 23	0858	0.00 - 0.30	B 1										(0.50)			Soft brown gravelly CLAY. Gravel is angular to subangular fine to coarse sandstone, glass and brick. (MADE GROUND)				
		0.20	ES 2																	
		0.30	D 3																	
13 Dec 23	0930 Damp	0.50 - 0.80	B 5										0.50	+136.42		Yellowish brown sandy angular to subrounded fine to coarse GRAVEL of sandstone and mudstone. (Possible MADE GROUND)		1 1		
													0.80	+136.12		END OF EXPLORATORY HOLE			0.80	

General Remarks															Hard Boring / Chiselling			Groundwater Entries			Sealed
Termination Reason: BH terminated due to hard stratum															Depths	Duration (mins)	Tool	No.	Depth	Remarks	
																		1	0.60	Remained at 0.60 m after 20 minutes. Seepage	0.60

Notes	Project	Project No.	Carried out for	Status	Scale	Printed	Borehole
For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.	Nant Y Cafn Industrial Units	H3091-23_N	Neath & Port Talbot County Council	FINAL	1:50	16 May 2024 16:39:57	WSN02
				© Copyright SOCOTEC UK Limited		Sheet 1 of 1	

Borehole Log



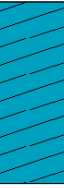
Checked	Depth		Dates		Method		Equipment		Rig Crew		Logger		Logged		Hole		Casing		Depth Related Remarks		Ground Level		Coordinates		National Grid	
	0.00 - 1.20 1.20 - 2.40		13 Dec 23 - 13 Dec 23 13 Dec 23 - 13 Dec 23		Hand excavated inseption pit Dynamic windowless sampling		Insulated Hand Tools Dando Terrier Legacy		DB/PB DB/PB		HP HP		13 Dec 23 13 Dec 23		Depth 2.00 2.40	Dia. (mm) 102 87	Depth	Dia. (mm)	Depth	Remarks	137.68 mOD E 281099.30 N 207811.92					
Approved																										
MW																										

0	Date		Time		Samples			Field Tests			Samp / Test		Coring			TCR %		SCR %		RQD %		Water added		Depth		Level		Legend	Strata Description		Chisel.	Water Entry	Backfill		
	Casing	Water	Depth	Type & No.	Records	Depth	Type	Records	Casing	Water	Depth (Diameter)																								
	13 Dec 23	1248	0.10 - 0.50	B 1																															
			0.30	ES 2																															
			0.70 - 1.20	B 3																															
			1.00	ES 4																															
			1.20 - 1.65	D 6a																															
			1.20 - 2.00	D 7																															
			1.20	D 6																															
			1.20 - 2.00	DYS	31% rec, dia 100mm																														
1																																			
													</																						

Borehole Log



Checked		Depth	Dates	Method	Equipment	Rig Crew	Logger	Logged	Hole		Casing		Depth Related Remarks		Ground Level	
MW		0.00 - 1.20	13 Dec 23 - 13 Dec 23	Hand excavated inspection pit	Insulated Hand Tools	DB/PB	HP	13 Dec 23	Depth	Dia. (mm)	Depth	Dia. (mm)	Depth	Remarks	Coordinates	137.22 mOD
Approved															National Grid	N 207857.08
MW																

0	Date	Time	Samples			Field Tests			Samp / Test		Coring Depth (Diameter)	TCR % SCR % RQD %	Water added Flush details	Depth (Thickness)	Level	Legend	Strata Description		Chisel.	Water Entry	Backfill	
	Casing	Water	Depth	Type & No.	Records	Depth	Type	Records	Casing	Water							Main	Detail				
	13 Dec 23	1500	0.00 - 0.30 0.20	B 1 ES 2										(0.30) 0.30	+136.92		Firm greyish brown slightly gravelly silty CLAY. Gravel is angular to subrounded fine to coarse of sandstone. Frequent rootlets. (TOPSOIL)					
			0.70 - 1.20	B 3									(0.90)			Firm light brown mottled grey slightly sandy silty CLAY. Sand is fine to coarse. (TILL)						
1	13 Dec 23	1600 Dry	1.20 1.20	D 4 ES 5										1.20	+136.02		END OF EXPLORATORY HOLE					
2																						
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						

General Remarks												Hard Boring / Chiselling			Groundwater Entries					
Termination Reason: No access for rig. Terminated at inspection pit depth.												Depths		Duration (mins)		Tool	No.	Depth	Remarks	Sealed

Notes	Project	Nant Y Cafn Industrial Units	Status	FINAL	Scale	1:50	Borehole	WSN04
	Project No.	H3091-23_N			Printed	16 May 2024 16:39:58		
	Carried out for	Neath & Port Talbot County Council			© Copyright SOCOTEC UK Limited			

AGS		Sheet 1 of 1
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Level	Depth (m)	Blows per 100mm	Torque (Nm)	Description	Legend	Backfill/ Instruments
+133.26 +133.16 +133.06		29 42 50				

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. © Copyright SOCOTEC UK Limited	Project Nant Y Cafn Industrial Units	Borehole
Scale 1:50 16/05/2024 16:39:58	Project No. H3091-23_N	WSN01-DP
	Carried out for Neath & Port Talbot County Council	Sheet 1 of 1

Level	Depth (m)	Blows per 100mm	Torque (Nm)	Description	Legend	Backfill/ Instruments
+135.28 +135.18	2.50	50	22			

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. © Copyright SOCOTEC UK Limited Scale 1:50 16/05/2024 16:39:59	Project	Nant Y Cafn Industrial Units	Borehole
	Project No.	H3091-23_N	WSN03-DP
	Carried out for	Neath & Port Talbot County Council	Sheet 1 of 1

Trial Pit Log



Checked MW	Depth 0.00 - 1.20	Dates 07 May 24 - 08 May 24	Method Hand excavated inspection pit for soakaway testing	Equipment Hand excavation	Crew SA and CB	Logger CB	Logged 07 May 24	Dimensions and Orientation Width 0.30 m Length 0.30 m C B A D ➔ 289 (Deg)	Depth	Remarks	Depth Related Remarks		Ground Level 140.61 mOD	Coordinates E 281158.28 National Grid N 207826.06							
	Approved AS																				
Date Time Water	Samples DepthType & No.Records			Field Tests DepthTypeRecords			Depth (Thickness)	Level	Legend	Strata Description		Water Entry	Backfill								
										Main	Detail										
0	0.10D 1						(0.15) 0.15	+140.46		Soft dark brown slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse of brick and mudstone. Sand is fine to coarse. Occasional ceramic fragments. (MADE GROUND)		1	0.15								
	0.80D 2						(1.05)			Soft brown mottled yellowish brown slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to medium of mudstone. (ALLUVIUM)				1.20							
1							1.20	+139.41		END OF EXPLORATORY HOLE											
2																					
3																					
4																					
5																					
General Remarks Soakaway test undertaken. Pit dimensions not in accordance with BREDG365 due to access constraints. Termination Reason: Scheduled depth										Stability Shoring Weather		Stable None Hot and sunny		Groundwater Entries No. Depth Remarks 1 0.80 Seepage		Sealed					
Notes For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.				Project Project No. Carried out for					Nant Y Cafn Industrial Units H3091-23_N Neath & Port Talbot County Council					Status FINAL		Scale Printed © Copyright SOCOTEC UK Limited		1:25 16 May 2024 16:39:59 AGS		Trial Pit SAN01 Sheet 1 of 1	

Trial Pit Log



Checked MW	Depth 0.00 - 0.90	Dates 07 May 24 - 08 May 24	Method Hand excavated inspection pit for soakaway testing	Equipment Hand excavation	Crew SA and CB	Logger CB	Logged 07 May 24	Dimensions and Orientation Width 0.30 m Length 0.30 m C B A D ➔ 289 (Deg)	Depth	Remarks	Depth Related Remarks	Ground Level Coordinates National Grid	138.79 mOD E 281150.20 N 207831.92			
														Approved AS		
0	Date Time Water	Samples			Field Tests			Depth (Thickness)	Level	Legend	Strata Description		Water Entry	Backfill		
		Depth	Type & No.	Records	Depth	Type	Records				Main	Detail				
	0.30	D 1				(0.40)	+138.39	Dark brown slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse of brick and mudstone. Occasional ceramic fragments. (MADE GROUND)								
	0.70	D 2				(0.50)		Soft locally firm brown mottled yellowish brown slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to medium of mudstone. (ALLUVIUM)								
						0.90	+137.89	END OF EXPLORATORY HOLE								
1																
2																
3																
4																
5																
General Remarks Soakaway test undertaken. Pit dimensions not in accordance with BREDCG365 due to access constraints. Termination Reason: Water ingress										Stability Stable Shoring None Weather Hot and sunny			Groundwater Entries No. Depth Remarks 1 0.90 Rose to 0.65 m after 20 minutes. Medium inflow			Sealed
Notes For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.					Project Nant Y Cafn Industrial Units Project No. H3091-23_N Carried out for Neath & Port Talbot County Council					Status FINAL		Scale 1:25 Printed 16 May 2024 16:39:59 © Copyright SOCOTEC UK Limited		Trial Pit SAN02 Sheet 1 of 1		



SOCOTEC

APPENDIX C

FIELD TESTING

Dynamic Cone Penetrometer Tests

TRL01 to TRL06

Soakaway Tests

SKWY/SAN01/1 and SKWY/SAN02/1

Dynamic Cone Penetrometer Test

Date of Test: 03 Jan 2024

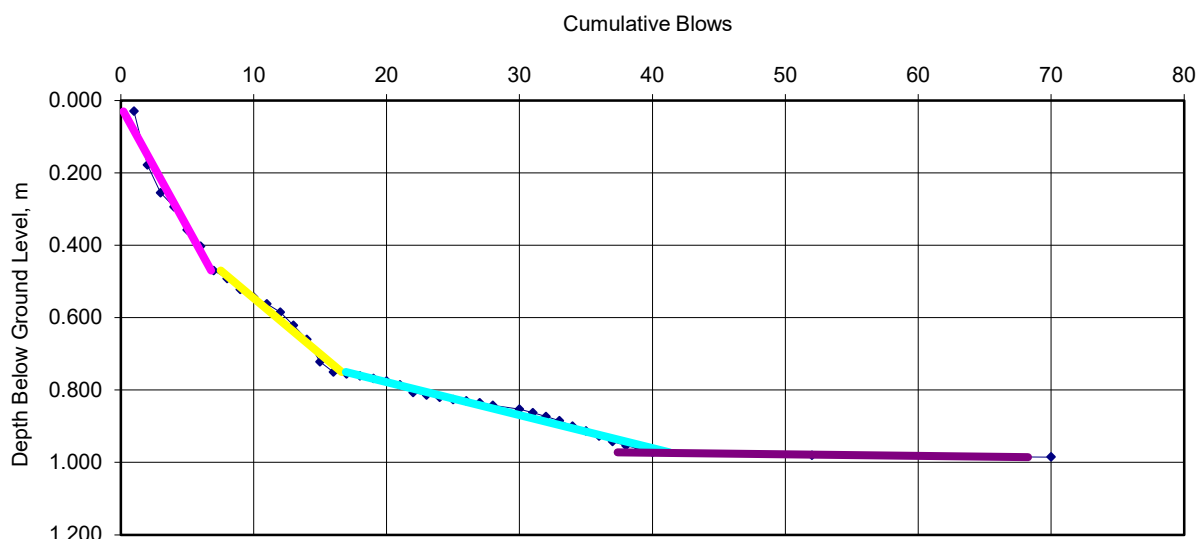
Test Depth:

0.00 mBGL

Method: TRL

Remarks: Refused

Depth, mBGL	Cumulative Blows	Depth, mBGL	Cumulative Blows	Depth, mBGL	Cumulative Blows	Depth, mBGL	Cumulative Blows	Depth, mBGL	Cumulative Blows
0.030	1	0.835	27						
0.178	2	0.842	28						
0.255	3	0.853	30						
0.294	4	0.863	31						
0.358	5	0.873	32						
0.403	6	0.885	33						
0.470	7	0.900	34						
0.492	8	0.913	35						
0.522	9	0.927	36						
0.543	10	0.942	37						
0.562	11	0.954	38						
0.585	12	0.963	39						
0.621	13	0.972	40						
0.660	14	0.980	52						
0.722	15	0.985	70						
0.750	16								
0.756	17								
0.761	18								
0.768	19								
0.775	20								
0.786	21								
0.807	22								
0.814	23								
0.820	24								
0.826	25								
0.830	26								



CBR Values

Top, mBGL	Base, mBGL	CBR, % ¹
0.03	0.47	3.5
0.47	0.75	8
0.75	0.97	29
0.97	0.99	750

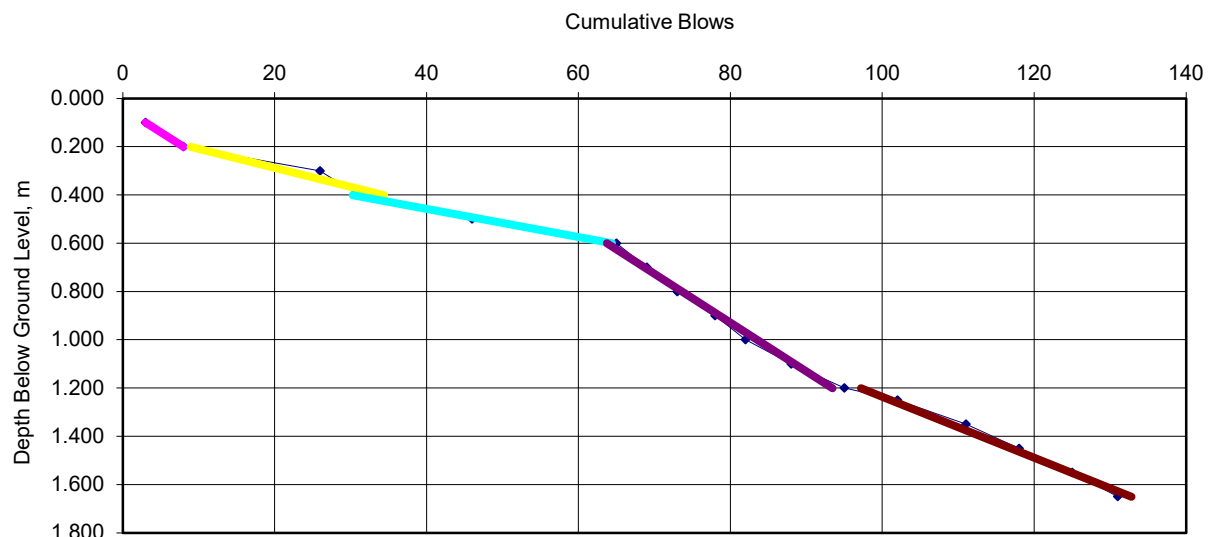
Note 1:
CBR values calculated in accordance with DMRB CS 229 Data for pavement assessment (2020)

Project Nant Y Cefn Industrial Units
Project No. H3091-23_N
Carried out for Neath & Port Talbot County Council

Hole **TRL01**

0.00 mBGL

Remarks:

[illegible]

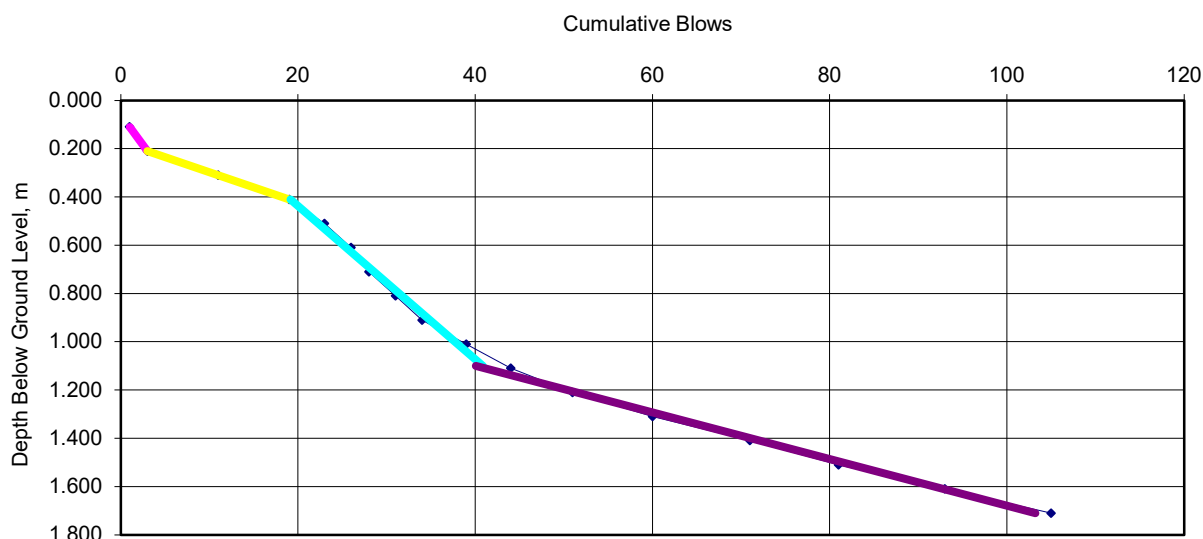
Top, mBGL	Base, mBGL	CBR, % ¹
0.10	0.20	12
0.20	0.40	34
0.40	0.60	46
0.60	1.20	12
1.20	1.65	20

Hole

TRL02

0.00 mBGL

Remarks:

[illegible]

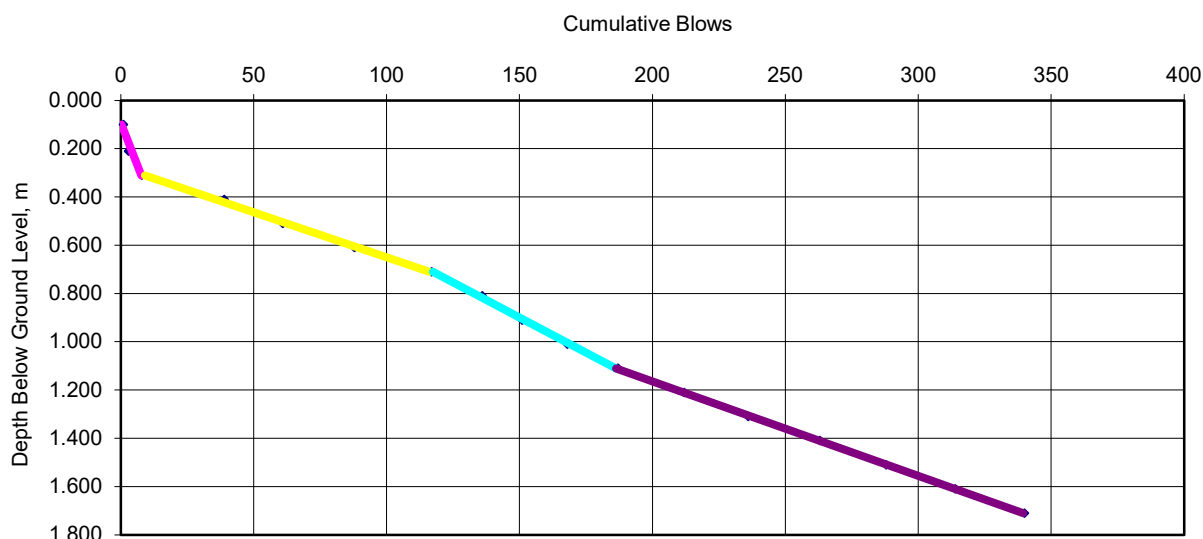
Top, mBGL	Base, mBGL	CBR, % ¹
0.11	0.21	4.8
0.21	0.41	20
0.41	1.10	7.8
1.10	1.71	27

Hole

TRL03

0.00 mBGL

Remarks:

[illegible]

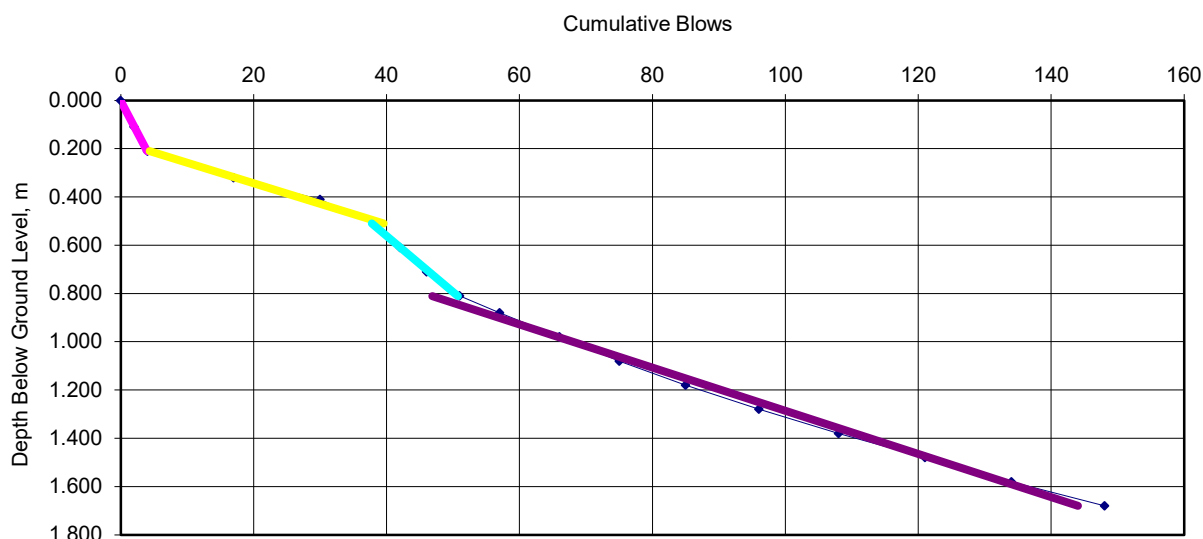
Top, mBGL	Base, mBGL	CBR, % ¹
0.10	0.31	8.8
0.31	0.71	74
0.71	1.11	47
1.11	1.71	71

Hole

TRL04

0.00 mBGL

Remarks:

[illegible]

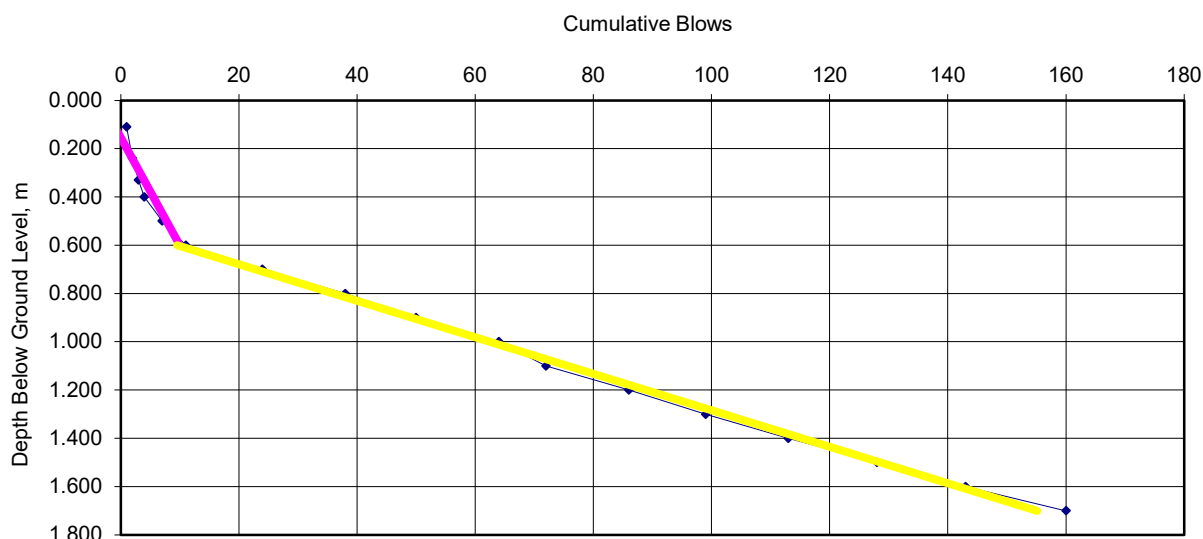
Top, mBGL	Base, mBGL	CBR, % ¹
0.00	0.21	4.5
0.21	0.51	31
0.51	0.81	10
0.81	1.68	29

Hole

TRL05

0.00 mBGL

Remarks:

[illegible]

Top, mBGL	Base, mBGL	CBR, % ¹
0.11	0.60	5.4
0.60	1.70	35

Hole

TRL06

Soakaway Test

Trial Pit No: SAN01

Test No: 1

Date: 07/05/2024

Length (m): 0.30

Datum height: 0.00

m agl

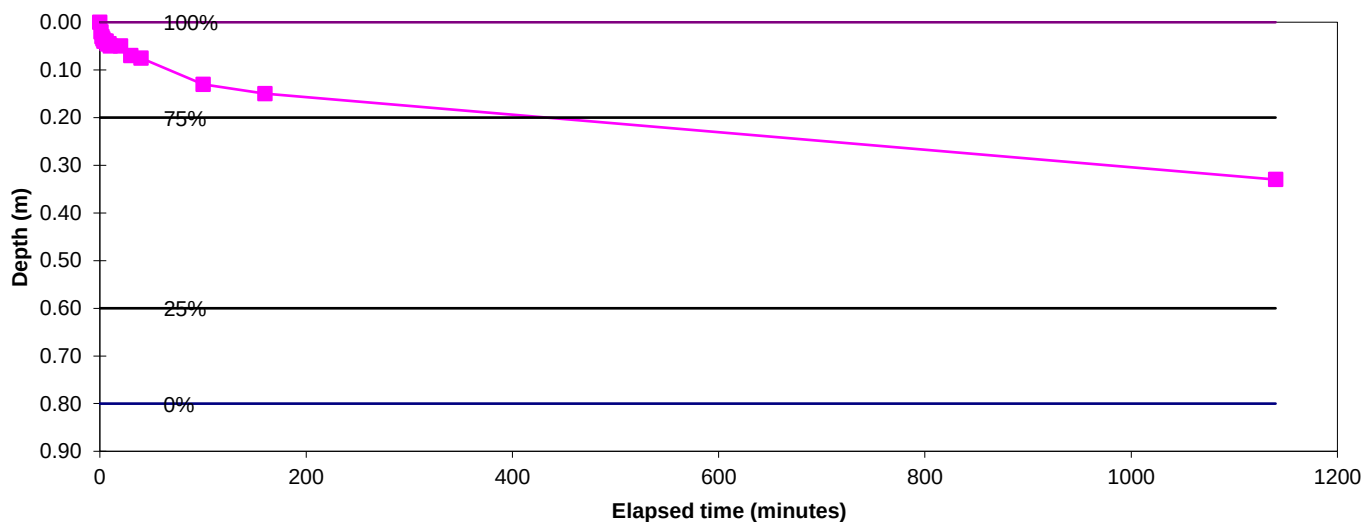
Width (m): 0.30

Granular infill: Yes

Depth (m): 0.80

Porosity of infill: 0.5

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.00	100	0.13
1	0.02	160	0.15
2	0.03	1140	0.33
3	0.04		
4	0.04		
5	0.04		
6	0.04		
7	0.05		
8	0.05		
9	0.05		
10	0.05		
20	0.05		
30	0.07		
40	0.08		



Start water depth for analysis (mbgl): 0.00

75% effective depth (mbgl): 0.20

Elapsed time (mins): 432.2

50% effective depth (mbgl): 0.40

25% effective depth (mbgl): 0.60

Base of soakage zone (mbgl): 0.80

Volume outflow between 75% and 25% effective depth (m³):

Mean surface area of outflow (m²): 0.57

(side area at 50% effective depth + base area)

Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate:

Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.

Remarks Results processed following BRE DG 365 (2016).

Test terminated after 19 hours. Pit dimensions not in accordance with BRE DG 365 (2016) due to access constraints on site.

Testing: CB and SA
Checked: MW
Approved: MW

Notes:

Project

Nant Y Cafn Industrial Units

Project No.

H3091-23_N

Carried out for

Neath & Port Talbot County Council

Figure

SKWY/SAN01/1

Soakaway Test

Trial Pit No: SAN02

Test No: 1

Date: 07/05/2024

Length (m): 0.30

Datum height: 0.00

m agl

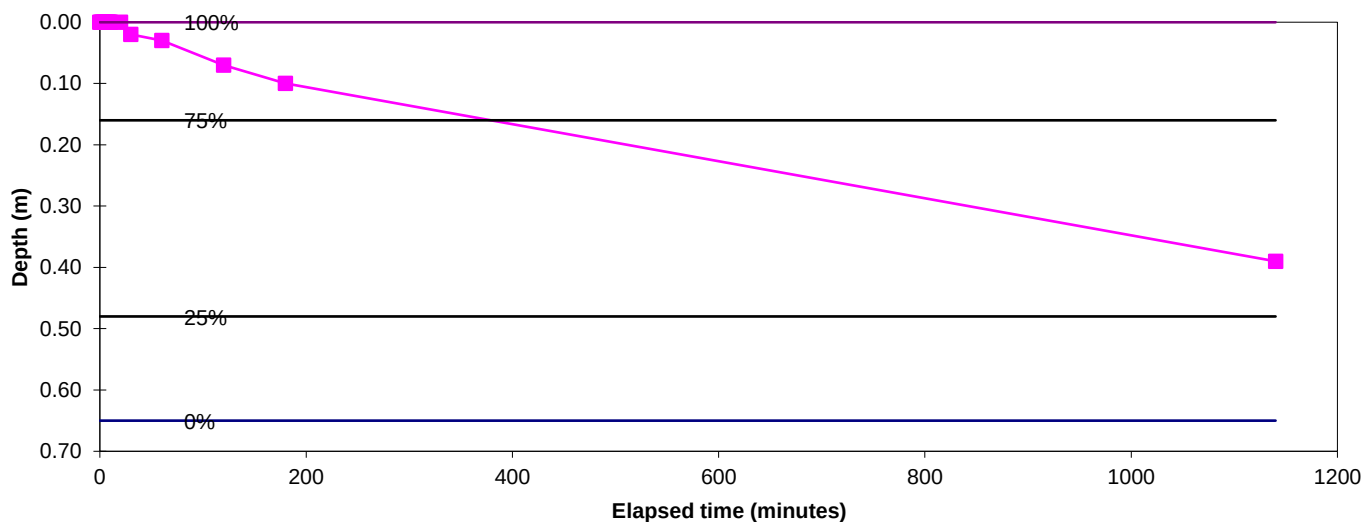
Width (m): 0.30

Granular infill: Yes

Depth (m): 0.65

Porosity of infill: 0.5

Elapsed time (minutes)	Water Depth (mbgl)	Elapsed time (minutes)	Water Depth (mbgl)
0	0.00	120	0.07
1	0.00	180	0.10
2	0.00	1140	0.39
3	0.00		
4	0.00		
5	0.00		
6	0.00		
7	0.00		
8	0.00		
9	0.00		
10	0.00		
20	0.00		
30	0.02		
60	0.03		



Start water depth for analysis (mbgl): 0.00

75% effective depth (mbgl): 0.16

Elapsed time (mins): 378.6

50% effective depth (mbgl): 0.32

25% effective depth (mbgl): 0.48

Base of soakage zone (mbgl): 0.65

Volume outflow between 75% and 25% effective depth (m³):

Mean surface area of outflow (m²): 0.49

(side area at 50% effective depth + base area)

Time for outflow between 75% and 25% effective depth (mins):

Soil infiltration rate:

Unable to reliably determine soil infiltration rate as 25% effective depth not achieved.

Remarks Results processed following BRE DG 365 (2016).

Test terminated after 19 hours. Pit dimensions not in accordance with BRE DG 365 (2016) due to access constraints on site.

Testing: CB and SA
Checked: MW
Approved: MW

Notes:

Project

Nant Y Cafn Industrial Units

Project No.

H3091-23_N

Carried out for

Neath & Port Talbot County Council

Figure

SKWY/SAN02/1



APPENDIX D

INSTRUMENTATION AND MONITORING

Monitoring Installations Summary

Table D1

Groundwater Monitoring

Table D2

Gas Monitoring

Table D3

Groundwater Elevation

Figure C4

Monitoring Installations Summary

Instrument Reference	Instrument Type (See Notes)	Installation Date, dd/mm/yyyy	Pipe Diameter, mm	Instrument Base, mbgl	Response Zone Range, mbgl	Pipe Top Details	Headworks	Remarks
BHN01 (1)	SP	13/12/2023	50	2.30	1.50 to 2.30	Gas tap	Flush cover	
WSN01 (1)	SP	13/12/2023	50	2.00	1.00 to 2.00	Gas tap	Flush cover	
WSN03 (1)	SP	13/12/2023	50	1.20	0.50 to 1.20	Gas tap	Flush cover	

Groundwater Monitoring



Instrument Reference	Instrument Type	Instrument Base, mbgl	Date Time dd/mm/yyyy hh:mm:ss	Result (mbgl)	Result (mOD)	Comments
BHN01 (1)	SP	2.30	05/01/2024 08:53:30	1.37	135.90	
BHN01 (1)	SP	2.30	12/01/2024 11:50:00	1.68	135.59	
BHN01 (1)	SP	2.30	24/01/2024 10:00:00	1.42	135.85	Headworks flooded, insufficient recharge for water sampling
BHN01 (1)	SP	2.30	12/02/2024 11:50:00	1.23	136.04	Headworks flooded
BHN01 (1)	SP	2.30	29/02/2024 10:55:00	0.91	136.36	Headworks flooded
BHN01 (1)	SP	2.30	06/03/2024 11:35:00	1.51	135.76	
BHN01 (1)	SP	2.30	13/03/2024 11:14:00	1.40	135.87	
BHN01 (1)	SP	2.30	20/03/2024 09:35:00	1.24	136.03	
WSN01 (1)	SP	2.00	05/01/2024 10:08:30	1.05	135.81	
WSN01 (1)	SP	2.00	12/01/2024 11:30:00	1.00	135.86	
WSN01 (1)	SP	2.00	24/01/2024 10:13:00	0.68	136.18	
WSN01 (1)	SP	2.00	12/02/2024 11:30:00	0.73	136.13	Headworks flooded
WSN01 (1)	SP	2.00	29/02/2024 10:45:00	0.30	136.56	
WSN01 (1)	SP	2.00	06/03/2024 11:02:30	0.70	136.16	
WSN01 (1)	SP	2.00	13/03/2024 10:57:30	0.63	136.23	
WSN01 (1)	SP	2.00	20/03/2024 09:40:00	0.57	136.29	
WSN03 (1)	SP	1.20	05/01/2024 09:12:30	0.11	137.57	
WSN03 (1)	SP	1.20	12/01/2024 11:40:00	0.10	137.58	
WSN03 (1)	SP	1.20	24/01/2024 10:15:00	0.53	137.15	Headworks flooded, insufficient for water sampling
WSN03 (1)	SP	1.20	12/02/2024 11:40:00	0.05	137.63	Headworks flooded
WSN03 (1)	SP	1.20	29/02/2024 10:50:00	0.00	137.68	Headworks flooded
WSN03 (1)	SP	1.20	06/03/2024 11:00:00	0.00	137.68	Headworks flooded
WSN03 (1)	SP	1.20	13/03/2024 11:25:00	0.00	137.68	Headworks flooded
WSN03 (1)	SP	1.20	20/03/2024 00:00:00	0.00	137.68	Headworks flooded

Notes: Type: SP - Standpipe, SPIE - Standpipe Piezometer, HPIE - Hydraulic Piezometer, PPIE - Pneumatic Piezometer, EPIE - Vibrating Wire Piezometer, PWEL - Pumping Well



Project	Nant Y Cafn Industrial Units
Project No.	H3091-23_N
Carried out for	Neath & Port Talbot County Council

D2

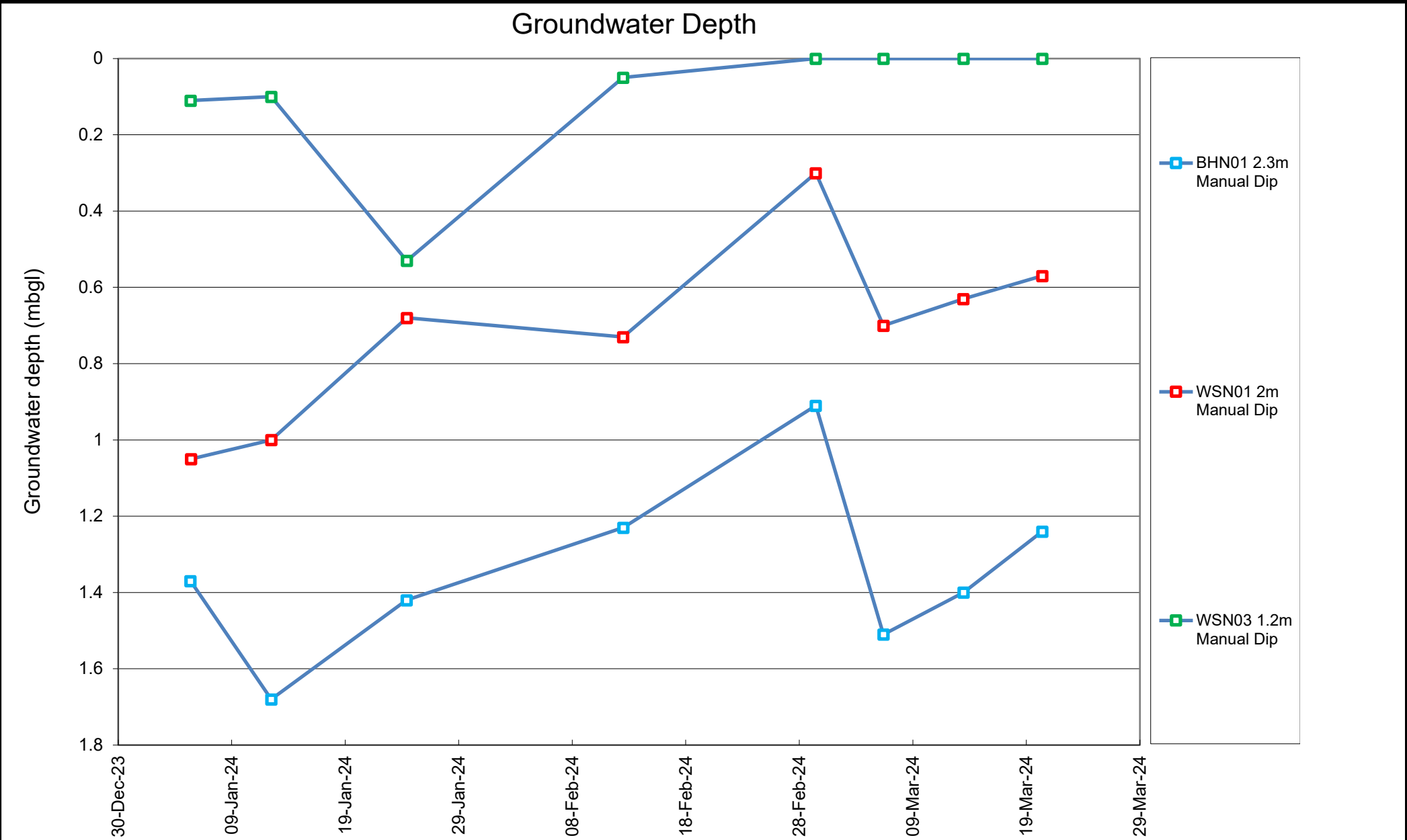
Gas Monitoring Summary



Notes: Peak gas concentrations, flow rates and differential pressures represent the interpreted highest values (or lowest gas concentration value for oxygen) recorded during the monitoring period. Steady state values are taken as the end of monitoring values. Values below the limit of detection (LoD) of the monitoring equipment are recorded as the LoD value preceded by '<' (eg <0.1).				Project Nant Y Cafn Industrial Units Project No. H3091-23_N Carried out for Neath & Port Talbot County Council						D3	
---	--	--	--	---	--	--	--	--	--	-----------	--

Location	Date	Air Temp, °C	Baro Press, mbar	Gas Flow Rate (pk), l/hr	Gas Flow Rate (st), l/hr	CH4 (pk), %vol	CH4 (st), %vol	CO2 (pk), %vol	CO2 (st), %vol	O2 (min), %vol	O2 (st), %vol
BHN01 (1)											
	05 Jan 2024	-1	1017	4.1	0.3	<0.1	<0.1	3.4	3.4	17.9	17.9
	06 Mar 2024	10	1004			<0.1	<0.1	0.2	0.1	20.5	21.4
	13 Mar 2024	10	991	<0.1	0.1	0.1	<0.1	0.1	0.1	21.2	21.8
WSN01 (1)											
	05 Jan 2024	-1	1017	<0.1		<0.1		0.4		18.5	
	24 Jan 2024	10	1011			<0.1	<0.1	0.1	0.1	20.9	21
	06 Mar 2024	10	1004	0.1	0.1	0.7	0.6	0.2	0.2	20.7	20.7
	13 Mar 2024	10	991			0.6	0.6	<0.1	<0.1	19.5	19.7
WSN03 (1)											
	05 Jan 2024	-1	1017	-0.2		<0.1		0.4		20.6	

Groundwater Monitoring Results - Depth





SOCOTEC

APPENDIX E

GEOTECHNICAL LABORATORY TEST RESULTS

Index Properties – Summary of Results

INDX (1 Sheet)

Particle Size Distribution Analyses

PSD (3 sheet)

Certificate of Analysis – Chemical Tests (pH and Sulphate
Contents)

24-00747

INDEX PROPERTIES - SUMMARY OF RESULTS

Hole No.	Sample				Soil Description	p	p_d	W	< 425 μm sieve	W_L	W_P	I_P	p_s	Remarks
	No.	Depth (m)		type										
		from	to			Mg/m ³	%	%	%	%		Mg/m ³		
BHN01	6	1.20		D	Brown slightly gravelly silty CLAY.			27.4*	93 h*	55 a*	29*	26* ▲		
WSN01	8	2.00	3.00	B	Brownish grey slightly gravelly silty CLAY. Gravel is mudstone.			16.9*	27 s*	32 a*	20*	12* ▲		
WSN03	3	0.70	1.20	B	Brown silty CLAY with occasional rootlets.			32.4*	79 h*	47 a*	31*	16* ▲		
WSN03	6	1.20		D	Brown silty CLAY.			32.3*	91 h*	48 a*	31*	17* ▲		
WSN04	4	1.20		D	Dark greyish brown slightly gravelly silty CLAY.			24.4*	32 h*	33 a*	22*	11* ▲		

General notes:

All above tests carried out to BS1377 : 1990 unless annotated otherwise. Cone type used 80g / 30 degrees. See Remarks for further details

Key : ρ bulk density, linear

ρ_d dry density

w moisture content

* test carried out to BS EN ISO 17892

W_L Liquid limit

a 4 point cone test

b 1 point cone test

▲ Water content increased

W_P Plastic limit

NP non - plastic

I_P Plasticity Index

▼ Water content decreased

<425um preparation

n from natural soil

s sieved specimen

h removed by hand

ρ_s particle density

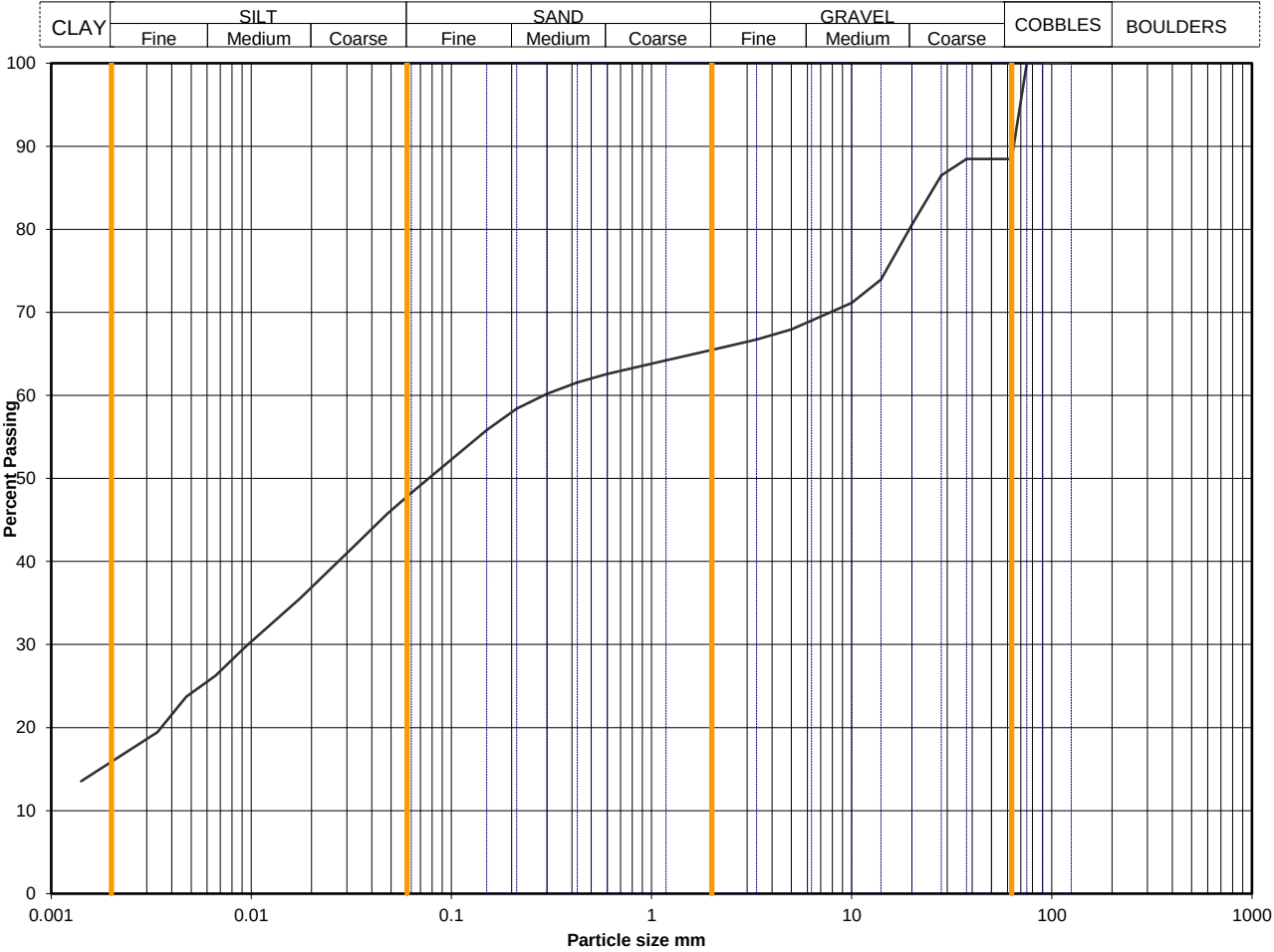
-g = gas jar

-p = small pycnometer

QA Ref SLR 1 Rev 2.96 Mar 17	 SOCOTEC	Project No	H3091-23_N	Figure INDX
		Project Name	Nant Y Cafn Industrial Units	
		The results reported relate only to the samples tested; opinions and interpretations expressed herein are outside the scope of UKAS accreditation. © Copyright 2017 SOCOTEC UK Limited		

Particle Size Distribution Analysis

Sample Details:	SAMPLE ID:	Hole No	BHN01
	#6601401798700004	Sample Depth (m BGL)	0.50 - 1.00
		Sample Type and No	B4
		Specimen Ref	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	48
90	100	0.0477	46
75	100	0.0342	42
63	88	0.0245	39
50	88	0.0175	36
37.5	88	0.0093	30
28	86	0.0066	26
20	81	0.0047	24
14	74	0.0034	19
10	71	0.0014	14
6.3	69		
5	68		
3.35	67		
2	65		
1.18	64	Particle density, Mg/m3 2.65 assumed	
0.6	63		
0.425	62	Dry mass of sample, kg 5.1	
0.3	60		
0.212	58		
0.15	56		
0.063	48		

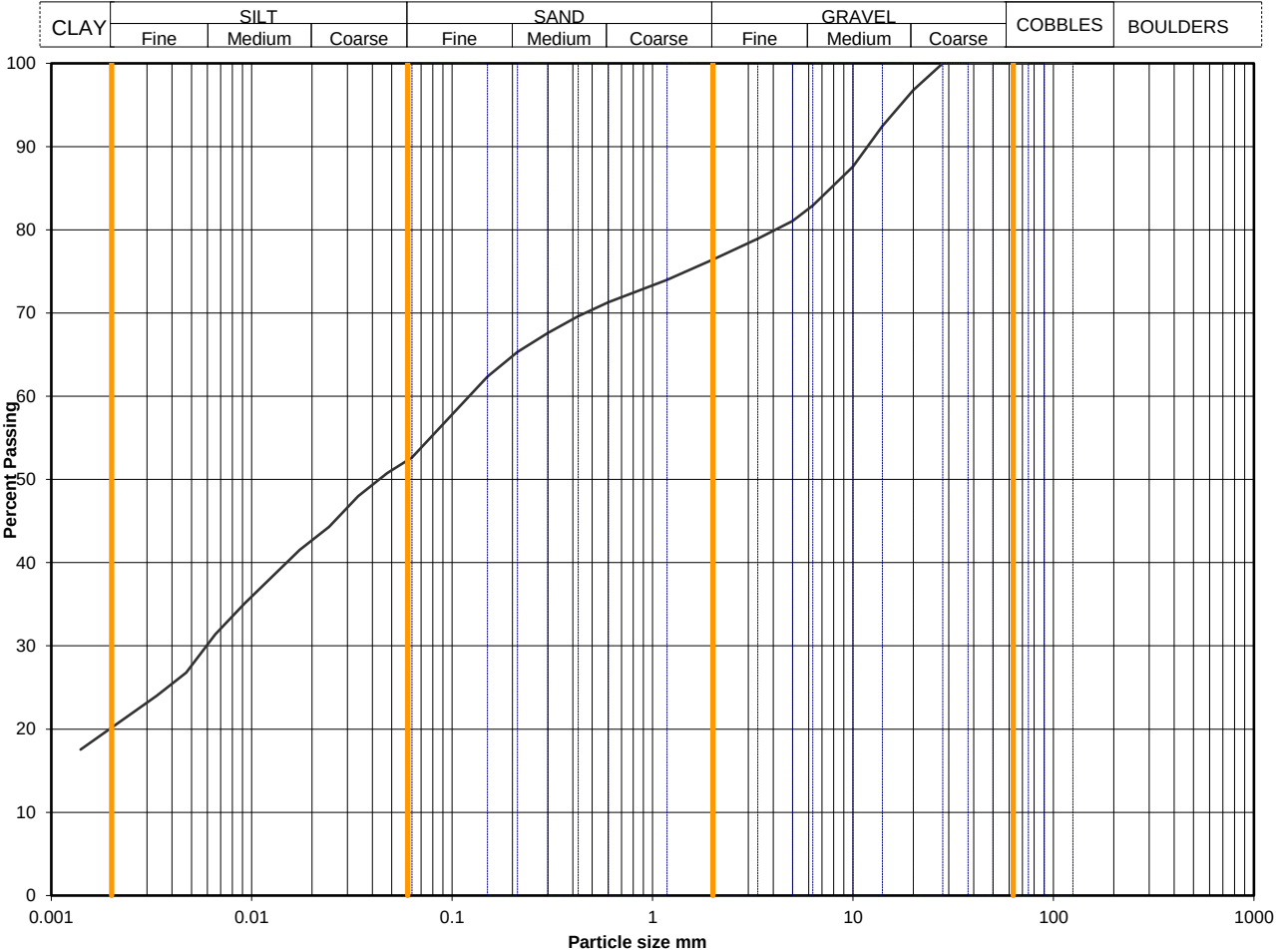
Soil description	Brown slightly sandy slightly gravelly CLAY with medium cobble content.
Preparation / Pretreatment	Sieve: pre dried, Hydro: as BS EN ISO 17892
Remarks	

Sample Proportions	Cobbles / boulders	Whole	*<63mm
		12	0
		23	26
		17	19
		32	37
		16	18
*<63mm values to aid description only			

Uniformity Coefficient		D60 / D10	Not applicable
Test Method	BS EN ISO 17892-4		
	Sieving	5.2	wet sieve
	Sedimentation	5.3	hydrometer

Particle Size Distribution Analysis

Sample Details:	SAMPLE ID:	Hole No	BHN01
	#6601401798700007	Sample Depth (m BGL)	1.50 - 2.00
		Sample Type and No	B7
		Specimen Ref	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	53
90	100	0.0475	51
75	100	0.0339	48
63	100	0.0243	44
50	100	0.0174	42
37.5	100	0.0092	35
28	100	0.0066	31
20	97	0.0047	27
14	92	0.0034	24
10	88	0.0014	18
6.3	83		
5	81		
3.35	79		
2	76		
1.18	74	Particle density, Mg/m3 2.65 assumed	
0.6	71		
0.425	70	Dry mass of sample, kg 0.8	
0.3	68		
0.212	65		
0.15	62		
0.063	53		

Soil description	Brown slightly sandy slightly gravelly CLAY.
Preparation / Pretreatment	Sieve: pre dried, Hydro: as BS EN ISO 17892
Remarks	

Sample Proportions	Cobbles / boulders	Whole	*<63mm
		0	0
*<63mm values to aid description only	Gravel	24	24
	Sand	24	24
	Silt	33	33
	Clay	20	20

Uniformity Coefficient		D60 / D10	Not applicable
Test Method	BS EN ISO 17892-4		
	Sieving	5.2	wet sieve
	Sedimentation	5.3	hydrometer

QA Ref
SLR 2,9
Rev 2.23
Jul 17



Project No H3091-23_N
Project Name Nant Y Cafn Industrial Units

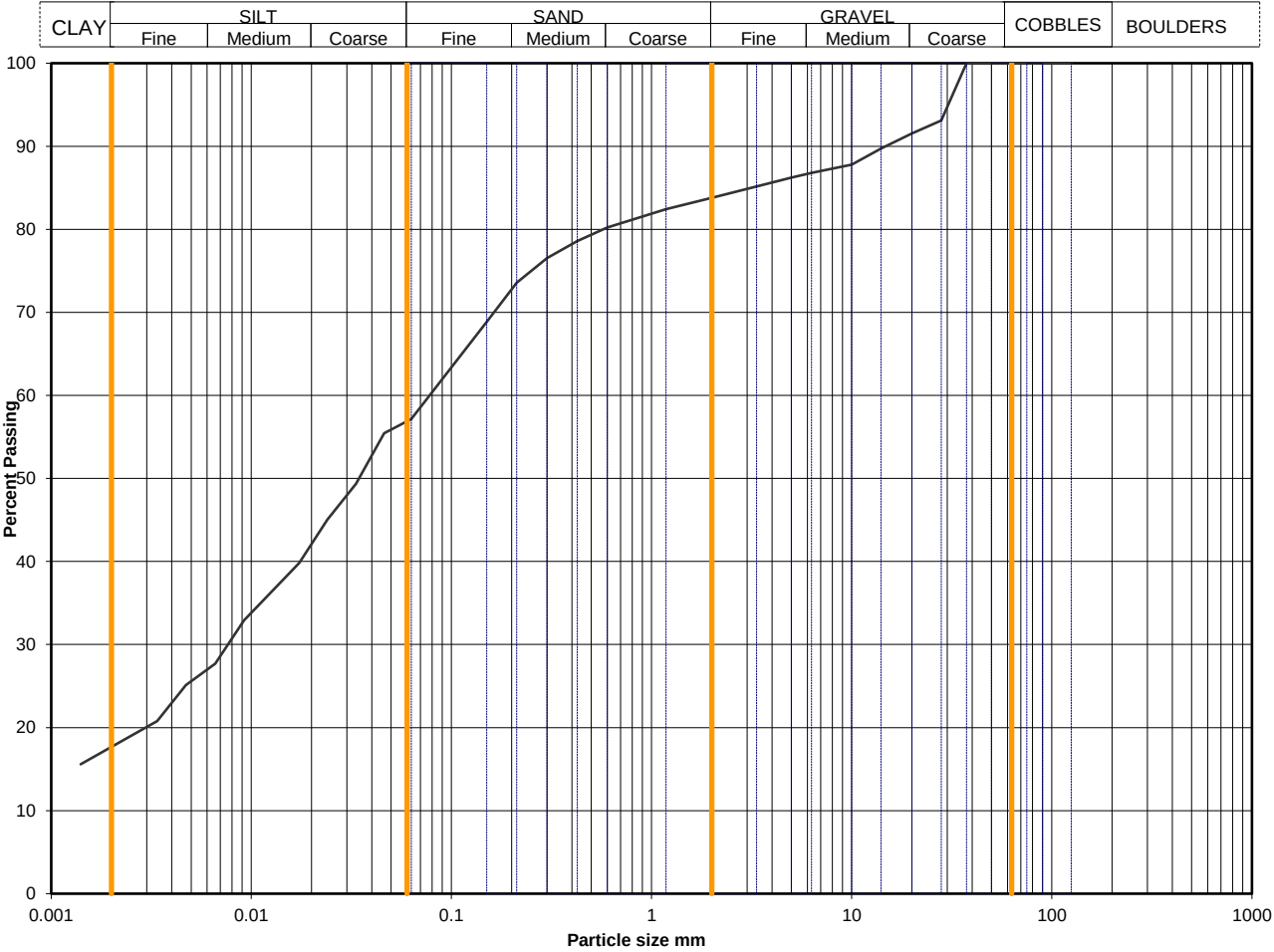
Figure
PSD

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Particle Size Distribution Analysis

Sample Details:	SAMPLE ID:	Hole No	WSN03
	#0166094391680003	Sample Depth (m BGL)	0.70 - 1.20
		Sample Type and No	B3
		Specimen Ref	



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	57
90	100	0.0460	55
75	100	0.0334	49
63	100	0.0240	45
50	100	0.0173	40
37.5	100	0.0092	33
28	93	0.0066	28
20	92	0.0047	25
14	90	0.0034	21
10	88	0.0014	16
6.3	87		
5	86		
3.35	85		
2	84		
1.18	82	Particle density, Mg/m3	
0.6	80		
0.425	79	2.65 assumed	
0.3	77	Dry mass of sample, kg	
0.212	74		
0.15	69		
0.063	57		
		2.4	

Soil description	Brown silty CLAY with occasional rootlets.
Preparation / Pretreatment	Sieve: pre dried, Hydro: as BS EN ISO 17892
Remarks	

Sample Proportions	Cobbles / boulders	Whole	*<63mm
		0	0
*<63mm values to aid description only	Gravel	16	16
	Sand	27	27
	Silt	40	40
	Clay	18	18

Uniformity Coefficient		D60 / D10	Not applicable
Test Method	BS EN ISO 17892-4		
	Sieving	5.2	wet sieve
	Sedimentation	5.3	hydrometer

QA Ref
SLR 2,9
Rev 2.23
Jul 17



Project No H3091-23_N
Project Name Nant Y Cafn Industrial Units

Figure
PSD

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Certificate of Analysis

Certificate Number 24-00747

Issued: 17-Jan-24

Client SOCOTEC UK Ltd
INFRASTRUCTURE SERVICES
Unit 15
Crosby Yard
Wildmill
Bridgend
CF31 1JZ

Our Reference 24-00747

Client Reference H3091-23_N

Order No H/5895

Contract Title Nanr Y Cafn Industrial Units

Description 4 Soil samples.

Date Received 15-Jan-24

Date Started 15-Jan-24

Date Completed 17-Jan-24

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

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

A handwritten signature in black ink, appearing to read "K. Bridgewood".

Kirk Bridgewood
General Manager



Summary of Chemical Analysis

Soil Samples

Our Ref 24-00747

Client Ref H3091-23_N

Contract Title Nanr Y Cafn Industrial Units

Lab No	2286257	2286258	2286259	2286260
Sample ID	BHN01	BHN01	WSN01	WSN03
Depth	1.20	2.30	2.00	0.70
Other ID	5	9	8	3
Sample Type	D	D	B	B
Sampling Date	n/s	n/s	n/s	n/s
Sampling Time	1059	1319	1403	1040

Test	Method	LOD	Units				
Inorganics							
pH	DETSC 2008#		pH	7.4	7.6	6.0	5.8
Sulphate Aqueous Extract as SO ₄ (2:1)	DETSC 2076#	10	mg/l	14	19	< 10	20
Sulphur as S, Total	DETSC 2320	0.01	%	< 0.01	< 0.01	< 0.01	0.04
Sulphate as SO ₄ , Total	DETSC 2321#	0.01	%	0.03	0.01	0.02	0.05

Information in Support of the Analytical Results

Our Ref 24-00747
 Client Ref H3091-23_N
 Contract Nanr Y Cafn Industrial Units

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2286257	BHN01 1.20 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), Metals ICP Prep (182 days), pH + Conductivity (7 days)	
2286258	BHN01 2.30 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), Metals ICP Prep (182 days), pH + Conductivity (7 days)	
2286259	WSN01 2.00 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), Metals ICP Prep (182 days), pH + Conductivity (7 days)	
2286260	WSN03 0.70 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), Metals ICP Prep (182 days), pH + Conductivity (7 days)	

Key: P-Plastic T-Tub

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

Soil Analysis Notes

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

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

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

Disposal

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

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

End of Report



SOCOTEC

APPENDIX F
GEOENVIRONMENTAL LABORATORY TEST RESULTS

Certificate of Analysis – (Soil)	23122152
Certificate of Analysis – (Water)	24012842

Certificate of Analysis

Client: SOCOTEC Geotechnical

Project: 23122152

Quote: BEC231132559 V1.1

Project Ref: H3091-23-N

Site: Nant y cafn

Contact: Amelia Jones

Address: Unit 15, Crosby Yard
Wildmill
Bridgend
Mid Glamorgan
CF31 1JZ

E-Mail: Amelia.Jones@socotec.com

Phone: 07810 180295

No. Samples Received: 6

Date Received: 19/12/2023

Analysis Date: 10/01/2024

Date Issued: 10/01/2024

Report Type: Final Version 01

This report supersedes any versions previously issued by the laboratory



Reported by Customer Service Co-Ordinator
Samantha Edwards



Client: SOCOTEC Geotechnical
Project Name: H3091-23-N-Nant y cafn
Project No: 23122152
Date Issued: 10/01/2024

Samples Analysed

<u>Text ID</u>	<u>Sample Reference</u>	<u>Sampling Date</u>	<u>Sample Type</u>	<u>Sample Description</u>
23122152-001	WSN01-2-ES-0.20	13/12/2023 18:48:00	SOLID	Soil Sample
23122152-002	WSN02-2-ES-0.20	13/12/2023 18:48:00	SOLID	Soil Sample
23122152-003	WSN03-2-ES-0.30	13/12/2023 18:48:00	SOLID	Soil Sample
23122152-004	WSN04-2-ES-0.20	13/12/2023 18:48:00	SOLID	Soil Sample
23122152-005	WSN04-5-ES-1.20	13/12/2023 18:48:00	SOLID	Soil Sample
23122152-006	BHN01-3-ES-0.40	13/12/2023 18:48:00	SOLID	Soil Sample



Client: SOCOTEC Geotechnical
 Project Name: H3091-23-N-Nant y cafn
 Project No: 23122152
 Date Issued: 10/01/2024



Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	001	002	003	004	005	006
					Customer ID	WSN01-2-ES-0.20	WSN02-2-ES-0.20	WSN03-2-ES-0.30	WSN04-2-ES-0.20	WSN04-5-ES-1.20	BHN01-3-ES-0.40
					Sample Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
					Sampling Date	13/12/2023	13/12/2023	13/12/2023	13/12/2023	13/12/2023	13/12/2023
>C6-C7 Aliphatic HS_1D_AL	GROHSA/BTEXHSA	0.2	mg/kg^	UM		<0.254	<0.239	<0.236	<0.264	<0.310	<0.239
>C7-C8 Aliphatic HS_1D_AL	GROHSA/BTEXHSA	0.2	mg/kg^	UM		<0.254	<0.239	<0.236	<0.264	<0.310	<0.239
>C7-C8 Aromatic HS_1D_AR	GROHSA/BTEXHSA	0.01	mg/kg^	UM		<0.013	<0.012	<0.012	<0.013	<0.016	<0.012
>C8-C10 Aliphatic HS_1D_AL	GROHSA/BTEXHSA	0.2	mg/kg^	UM		<0.254	<0.239	<0.236	<0.264	<0.31	<0.239
>C8-C10 Aromatic HS_1D_AR	GROHSA/BTEXHSA	0.04	mg/kg^	UM		<0.051	<0.048	<0.048	<0.053	0.066	<0.048
C5-C6 Aliphatic HS_1D_AL	GROHSA/BTEXHSA	0.2	mg/kg^	UM		<0.254	<0.239	<0.236	<0.264	<0.310	<0.239
C5-C7 Aromatic HS_1D_AR	GROHSA/BTEXHSA	0.01	mg/kg^	UM		<0.013	<0.012	<0.012	<0.013	<0.016	<0.012
Total GRO C5-C10 HS_1D_Total	GROHSA/BTEXHSA	0.2	mg/kg^	UM		<0.254	<0.239	<0.236	<0.264	<0.310	<0.239
pH (2.5:1 extraction)	PHSOIL	1	pH units	UM		7.4	7.8	6.8	6.9	4.1	7.0
Total Cyanide	SFAPI	0.5	mg/kg^	UM		<0.6	<0.6	<0.6	<0.7	<0.8	<0.6
Soil Organic Matter	WSLM59	0.04	% m/m^	U		5.84	3.71	3.69	4.27	7.38	4.62
Arsenic as As	ICPMSS	0.3	mg/kg^	UM		26.9	24.2	12.1	3.3	14.6	10.7
Cadmium as Cd	ICPMSS	0.2	mg/kg^	UM		0.5	0.2	0.2	<0.2	0.4	0.2
Copper as Cu	ICPMSS	1.6	mg/kg^	UM		36.8	144.2	791.5	6.1	22.6	23.9
Lead as Pb	ICPMSS	0.7	mg/kg^	UM		34.1	41.3	28.0	3.7	24.1	14.1
Mercury as Hg	ICPMSS	0.5	mg/kg^	UM		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel as Ni	ICPMSS	2	mg/kg^	UM		26.8	57.7	20.8	4.3	32.2	29.2
Total Chromium as Cr	ICPMSS	1.2	mg/kg^	UM		18.0	22.7	11.9	1.4	67.8	14.2
Zinc as Zn	ICPMSS	16	mg/kg^	UM		67.5	42.4	48.8	<16.0	90.6	57.9

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	001	002	003	004	005	006
					Customer ID	WSN01-2-ES-0.20	WSN02-2-ES-0.20	WSN03-2-ES-0.30	WSN04-2-ES-0.20	WSN04-5-ES-1.20	BHN01-3-ES-0.40
					Sample Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
					Sampling Date	13/12/2023	13/12/2023	13/12/2023	13/12/2023	13/12/2023	13/12/2023
Boron as B	ICPSOIL	10	mg/kg^	N		19	17	<10	17	16	<10
Water Soluble Sulphate as SO4 by Mass	ICPWSS	20	mg/kg^	UM		49	207	37	32	49	29
Benzene HS_1D_AR	BTEXHSA	10	µg/kg^	UM		<13	<12	<12	<13	<16	<12
Ethylbenzene HS_1D_AR	BTEXHSA	10	µg/kg^	UM		<13	<12	<12	<13	<16	<12
m/p-Xylene HS_1D_AR	BTEXHSA	20	µg/kg^	UM		<25	<24	<24	<26	<31	<24
o-Xylene HS_1D_AR	BTEXHSA	10	µg/kg^	UM		<13	<12	<12	<13	19	<12
Toluene HS_1D_AR	BTEXHSA	10	µg/kg^	UM		<13	<12	<12	<13	<16	<12
Acenaphthene	PAHMSUS	0.08	mg/kg^	UM		<0.10	<0.10	<0.09 c	<0.11	<0.12	<0.10
Acenaphthylene	PAHMSUS	0.08	mg/kg^	U		<0.10	<0.10	<0.09 c	<0.11	<0.12	<0.10
Anthracene	PAHMSUS	0.08	mg/kg^	U		<0.10	<0.10	<0.09 c	<0.11	<0.12	<0.10
Benzo[a]anthracene	PAHMSUS	0.08	mg/kg^	UM		0.27	0.32	<0.09 c	<0.11	<0.12	0.14
Benzo[a]pyrene	PAHMSUS	0.08	mg/kg^	UM		0.21	0.22	<0.09 c	<0.11	<0.12	0.15
Benzo[b]fluoranthene	PAHMSUS	0.08	mg/kg^	UM		0.35	0.36	<0.09 c	<0.11	<0.12	0.25
Benzo[g,h,i]perylene	PAHMSUS	0.08	mg/kg^	UM		0.11	0.10	<0.09 c	<0.11	<0.12	<0.10
Benzo[k]fluoranthene	PAHMSUS	0.08	mg/kg^	UM		0.14	0.16	<0.09 c	<0.11	<0.12	<0.10
Chrysene	PAHMSUS	0.08	mg/kg^	UM		0.26	0.31	<0.09 c	<0.11	<0.12	0.19
Dibenzo[a,h]anthracene	PAHMSUS	0.08	mg/kg^	UM		<0.10	<0.10	<0.09 c	<0.11	<0.12	<0.10
Fluoranthene	PAHMSUS	0.08	mg/kg^	UM		0.70	0.85	<0.09 c	<0.11	<0.12	0.39
Fluorene	PAHMSUS	0.08	mg/kg^	UM		<0.10	<0.10	<0.09 c	<0.11	<0.12	<0.10

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	001	002	003	004	005	006
					Customer ID	WSN01-2-ES-0.20	WSN02-2-ES-0.20	WSN03-2-ES-0.30	WSN04-2-ES-0.20	WSN04-5-ES-1.20	BHN01-3-ES-0.40
					Sample Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
					Sampling Date	13/12/2023	13/12/2023	13/12/2023	13/12/2023	13/12/2023	13/12/2023
Indeno[1,2,3-cd]pyrene	PAHMSUS	0.08	mg/kg [^]	UM		0.12	0.12	<0.09 c	<0.11	<0.12	<0.10
Naphthalene	PAHMSUS	0.08	mg/kg [^]	UM		<0.10	<0.10	<0.09 c	<0.11	<0.12	<0.10
Phenanthrene	PAHMSUS	0.08	mg/kg [^]	UM		0.30	0.23	<0.09 c	<0.11	<0.12	0.24
Pyrene	PAHMSUS	0.08	mg/kg [^]	UM		0.50	0.60	<0.09 c	<0.11	<0.12	0.33
Total PAH 16	PAHMSUS	1.28	mg/kg [^]	U		3.56	3.85	<1.51 c	<1.69	<1.98	2.54
Dimethylphenols	PHEHPLCUV	0.1	mg/kg [^]	U		<0.13	<0.11	<0.11	<0.13	<0.14	0.51
Methylphenols	PHEHPLCUV	0.1	mg/kg [^]	U		<0.13	<0.11	0.13	0.20	0.20	0.14
Phenol	PHEHPLCUV	0.1	mg/kg [^]	UM		0.31	<0.11	0.13	<0.13	<0.14	0.39
Total Phenols	PHEHPLCUV	0.4	mg/kg [^]	U		0.68	<0.45	0.49	0.58	0.62	1.31
Trimethylphenols	PHEHPLCUV	0.1	mg/kg [^]	U		<0.13	<0.11	<0.11	<0.13	<0.14	0.26
>C10-C12 (Aliphatic) EH_CU_1D_AL	TPHFIDUS (Aliphatic)	4	mg/kg [^]	U		<5.09	<4.78	<4.72	<5.27	<6.19	<4.77
>C12-C16 (Aliphatic) EH_CU_1D_AL	TPHFIDUS (Aliphatic)	4	mg/kg [^]	U		<5.09	<4.78	<4.72	<5.27	7.35	6.31
>C16-C21 (Aliphatic) EH_CU_1D_AL	TPHFIDUS (Aliphatic)	4	mg/kg [^]	U		5.24	<4.78	<4.72	<5.27	7.47	7.95
>C21-C35 (Aliphatic) EH_CU_1D_AL	TPHFIDUS (Aliphatic)	10	mg/kg [^]	U		<12.7	<11.9	<11.8	<13.2	<15.5	27.3
Total TPH >C8-C40 (Aliphatic) EH_CU_1D_AL	TPHFIDUS (Aliphatic)	20	mg/kg [^]	U		<25.4	<23.9	<23.6	<26.4	47.6	58.9
>C10-C12 (Aromatic) EH_CU_1D_AR	TPHFIDUS (Aromatic)	4	mg/kg [^]	U		<5.09	<4.78	<4.72	<5.27	<6.19	<4.77
>C12-C16 (Aromatic) EH_CU_1D_AR	TPHFIDUS (Aromatic)	4	mg/kg [^]	U		<5.09	<4.78	6.86	<5.27	<6.19	4.92
>C16-C21 (Aromatic) EH_CU_1D_AR	TPHFIDUS (Aromatic)	4	mg/kg [^]	U		<5.09	<4.78	8.19	6.06	28.9	7.34
>C21-C35 (Aromatic) EH_CU_1D_AR	TPHFIDUS (Aromatic)	10	mg/kg [^]	U		<12.7	29.8	27.1	16.0	565	34.2

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	001	002	003	004	005	006
					Customer ID	WSN01-2-ES-0.20	WSN02-2-ES-0.20	WSN03-2-ES-0.30	WSN04-2-ES-0.20	WSN04-5-ES-1.20	BHN01-3-ES-0.40
					Sample Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
					Sampling Date	13/12/2023	13/12/2023	13/12/2023	13/12/2023	13/12/2023	13/12/2023
Total TPH >C8-C40 (Aromatic) EH_CU_1D_AR	TPHFIDUS (Aromatic)	20	mg/kg^	U		<25.4	39.0	49.8	29.3	605	50.4
1,1,1,2-Tetrachloroethane	VOCHSAS	1	µg/kg^	UM		<1	<1	<11 d	<1	<11 c,d	<12 d
1,1,1-Trichloroethane	VOCHSAS	1	µg/kg^	UM		<1	<1	<11 d	<1	<11 c,d	<12 d
1,1,2,2-Tetrachloroethane	VOCHSAS	1	µg/kg^	N		<1	<1	<11 d	<1	<11 c,d	<12 d
1,1,2-Trichloroethane	VOCHSAS	1	µg/kg^	UM		<1	<1	<11 d	<1	<11 c,d	<12 d
1,1-Dichloroethane	VOCHSAS	1	µg/kg^	UM		<1	<1	<11 d	<1	<11 c,d	<12 d
1,1-Dichloroethene	VOCHSAS	1	µg/kg^	U		<1	<1	<11 d	<1	<11 c,d	<12 d
1,1-Dichloropropene	VOCHSAS	1	µg/kg^	UM		<1	<1	<11 d	<1	<11 c,d	<12 d
1,2,3-Trichlorobenzene	VOCHSAS	3	µg/kg^	UM		<4	<4	<32 d	<4	<33 c,d	<36 d
1,2,3-Trichloropropane	VOCHSAS	1	µg/kg^	UM		<1	<1	<11 d	<1	<11 c,d	<12 d
1,2,4-Trichlorobenzene	VOCHSAS	3	µg/kg^	N		<4	<4	<32 d	<4	<33 c,d	<36 d
1,2,4-Trimethylbenzene	VOCHSAS	1	µg/kg^	UM		<1	<1	<11 d	<1	15 c	<12 d
1,2-Dibromo-3-chloropropane	VOCHSAS	1	µg/kg^	U		<1	<1	<11 d	<1	<11 c,d	<12 d
1,2-Dibromoethane	VOCHSAS	1	µg/kg^	UM		<1	<1	<11 d	<1	<11 c,d	<12 d
1,2-Dichlorobenzene	VOCHSAS	1	µg/kg^	UM		<1	<1	<11 d	<1	<11 c,d	<12 d
1,2-Dichloroethane	VOCHSAS	1	µg/kg^	UM		<1	<1	<11 d	<1	<11 c,d	<12 d
1,2-Dichloropropane	VOCHSAS	1	µg/kg^	UM		<1	<1	<11 d	<1	<11 c,d	<12 d
1,3,5-Trimethylbenzene	VOCHSAS	1	µg/kg^	UM		<1	<1	<11 d	<1	12 c	14
1,3-Dichlorobenzene	VOCHSAS	1	µg/kg^	UM		<1	<1	<11 d	<1	<11 c,d	<12 d

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	001	002	003	004	005	006
					Customer ID	WSN01-2-ES-0.20	WSN02-2-ES-0.20	WSN03-2-ES-0.30	WSN04-2-ES-0.20	WSN04-5-ES-1.20	BHN01-3-ES-0.40
					Sample Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
					Sampling Date	13/12/2023	13/12/2023	13/12/2023	13/12/2023	13/12/2023	13/12/2023
1,3-Dichloropropane	VOCHSAS	1	µg/kg [^]	UM		<1	<1	<11 _D	<1	<11 _{C,D}	<12 _D
1,4-Dichlorobenzene	VOCHSAS	1	µg/kg [^]	UM		<1	<1	<11 _D	<1	<11 _{C,D}	<12 _D
2,2-Dichloropropane	VOCHSAS	2	µg/kg [^]	UM		<3	<3	<21 _D	<3	<22 _{C,D}	<24 _D
2-Chlorotoluene	VOCHSAS	1	µg/kg [^]	UM		<1	<1	<11 _D	<1	<11 _{C,D}	<12 _D
4-Chlorotoluene	VOCHSAS	1	µg/kg [^]	UM		<1	<1	<11 _D	<1	<11 _{C,D}	<12 _D
Benzene	VOCHSAS	1	µg/kg [^]	UM		<1	<1	<11 _D	<1	<11 _{C,D}	<12 _D
Bromobenzene	VOCHSAS	1	µg/kg [^]	UM		<1	<1	<11 _D	<1	<11 _{C,D}	<12 _D
Bromochloromethane	VOCHSAS	1	µg/kg [^]	UM		<1	<1	<11 _D	<1	<11 _{C,D}	<12 _D
Bromodichloromethane	VOCHSAS	1	µg/kg [^]	UM		<1	<1	<11 _D	<1	<11 _{C,D}	<12 _D
Bromoform	VOCHSAS	1	µg/kg [^]	UM		<1	<1	<11 _D	<1	<11 _{C,D}	<12 _D
Bromomethane	VOCHSAS	1	µg/kg [^]	UM		<1* _B	<1* _B	<11* _{B,D}	<1* _B	<11* _{B,C,D}	<12* _{B,D}
Carbon Tetrachloride	VOCHSAS	1	µg/kg [^]	UM		<1	<1	<11 _D	<1	<11 _{C,D}	<12 _D
Chlorobenzene	VOCHSAS	1	µg/kg [^]	UM		<1	<1	<11 _D	<1	<11 _{C,D}	<12 _D
Chloroethane	VOCHSAS	2	µg/kg [^]	UM		<3	<3	<21 _D	<3	<22 _{C,D}	<24 _D
Chloroform	VOCHSAS	1	µg/kg [^]	UM		<1	<1	<11 _D	<1	<11 _{C,D}	<12 _D
Chloromethane	VOCHSAS	3	µg/kg [^]	U		<4	<4	<32 _D	<4	<33 _{C,D}	<36 _D
cis 1,2-Dichloroethene	VOCHSAS	5	µg/kg [^]	UM		<7	<7	<54 _D	<7	<55 _{C,D}	<60 _D
cis 1,3-Dichloropropene	VOCHSAS	1	µg/kg [^]	UM		<1	<1	<11 _D	<1	<11 _{C,D}	<12 _D
Dibromochloromethane	VOCHSAS	1	µg/kg [^]	UM		<1	<1	<11 _D	<1	<11 _{C,D}	<12 _D

Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	001	002	003	004	005	006
					Customer ID	WSN01-2-ES-0.20	WSN02-2-ES-0.20	WSN03-2-ES-0.30	WSN04-2-ES-0.20	WSN04-5-ES-1.20	BHN01-3-ES-0.40
					Sample Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
					Sampling Date	13/12/2023	13/12/2023	13/12/2023	13/12/2023	13/12/2023	13/12/2023
Dibromomethane	VOCHSAS	1	µg/kg [^]	UM		<1	<1	<11 _D	<1	<11 _{C,D}	<12 _D
Dichlorodifluoromethane	VOCHSAS	1	µg/kg [^]	N		<1	<1	<11 _D	<1	<11 _{C,D}	<12 _D
Ethylbenzene	VOCHSAS	2	µg/kg [^]	UM		<3	<3	<21 _D	<3	<22 _{C,D}	<24 _D
Hexachlorobutadiene	VOCHSAS	2	µg/kg [^]	N		<3	<3	<21 _D	<3	<22 _{C,D}	<24 _D
iso-Propylbenzene	VOCHSAS	1	µg/kg [^]	UM		<1	<1	<11 _D	<1	<11 _{C,D}	<12 _D
m and p-Xylene	VOCHSAS	4	µg/kg [^]	UM		<5	<5	<43 _D	<5	<44 _{C,D}	<48 _D
MTBE	VOCHSAS	1	µg/kg [^]	UM		<1	<1	<11 _D	<1	<11 _{C,D}	<12 _D
Naphthalene	VOCHSAS	5	µg/kg [^]	UM		<7	<7	<54 _D	<7	<55 _{C,D}	<60 _D
n-Butylbenzene	VOCHSAS	1	µg/kg [^]	U		<1* _B	<1* _B	<11 _D	<1* _B	<11 _{C,D}	<12 _D
o-Xylene	VOCHSAS	2	µg/kg [^]	UM		<3	<3	<21 _D	<3	22 _C	<24 _D
p-Isopropyltoluene	VOCHSAS	1	µg/kg [^]	UM		<1	<1	<11 _D	<1	<11 _{C,D}	<12 _D
Propylbenzene	VOCHSAS	1	µg/kg [^]	UM		<1	<1	<11 _D	<1	<11 _{C,D}	<12 _D
sec-Butylbenzene	VOCHSAS	1	µg/kg [^]	UM		<1	<1	<11 _D	<1	<11 _{C,D}	<12 _D
Styrene	VOCHSAS	1	µg/kg [^]	UM		<1	<1	<11 _D	<1	<11 _{C,D}	<12 _D
tert-Butylbenzene	VOCHSAS	1	µg/kg [^]	UM		<1	<1	<11 _D	<1	<11 _{C,D}	<12 _D
Tetrachloroethene	VOCHSAS	3	µg/kg [^]	UM		<4	<4	<32 _D	<4	<33 _{C,D}	<36 _D
Toluene	VOCHSAS	5	µg/kg [^]	UM		<7	<7	<54 _D	<7	<55 _{C,D}	<60 _D
trans 1,2-Dichloroethene	VOCHSAS	1	µg/kg [^]	UM		<1	<1	<11 _D	<1	<11 _{C,D}	<12 _D
trans 1,3-Dichloropropene	VOCHSAS	1	µg/kg [^]	UM		<1	<1	<11 _D	<1	<11 _{C,D}	<12 _D



Client: SOCOTEC Geotechnical
Project Name: H3091-23-N-Nant y cafn
Project No: 23122152
Date Issued: 10/01/2024



Analysis Results

Analysis	Method Code	MDL	Units	Accred.	Sample ID	001	002	003	004	005	006
					Customer ID	WSN01-2-ES-0.20	WSN02-2-ES-0.20	WSN03-2-ES-0.30	WSN04-2-ES-0.20	WSN04-5-ES-1.20	BHN01-3-ES-0.40
					Sample Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
					Sampling Date	13/12/2023	13/12/2023	13/12/2023	13/12/2023	13/12/2023	13/12/2023
Trichloroethene	VOCHSAS	1	µg/kg^	U		<1	<1	<11 _D	<1	<11 _{C,D}	<12 _D
Trichlorofluoromethane	VOCHSAS	1	µg/kg^	UM		<1	<1	<11 _D	<1	<11 _{C,D}	<12 _D
Vinyl Chloride	VOCHSAS	1	µg/kg^	UM		<1* _B	<1* _B	<11 _D	<1* _B	<11 _{C,D}	<12 _D
Total Moisture at 35°C	CLANDPREP	0.1	%	N		21.4	16.3	15.2	24.1	35.4	16.2
Colour of Material	CLANDPREP		-	N		Brown	Brown	Brown	Brown	Brown	Brown
Major Constituents	CLANDPREP		-	N		SILT	SILT	SILT	SILT	SILT	SILT
Minor Constituents	CLANDPREP		-	N		Clay	Clay	Clay	Clay	Roots	Clay
Miscellaneous Constituents	CLANDPREP		-	N		Organic Matter	Organic Matter	Organic Matter	Organic Matter	Gravel	Organic Matter
Asbestos Identification	SUB020		-	N		NAIIS	NAIIS	NAIIS	NAIIS	NAIIS	NAIIS

CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: SOCOTEC UK Ltd
Environmental Chemistry
PO Box 100
Burton upon Trent
Staffordshire
DE15 0XD

CONTRACT NO: S38061-1

DATE OF ISSUE: 10.01.24

DATE SAMPLES RECEIVED: 03.01.24

DATE ANALYSIS COMPLETED: 10.01.24

DESCRIPTION: Six soil/loose aggregate samples each weighing approximately 0.7-1.3kg.

ANALYSIS REQUESTED: Qualitative and quantitative analysis of soil/loose aggregate samples for mass determination of asbestos.

METHODS:

Qualitative - The samples were analysed qualitatively for asbestos by polarised light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative - The analysis was carried out using our documented in-house method based on HSE Contract Research Report No. 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies *et al*, 1996) and HSG 248. Our method includes initial examination of the entire sample, detailed analysis of a representative sub-sample and quantification by hand picking/weighing and/or fibre counting/sizing as appropriate.

RESULTS:

Initial Screening

No asbestos was detected in any of the soil samples by stereo-binocular and polarised light microscopy.

A summary of the results is given in Table 1.



CONTRACT NO: S38061-1
DATE OF ISSUE: 10.01.24

RESULTS: (cont.)

Table 1: Qualitative Results

SOCOTEC Job I.D: 23122152

IOM sample number	SOCOTEC Sample ID	Client Sample ID	ACM type detected	PLM result
S38061-1	23122152-001	WSN01-2-ES-0.20	-	No Asbestos Detected
S38061-2	23122152-002	WSN02-2-ES-0.20	-	No Asbestos Detected
S38061-3	23122152-003	WSN03-2-ES-0.30	-	No Asbestos Detected
S38061-4	23122152-004	WSN04-2-ES-0.20	-	No Asbestos Detected
S38061-5	23122152-005	WSN04-5-ES-1.20	-	No Asbestos Detected
S38061-6	23122152-006	BHN01-3-ES-0.40	-	No Asbestos Detected

Our detection limit for this method is 0.001%.

COMMENTS:

IOM Consulting cannot accept responsibility for samples that have been incorrectly collected or despatched by external clients.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

AUTHORISED BY:

D Third
Laboratory Analyst



Client: SOCOTEC Geotechnical
 Project Name: H3091-23-N-Nant y cafn
 Project No: 23122152
 Date Issued: 10/01/2024

Deviating Sample Report

Sample Reference	Text ID	Method Code	Incorrect Container	Incorrect Label	Headspace	Incorrect/No Preservative	No Sampling Date	Holding Time
WSN01-2-ES-0.20	23122152-001	PHSOIL						✓
WSN02-2-ES-0.20	23122152-002	PHSOIL						✓
WSN03-2-ES-0.30	23122152-003	PHSOIL						✓
WSN03-2-ES-0.30	23122152-003	VOCHSAS						✓
WSN04-2-ES-0.20	23122152-004	PHSOIL						✓
WSN04-5-ES-1.20	23122152-005	PHSOIL						✓
WSN04-5-ES-1.20	23122152-005	VOCHSAS						✓
BHN01-3-ES-0.40	23122152-006	BTEXHSA						✓
BHN01-3-ES-0.40	23122152-006	PHSOIL						✓
BHN01-3-ES-0.40	23122152-006	VOCHSAS						✓

Analysis Method

Method Code	Method Description	Analysis Method
BTEXHSA	BTEX by GCFID	As Received
CLANDPREP	DW35 - CLand Prep and Dry Weight Correction to 35°C	As Received
CLANDPREP	Solid Material Description	As Received
GROHSA/BTEXHSA	GRO CWG (C5-C10) Ali/Aro Split	As Received
ICPMSS	Arsenic in Solids by ICPMS	Air Dried & Ground
ICPMSS	Cadmium in Solids by ICPMS	Air Dried & Ground
ICPMSS	Chromium in Solids by ICPMS	Air Dried & Ground
ICPMSS	Copper in Solids by ICPMS	Air Dried & Ground
ICPMSS	Lead in Solids by ICPMS	Air Dried & Ground
ICPMSS	Mercury in Solids by ICPMS	Air Dried & Ground
ICPMSS	Nickel in Solids by ICPMS	Air Dried & Ground
ICPMSS	Zinc in Solids by ICPMS	Air Dried & Ground
ICPSOIL	Boron in Solids by ICPOES	Air Dried & Ground
ICPWSS	Sulphate as SO4 (Water Soluble)	Air Dried & Ground
PAHMSUS	16 PAHs by GCMS	As Received
PHEHPLCUV	Phenols Suite by HPLC UV	As Received
PHSOIL	pH (2.5:1)	As Received
SFAPI	Cyanide (Total) by SFA	As Received
SUB020	Asbestos Stage 1 (with Stage 2+3 Trigger)	
TPHFIDUS (Aliphatic)	TPH (CWG) Aliphatic Split with Carbon Banding	As Received
TPHFIDUS (Aromatic)	TPH (CWG) Aromatic Split with Carbon Banding	As Received
VOCHSAS	VOCs (Target List) by GCMS	As Received
WSLM59	SOM: Soil Organic Matter (%) (Calc)	Air Dried & Ground



Client: SOCOTEC Geotechnical
Project Name: H3091-23-N-Nant y cafn
Project No: 23122152
Date Issued: 10/01/2024

Result Report Notes

Letters alongside results signify that the result has associated report notes.
The report notes are as follows:

<u>Letter</u>	<u>Note</u>
A	Due to the matrix of the sample the laboratory has had to deviate from our standard protocols to be able to process the sample and provide a result. Where applicable the accreditation has been removed and this should be taken into consideration when utilising the data.
B	The QC associated with this result has not wholly met the QMS requirements, the accreditation has therefore been removed. However, the Laboratory has confidence in the performance of the method as a whole and that the integrity of the data has not been significantly compromised.
C	Due to matrix interference, the internal standard and/or surrogate has not met the QMS requirements. This should be taken into consideration when utilising the data.
D	A non-standard volume or mass has been used for this test which has resulted in a raised detection limit.
E	Due to the parameter value being beyond our calibration range (and following the maximum size of dilution allowed, where applicable), the result cannot be quantified and as such the result will appear as a greater than symbol (>) with the accreditation removed. This data should be used for indicative purposes only.
F	Based on the sample history, appearance and smell a dilution was applied prior to testing. Unfortunately, the result is either above (>) or below (<) our calibration range. Results above our calibration range have accreditation removed. The data should be used for indicative purposes only.
G	The day 5 oxygen reading was below the capability of the instrument to detect, and therefore the calculated BOD has been reported unaccredited for guidance purposes only.

HWOL Acronym Key

<u>Acronym</u>	<u>Description</u>
HS	Headspace Analysis
EH	Extractable Hydrocarbons - i.e everything extracted by the solvent(s)
CU	Clean up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
+	Operator to indicate cumulative e.g. EH_CU+HS_1D_Total



Client: SOCOTEC Geotechnical
Project Name: H3091-23-N-Nant y cafn
Project No: 23122152
Date Issued: 10/01/2024

Additional Information

This report refers to samples as received. SOCOTEC UK Ltd takes no responsibility for accuracy or competence of sampling by others.

Results within this report relate only to the samples tested.

The accreditation codes are as follows:

U = UKAS accredited analysis
M = MCERT accredited analysis
N = Unaccredited analysis

Any units marked with ^ signify results are reported on a dry weight basis of 35 °C.

All Air Dried and Ground Samples (ADG) are oven dried at less than 35 °C.

This report shall not be reproduced except in full, without written approval of the laboratory.

Opinions and interpretations given are outside the scope of our UKAS accreditation.

Any samples marked with * are not covered by our scope of UKAS accreditation. If applicable, further report notes have been added.

Any solid samples where the Major Constituents are not one of the following (Sand, Silt, Clay, Made Ground) are not one of our accredited matrix types.

Any samples marked with ‡ have had MCERTS accreditation removed for this result

Any samples marked with a tick in the deviant table is deviant for the specific reason.

Any samples reported as IS, NA, ND mean the following:

IS = Insufficient Sample to complete analysis
NA = Sample is not amenable for the required analysis
ND = Results cannot be determined

Items listed with a 'SUB' method code prefix have been carried out by an external subcontracted laboratory.

Our deviating sample report does not include deviancy information for Subcontracted analysis. Please see the report from the subcontracted lab for information regarding any deviancies for this analysis.

Summaries of analysis methods are available upon request.

End of Certificate of Analysis

Certificate of Analysis

Client: SOCOTEC Geotechnical

Project: 24012842

Quote: BEC231132559 V1.1

Project Ref: H3091-23-N

Site: Nant Y Canf (H3091-23/N)

Contact: Amelia Gyngell-Jones

Address: Unit 15, Crosby Yard
Wildmill
Bridgend
Mid Glamorgan
CF31 1JZ

E-Mail: Amelia.Gyngell-Jones@socotec.com

Phone: 07810 180295

No. Samples Received: 1

Date Received: 26/01/2024

Analysis Date: 07/02/2024

Date Issued: 07/02/2024

Report Type: Final Version 01

This report supersedes any versions previously issued by the laboratory



Reported by Customer Service Co-Ordinator
Julie Dickinson
01283 554496



Client: SOCOTEC Geotechnical
Project Name: H3091-23-N-Nant Y Canf (H3091-23/N)
Project No: 24012842
Date Issued: 07/02/2024

Samples Analysed

<u>Text ID</u>	<u>Sample Reference</u>	<u>Sampling Date</u>	<u>Sample Type</u>	<u>Sample Description</u>
24012842-001	WSN01-1-W-1.20	24/01/2024 12:00:00	WATER	Ground Water



Client: SOCOTEC Geotechnical
Project Name: H3091-23-N-Nant Y Canf (H3091-23/N)
Project No: 24012842
Date Issued: 07/02/2024



Analysis Results

					Sample ID
					001
					Customer ID
					WSN01-1-W-1.20
					Sample Type
					WATER
					Sampling Date
					24/01/2024
Analysis	Method Code	MDL	Units	Accred.	
>C6-C7 Aliphatic HS_1D_AL	GROHSA/BTEXHSA	0.1	mg/l	N	<0.100
>C7-C8 Aliphatic HS_1D_AL	GROHSA/BTEXHSA	0.1	mg/l	N	<0.100 _B
>C7-C8 Aromatic HS_1D_AR	GROHSA/BTEXHSA	0.005	mg/l	U	<0.005* _B
>C8-C10 Aliphatic HS_1D_AL	GROHSA/BTEXHSA	0.1	mg/l	N	<0.100
>C8-C10 Aromatic HS_1D_AR	GROHSA/BTEXHSA	0.02	mg/l	U	<0.020
C5-C6 Aliphatic HS_1D_AL	GROHSA/BTEXHSA	0.1	mg/l	N	<0.100
C5-C7 Aromatic HS_1D_AR	GROHSA/BTEXHSA	0.005	mg/l	U	<0.005
Total GRO C5-C10 HS_1D_Total	GROHSA/BTEXHSA	0.1	mg/l	U	<0.100
pH	PHCONDW	1	pH units	U	6.7
Total Cyanide	SFAPI	0.02	mg/l	U	<0.02
Arsenic as As	ICPMSW (Dissolved)	0.001	mg/l	U	0.003
Cadmium as Cd	ICPMSW (Dissolved)	0.00002	mg/l	U	<0.00002
Total Chromium as Cr	ICPMSW (Dissolved)	0.001	mg/l	U	<0.001
Copper as Cu	ICPMSW (Dissolved)	0.001	mg/l	U	<0.001
Lead as Pb	ICPMSW (Dissolved)	0.001	mg/l	U	<0.001
Mercury as Hg	ICPMSW (Dissolved)	0.00003	mg/l	U	<0.00003
Nickel as Ni	ICPMSW (Dissolved)	0.001	mg/l	U	0.007
Zinc as Zn	ICPMSW (Dissolved)	0.002	mg/l	U	0.014
Boron as B	ICPWATVAR (Dissolved)	0.01	mg/l	U	<0.01



Client: SOCOTEC Geotechnical
Project Name: H3091-23-N-Nant Y Canf (H3091-23/N)
Project No: 24012842
Date Issued: 07/02/2024



Analysis Results

					Sample ID
					001
					Customer ID
					WSN01-1-W-1.20
					Sample Type
					WATER
					Sampling Date
					24/01/2024
Analysis	Method Code	MDL	Units	Accred.	
Total Sulphur as SO4	ICPWATVAR (Dissolved)	3	mg/l	U	26
Benzene HS_1D_AR	BTEXHSA	5	µg/l	U	<5
Ethylbenzene HS_1D_AR	BTEXHSA	5	µg/l	U	<5
m/p-Xylene HS_1D_AR	BTEXHSA	10	µg/l	U	<10
o-Xylene HS_1D_AR	BTEXHSA	5	µg/l	U	<5
Toluene HS_1D_AR	BTEXHSA	5	µg/l	U	<5* _B
Acenaphthene	PAHMSW	0.01	µg/l	U	<0.10 _D
Acenaphthylene	PAHMSW	0.01	µg/l	U	<0.10 _D
Anthracene	PAHMSW	0.01	µg/l	U	<0.10 _D
Benzo[a]anthracene	PAHMSW	0.01	µg/l	U	<0.10 _D
Benzo[a]pyrene	PAHMSW	0.01	µg/l	U	<0.10 _D
Benzo[b]fluoranthene	PAHMSW	0.01	µg/l	U	<0.10 _D
Benzo[g,h,i]perylene	PAHMSW	0.01	µg/l	U	<0.10 _D
Benzo[k]fluoranthene	PAHMSW	0.01	µg/l	U	<0.10 _D
Chrysene	PAHMSW	0.01	µg/l	U	<0.10 _D
Dibenzo[a,h]anthracene	PAHMSW	0.01	µg/l	U	<0.10 _D
Fluoranthene	PAHMSW	0.01	µg/l	U	<0.10 _D
Fluorene	PAHMSW	0.01	µg/l	U	<0.10 _D
Indeno[1,2,3-cd]pyrene	PAHMSW	0.01	µg/l	U	<0.10 _D



Client: SOCOTEC Geotechnical
Project Name: H3091-23-N-Nant Y Canf (H3091-23/N)
Project No: 24012842
Date Issued: 07/02/2024



Analysis Results

					Sample ID
					001
					Customer ID
					WSN01-1-W-1.20
					Sample Type
					WATER
					Sampling Date
					24/01/2024
Analysis	Method Code	MDL	Units	Accred.	
Naphthalene	PAHMSW	0.01	µg/l	U	<0.10 D
Phenanthrene	PAHMSW	0.01	µg/l	U	<0.10 D
Pyrene	PAHMSW	0.01	µg/l	U	<0.10 D
Total PAH 16	PAHMSW	0.16	µg/l	U	<1.60 D
Dimethylphenols	PHEHPLCUV	0.05	mg/l	U	<0.05
Methylphenols	PHEHPLCUV	0.05	mg/l	U	<0.05
Phenol	PHEHPLCUV	0.05	mg/l	U	0.09
Total Phenols	PHEHPLCUV	0.2	mg/l	U	0.24
Trimethylphenols	PHEHPLCUV	0.05	mg/l	U	<0.05
>C10-C12 (Aliphatic) EH_CU_1D_AL	TPHFID (Aliphatic)	0.01	mg/l	U	<0.10 D
>C12-C16 (Aliphatic) EH_CU_1D_AL	TPHFID (Aliphatic)	0.01	mg/l	U	<0.10 D
>C16-C21 (Aliphatic) EH_CU_1D_AL	TPHFID (Aliphatic)	0.01	mg/l	U	<0.10 D
>C21-C35 (Aliphatic) EH_CU_1D_AL	TPHFID (Aliphatic)	0.01	mg/l	U	0.13
Total TPH >C8-C40 (Aliphatic) EH_CU_1D_AL	TPHFID (Aliphatic)	0.01	mg/l	U	0.36
>C10-C12 (Aromatic) EH_CU_1D_AR	TPHFID (Aromatic)	0.01	mg/l	U	<0.10 D
>C12-C16 (Aromatic) EH_CU_1D_AR	TPHFID (Aromatic)	0.01	mg/l	U	<0.10 D
>C16-C21 (Aromatic) EH_CU_1D_AR	TPHFID (Aromatic)	0.01	mg/l	U	<0.10 D
>C21-C35 (Aromatic) EH_CU_1D_AR	TPHFID (Aromatic)	0.01	mg/l	U	0.17
Total TPH >C8-C40 (Aromatic) EH_CU_1D_AR	TPHFID (Aromatic)	0.01	mg/l	U	0.29



Client: SOCOTEC Geotechnical
Project Name: H3091-23-N-Nant Y Canf (H3091-23/N)
Project No: 24012842
Date Issued: 07/02/2024



Analysis Results

					Sample ID
					001
					Customer ID
					WSN01-1-W-1.20
					Sample Type
					WATER
					Sampling Date
					24/01/2024
Analysis	Method Code	MDL	Units	Accred.	
1,1,1,2-Tetrachloroethane	VOCHSAW	1	µg/l	U	<1
1,1,1-Trichloroethane	VOCHSAW	1	µg/l	U	<1
1,1,2,2-Tetrachloroethane	VOCHSAW	1	µg/l	N	<1
1,1,2-Trichloroethane	VOCHSAW	1	µg/l	U	<1
1,1-Dichloroethane	VOCHSAW	1	µg/l	U	<1
1,1-Dichloroethene	VOCHSAW	1	µg/l	U	<1
1,1-Dichloropropene	VOCHSAW	1	µg/l	U	<1
1,2,3-Trichlorobenzene	VOCHSAW	5	µg/l	U	<5
1,2,3-Trichloropropane	VOCHSAW	1	µg/l	U	<1
1,2,4-Trichlorobenzene	VOCHSAW	5	µg/l	U	<5
1,2,4-Trimethylbenzene	VOCHSAW	1	µg/l	U	<1
1,2-Dibromo-3-chloropropane	VOCHSAW	5	µg/l	U	<5
1,2-Dibromoethane	VOCHSAW	1	µg/l	U	<1
1,2-Dichlorobenzene	VOCHSAW	5	µg/l	U	<5
1,2-Dichloroethane	VOCHSAW	1	µg/l	U	<1
1,2-Dichloropropane	VOCHSAW	1	µg/l	U	<1
1,3,5-Trimethylbenzene	VOCHSAW	0.6	µg/l	U	<0.6
1,3-Dichlorobenzene	VOCHSAW	1	µg/l	U	<1
1,3-Dichloropropane	VOCHSAW	1	µg/l	N	<1



Client: SOCOTEC Geotechnical
Project Name: H3091-23-N-Nant Y Canf (H3091-23/N)
Project No: 24012842
Date Issued: 07/02/2024



Analysis Results

					Sample ID
					001
					Customer ID
					WSN01-1-W-1.20
					Sample Type
					WATER
					Sampling Date
					24/01/2024
Analysis	Method Code	MDL	Units	Accred.	
1,4-Dichlorobenzene	VOCHSAW	1	µg/l	U	<1
2,2-Dichloropropane	VOCHSAW	1	µg/l	N	<1
2-Chlorotoluene	VOCHSAW	1	µg/l	U	<1
4-Chlorotoluene	VOCHSAW	1	µg/l	U	<1
Benzene	VOCHSAW	1	µg/l	U	<1
Bromobenzene	VOCHSAW	1	µg/l	U	<1
Bromochloromethane	VOCHSAW	1	µg/l	U	<1
Bromodichloromethane	VOCHSAW	1	µg/l	U	<1
Bromoform	VOCHSAW	1	µg/l	U	<1
Bromomethane	VOCHSAW	5	µg/l	N	<5
Carbon Tetrachloride	VOCHSAW	1	µg/l	U	<1
Chlorobenzene	VOCHSAW	1	µg/l	U	<1
Chloroethane	VOCHSAW	5	µg/l	U	<5
Chloroform	VOCHSAW	5	µg/l	U	<5
Chloromethane	VOCHSAW	1	µg/l	U	<1* B
cis 1,2-Dichloroethene	VOCHSAW	1	µg/l	U	<1
cis 1,3-Dichloropropene	VOCHSAW	1	µg/l	N	<1
Dibromochloromethane	VOCHSAW	1	µg/l	U	<1
Dibromomethane	VOCHSAW	1	µg/l	U	<1* B



Client: SOCOTEC Geotechnical
Project Name: H3091-23-N-Nant Y Canf (H3091-23/N)
Project No: 24012842
Date Issued: 07/02/2024



Analysis Results

					Sample ID
					001
					Customer ID
					WSN01-1-W-1.20
					Sample Type
					WATER
					Sampling Date
					24/01/2024
Analysis	Method Code	MDL	Units	Accred.	
Dichlorodifluoromethane	VOCHSAW	1	µg/l	N	<1
Ethylbenzene	VOCHSAW	0.5	µg/l	U	<0.5
Hexachlorobutadiene	VOCHSAW	5	µg/l	U	<5
iso-Propylbenzene	VOCHSAW	1	µg/l	U	<1
m and p-Xylene	VOCHSAW	1	µg/l	U	<1
MTBE	VOCHSAW	1	µg/l	N	<1
Naphthalene	VOCHSAW	5	µg/l	U	<5
n-Butylbenzene	VOCHSAW	1	µg/l	U	<1
o-Xylene	VOCHSAW	1	µg/l	U	<1
p-Isopropyltoluene	VOCHSAW	1	µg/l	U	<1
Propylbenzene	VOCHSAW	1	µg/l	U	<1
sec-Butylbenzene	VOCHSAW	1	µg/l	U	<1
Styrene	VOCHSAW	1	µg/l	U	<1
tert-Butylbenzene	VOCHSAW	1	µg/l	U	<1
Tetrachloroethene	VOCHSAW	5	µg/l	U	<5
Toluene	VOCHSAW	1	µg/l	U	<1
trans 1,2-Dichloroethene	VOCHSAW	1	µg/l	U	<1
trans 1,3-Dichloropropene	VOCHSAW	1	µg/l	U	<1
Trichloroethene	VOCHSAW	5	µg/l	U	<5



Client: SOCOTEC Geotechnical
Project Name: H3091-23-N-Nant Y Canf (H3091-23/N)
Project No: 24012842
Date Issued: 07/02/2024



Analysis Results

					Sample ID
					001
					Customer ID
					WSN01-1-W-1.20
					Sample Type
					WATER
					Sampling Date
					24/01/2024
Analysis	Method Code	MDL	Units	Accred.	
Trichlorofluoromethane	VOCHSAW	1	µg/l	U	<1
Vinyl Chloride	VOCHSAW	1	µg/l	U	<1



Client: SOCOTEC Geotechnical
Project Name: H3091-23-N-Nant Y Canf (H3091-23/N)
Project No: 24012842
Date Issued: 07/02/2024

Deviating Sample Report

All samples received in an appropriate condition with no deviancies noted with the samples.

Analysis Method

<u>Method Code</u>	<u>Method Description</u>	<u>Analysis Method</u>
BTEXHSA	BTEX by GCFID	Unfiltered
GROHSA/BTEXHSA	GRO CWG (C5-C10) Ali/Aro Split	Unfiltered
ICPMSW (Dissolved)	Arsenic (Diss.) in Water by ICPMS	Filtered
ICPMSW (Dissolved)	Cadmium (Diss.) in Water by ICPMS	Filtered
ICPMSW (Dissolved)	Chromium (Diss.) in Water by ICPMS	Filtered
ICPMSW (Dissolved)	Copper (Diss.) in Water by ICPMS	Filtered
ICPMSW (Dissolved)	Lead (Diss.) in Water by ICPMS	Filtered
ICPMSW (Dissolved)	Mercury (Diss.) in Water by ICPMS	Filtered
ICPMSW (Dissolved)	Nickel (Diss.) in Water by ICPMS	Filtered
ICPMSW (Dissolved)	Zinc (Diss.) in Water by ICPMS	Filtered
ICPWATVAR (Dissolved)	Boron (Diss.) in Water by ICPOES	Filtered
ICPWATVAR (Dissolved)	Total Sulphur as SO ₄ (Diss.) in Water	Filtered
PAHMSW	16 PAHs by GCMS	Unfiltered
PHCONDW	pH	Unfiltered
PHEHPLCUV	Phenols Suite by HPLC UV	Unfiltered
SFAPI	Cyanide (Total) by SFA	Unfiltered
TPHFID (Aliphatic)	TPH (CWG) Aliphatic Split with Carbon Banding	Unfiltered
TPHFID (Aromatic)	TPH (CWG) Aromatic Split with Carbon Banding	Unfiltered
VOCHSAW	VOCs (Target List) by GCMS	Unfiltered

Result Report Notes

Letters alongside results signify that the result has associated report notes.
The report notes are as follows:

<u>Letter</u>	<u>Note</u>
A	Due to the matrix of the sample the laboratory has had to deviate from our standard protocols to be able to process the sample and provide a result. Where applicable the accreditation has been removed and this should be taken into consideration when utilising the data.
B	The QC associated with this result has not wholly met the QMS requirements, the accreditation has therefore been removed. However, the Laboratory has confidence in the performance of the method as a whole and that the integrity of the data has not been significantly compromised.
C	Due to matrix interference, the internal standard and/or surrogate has not met the QMS requirements. This should be taken into consideration when utilising the data.
D	A non-standard volume or mass has been used for this test which has resulted in a raised detection limit.
E	Due to the parameter value being beyond our calibration range (and following the maximum size of dilution allowed, where applicable), the result cannot be quantified and as such the result will appear as a greater than symbol (>) with the accreditation removed. This data should be used for indicative purposes only.



Client: SOCOTEC Geotechnical
Project Name: H3091-23-N-Nant Y Canf (H3091-23/N)
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Date Issued: 07/02/2024

- F Based on the sample history, appearance and smell a dilution was applied prior to testing. Unfortunately, the result is either above (>) or below (<) our calibration range. Results above our calibration range have accreditation removed. The data should be used for indicative purposes only.
- G The day 5 oxygen reading was below the capability of the instrument to detect, and therefore the calculated BOD has been reported unaccredited for guidance purposes only.

[HWOL Acronym Key](#)

<u>Acronym</u>	<u>Description</u>
HS	Headspace Analysis
EH	Extractable Hydrocarbons - i.e everything extracted by the solvent(s)
CU	Clean up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
+	Operator to indicate cumulative e.g. EH_CU+HS_1D_Total



Client: SOCOTEC Geotechnical
Project Name: H3091-23-N-Nant Y Canf (H3091-23/N)
Project No: 24012842
Date Issued: 07/02/2024

Additional Information

This report refers to samples as received. SOCOTEC UK Ltd takes no responsibility for accuracy or competence of sampling by others.

Results within this report relate only to the samples tested.

The accreditation codes are as follows:

- U = UKAS accredited analysis
- M = MCERT accredited analysis
- N = Unaccredited analysis

Any units marked with ^ signify results are reported on a dry weight basis of 105 ° c.

All Air Dried and Ground Samples (ADG) are oven dried at less than 35° c.

This report shall not be reproduced except in full, without written approval of the laboratory.

Opinions and interpretations given are outside the scope of our UKAS accreditation.

Any samples marked with * are not covered by our scope of UKAS accreditation. If applicable, further report notes have been added.

Any solid samples where the Major Constituents are not one of the following (Sand, Silt, Clay, Made Ground) are not one of our accredited matrix types.

Any samples marked with ‡ have had MCERTS accreditation removed for this result

Any samples marked with a tick in the deviant table is deviant for the specific reason.

Any samples reported as IS, NA, ND mean the following:

- IS = Insufficient Sample to complete analysis
- NA = Sample is not amenable for the required analysis
- ND = Results cannot be determined

Items listed with a 'SUB' method code prefix have been carried out by an external subcontracted laboratory.

Our deviating sample report does not include deviancy information for Subcontracted analysis. Please see the report from the subcontracted lab for information regarding any deviancies for this analysis.

Summaries of analysis methods are available upon request.

End of Certificate of Analysis



SOCOTEC

APPENDIX G
PHOTOGRAPHS

Dynamic Samples

Sheet 1 to 3

Dynamic Sample Liner Photographs



WSN01 1.20-3.00m

Notes:

Project A1280 Nant y Cafn
Project No. H3091-23/N
Carried out for Neath Port Talbot County Borough Council

Sheet

Dynamic Sample Liner Photographs



WSN01 3.00-3.41m

Notes:

Project A1280 Nant y Cafn
 Project No. H3091-23/N
 Carried out for Neath Port Talbot County Borough Council

Sheet

2

Dynamic Sample Liner Photographs



WSN03 1.20m-2.00m

Notes:	Project	A1280 Nant y Cafn	Sheet 3
	Project No.	H3091-23/N	
	Carried out for	Neath Port Talbot County Borough Council	



APPENDIX H

GEOENVIRONMENTAL ASSESSMENT

Data Summary and Analysis - Soil Sample Data vs GAC for Commercial use	Table H1
Data Summary and Analysis - Groundwater Test Data vs Assessment Criteria from Drinking Water Standards (DWS)	Table H2
Data Summary and Analysis - Groundwater Test Data vs Assessment Criteria from Environmental Quality Standards (EQS) for Fresh Water	Table H3
Key to Generic Quality Risk Assessment	
Source-Pathway-Receptors	Table H4
Generic Quality Risk Assessment	Table H5

Table H1 - Data Summary and Analysis - Soil Sample Data vs GAC for Commercial use



Site:	NPT - Nant Y Cafn	Project No:	H3091_N
Data Description:	Tier 2 GQRA	SOM (%):	1% ¹
Land Use:	Commercial	Completed By:	MW
Receptor:	Human Health	Checked By:	-

Key to Generic Assessment Criteria (GAC)

C4SL : CL-AIRE Category 4 Screening Levels
S4UL : LQM Suitable for Use Levels (S4UL)²
EIC GAC : Environmental Industries Commission GAC

Notes

¹ Assumed value
² Copyright Land Quality
³ >C6-C8 Aliphatic, and >C16-C35 Aliphatic are determined as sums of measured values.

^ Result reported on a dry weight basis of 35°C.

Laboratory Test Results				Assessment Criteria (AC)		Summary Statistics							Sample Identifiers (Ref, Type, Lab No, Sampling Date) and Analytical Data							
Contaminant	Test Method	Units	Units (Calculated equivalent units shown in italics)		Source (see key)	Number of Samples Tested	Results Above Detection Limit	Min Value	Max Value	Arithmetic Mean	Standard Deviation	Number of results >AC	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6		
			µg/kg	mg/kg									WSN01-2-ES-0.20	WSN02-2-ES-0.20	WSN03-2-ES-0.30	WSN04-2-ES-0.20	WSN04-5-ES-1.20	BHN01-3-ES-0.40		
													Soil Sample	Soil Sample	Soil Sample	Soil Sample	Soil Sample	Soil Sample		
													23122152-001	23122152-002	23122152-003	23122152-004	23122152-005	23122152-006		
													13/12/2023	13/12/2023	13/12/2023	13/12/2023	13/12/2023	13/12/2023		
Metals	Boron as B ^Δ	ICPBOR	mg/kg	240000000	240000	S4UL						0								
	Arsenic as As ^Δ	ICPMSS	mg/kg	640000	640	S4UL	6	6	3.3	26.9	15.3	8.8	0	26.9	24.2	12.1	3.3	14.6	10.7	
	Cadmium as Cd ^Δ	ICPMSS	mg/kg	190000	190	S4UL	6	5	<0.2	0.5	0.3	0.1	0	0.5	0.2	0.2	<0.2	0.4	0.2	
	Copper as Cu ^Δ	ICPMSS	mg/kg	68000000	68000	S4UL	6	6	6.1	791.5	170.9	308.1	0	36.8	144.2	791.5	6.1	22.6	23.9	
	Lead as Pb ^Δ	ICPMSS	mg/kg	2330000	2330	C4SL	6	6	3.7	41.3	24.2	13.6	0	34.1	41.3	28	3.7	24.1	14.1	
	Mercury as Hg ^Δ	ICPMSS	mg/kg	58000	58	S4UL	6	0	<0.5	<0.5	-	-	0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
	Nickel as Ni ^Δ	ICPMSS	mg/kg	980000	980	S4UL	6	6	4.3	57.7	28.5	17.4	0	26.8	57.7	20.8	4.3	32.2	29.2	
	Selenium as Se ^Δ	ICPMSS	mg/kg	12000000	12000	S4UL							0							
	Total Chromium as Cr ^Δ	ICPMSS	mg/kg	8600000	8600	S4UL	6	6	1.4	67.8	22.7	23.2	0	18	22.7	11.9	1.4	67.8	14.2	
	Zinc as Zn ^Δ	ICPMSS	mg/kg	730000000	730000	S4UL	6	5	<16	90.6	53.9	25.1	0	67.5	42.4	48.8	<16.0	90.6	57.9	
Misc	Chromium (VI) as Cr ^Δ	KONENS	mg/kg	33000	33	S4UL							0							
	pH (2.5:1 extraction) ^Δ	PHSOIL	pH units	-	-	-	6	6	4.1	7.8	6.7	1.3	-	7.4	7.8	6.8	6.9	4.1	7	
	Free Cyanide ^Δ	SFAPI	mg/kg	157000	157	GAC _{sed}							0							
	Phenol Index ^Δ	SFAPI	mg/kg	760000	760	S4UL							0							
Asbestos Identification				SUB020	-	Presence of fibres		GAC	6	-	-	-	-	0	NAIS	NAIS	NAIS	NAIS	NAIS	NAIS
Polyyclic Aromatic Hydrocarbons (PAH)	Acenaphthene ^Δ	PAHMSUS	mg/kg	84000000	84000	S4UL	6	0	<0.09	<0.12	-	-	0	<0.10	<0.10	<0.09	<0.11	<0.12	<0.10	
	Acenaphthylene ^Δ	PAHMSUS	mg/kg	83000000	83000	S4UL	6	0	<0.09	<0.12	-	-	0	<0.10	<0.10	<0.09	<0.11	<0.12	<0.10	
	Anthracene ^Δ	PAHMSUS	mg/kg	520000000	520000	S4UL	6	0	<0.09	<0.12	-	-	0	<0.10	<0.10	<0.09	<0.11	<0.12	<0.10	
	Benzo[a]anthracene ^Δ	PAHMSUS	mg/kg	170000	170	S4UL	6	3	<0.09	0.32	0.2	0.1	0	0.27	0.32	<0.09	<0.11	<0.12	0.14	
	Benzo[a]pyrene ^Δ	PAHMSUS	mg/kg	35000	35	S4UL	6	3	<0.09	0.22	0.2	0.1	0	0.21	0.22	<0.09	<0.11	<0.12	0.15	
	Benzo[b]fluoranthene ^Δ	PAHMSUS	mg/kg	44000	44	S4UL	6	3	<0.09	0.36	0.2	0.1	0	0.35	0.36	<0.09	<0.11	<0.12	0.25	
	Benzo[g,h,i]perylene ^Δ	PAHMSUS	mg/kg	3900000	3900	S4UL	6	2	<0.09	0.12	0.1	0.0	0	0.11	0.1	<0.09	<0.11	<0.12	<0.10	
	Benzo[k]fluoranthene ^Δ	PAHMSUS	mg/kg	1200000	1200	S4UL	6	2	<0.09	0.16	0.1	0.0	0	0.14	0.16	<0.09	<0.11	<0.12	<0.10	
	Chrysene ^Δ	PAHMSUS	mg/kg	350000	350	S4UL	6	3	<0.09	0.31	0.2	0.1	0	0.26	0.31	<0.09	<0.11	<0.12	0.19	
	Dibenzo[a,h]anthracene ^Δ	PAHMSUS	mg/kg	3500	3.5	S4UL	6	0	<0.09	<0.12	-	-	0	<0.10	<0.10	<0.09	<0.11	<0.12	<0.10	
	Fluoranthene ^Δ	PAHMSUS	mg/kg	23000000	23000	S4UL	6	3	<0.09	0.85	0.4	0.3	0	0.7	0.85	<0.09	<0.11	<0.12	0.39	
	Fluorene ^Δ	PAHMSUS	mg/kg	63000000	63000	S4UL	6	0	<0.09	<0.12	-	-	0	<0.10	<0.10	<0.09	<0.11	<0.12	<0.10	
	Indeno[1,2,3-cd]pyrene ^Δ	PAHMSUS	mg/kg	500000	500	S4UL	6	2	<0.09	0.12	0.1	0.0	0	0.12	0.12	<0.09	<0.11	<0.12	<0.10	
	Naphthalene ^Δ	PAHMSUS	mg/kg	190000	190	S4UL	6	0	<0.09	<0.12	-	-	0	<0.10	<0.10	<0.09	<0.11	<0.12	<0.10	
	Phenanthrene ^Δ	PAHMSUS	mg/kg	22000000	22000	S4UL	6	3	<0.09	0.3	0.2	0.1	0	0.3	0.23	<0.09	<0.11	<0.12	0.24	
	Pyrene ^Δ	PAHMSUS	mg/kg	54000000	54000	S4UL	6	3	<0.09	0.6	0.3	0.2	0	0.5	0.6	<0.09	<0.11	<0.12	0.33	
	BTX	Benzene ^Δ	BTEXHSA	µg/kg	27000	27	S4UL	6	0	<12	<16	-	-	0	<13	<12	<12	<13	<16	<12
		Toluene ^Δ	BTEXHSA	mg/kg	56000000	56000	S4UL							0						
		Ethylbenzene ^Δ	BTEXHSA	mg/kg	5700000	5700	S4UL							0						
		m/p-Xylene ^Δ	BTEXHSA	mg/kg	5900000	5900	S4UL							0						
Total Petroleum Hydrocarbons (TPH)	o-Xylene ^Δ	BTEXHSA	mg/kg	6600000	6600	S4UL							0							
	C5-C6 Aliphatic ^Δ	GROHSA/BTEXHSA	mg/kg	3200000	3200	S4UL	6	0	<0.236	<0.31	-	-	0	<0.254	<0.239	<0.236	<0.264	<0.310	<0.239	
	>C6-C7 Aliphatic ^Δ	GROHSA/BTEXHSA	mg/kg	-	-	-	6	0	<0.236	<0.31	-	-	-	<0.254	<0.239	<0.236	<0.264	<0.310	<0.239	
	>C7-C8 Aliphatic ^Δ	GROHSA/BTEXHSA	mg/kg	-	-	-	6	0	<0.236	<0.31	-	-	-	<0.254	<0.239	<0.236	<0.264	<0.310	<0.239	
	>C6-C8 Aliphatic ^Δ	-	mg/kg	7800000	7800	S4UL	6	0	<0.472	<0.62	-	-	0	<0.508	<0.478	<0.472	<0.528	<0.62	<0.478	
	>C8-C10 Aliphatic ^Δ	GROHSA/BTEXHSA	mg/kg	2000000	2000	S4UL	6	0	<0.236	<0.31	-	-	0	<0.254	<0.239	<0.236	<0.264	<0.31	<0.239	
	C5-C7 Aromatic ^Δ	GROHSA/BTEXHSA	mg/kg	26000000	26000	S4UL	6	0	<0.012	<0.016	-	-	0	<0.013	<0.012	<0.012	<0.013	<0.016	<0.012	
	>C7-C8 Aromatic ^Δ	GROHSA/BTEXHSA	mg/kg	56000000	56000	S4UL	6	0	<0.012	<0.016	-	-	0	<0.013	<0.012	<0.012	<0.013	<0.016	<0.012	
	>C8-C10 Aromatic ^Δ	GROHSA/BTEXHSA	mg/kg	3500000	3500	S4UL	6	1	<0.048	0.066	-	-	0	<0.051	<0.048	<0.048	<0.053	0.066	<0.048	
	Total GRO C5-C10 ^Δ	GROHSA/BTEXHSA	mg/kg	-	-	-	6	0	<0.236	<0.31	-	-	-	<0.254	<0.239	<0.236	<0.264	<0.310	<0.239	
	>C10-C12 (Aliphatic) ^Δ	THPHSDS (Aliphatic)	mg/kg	9700000	9700	S4UL	6	0	<4.72	<6.19	-	-	0	<5.09	<4.78	<4.72	<5.27	<6.19	<4.77	
	>C12-C16 (Aliphatic) ^Δ	THPHSDS (Aliphatic)	mg/kg	59000000	59000	S4UL	6	2	<4.72	7.35	5.6	1.0	0	<5.09	<4.78	<4.72	<5.27	7.35	6.31	
	>C16-C21 (Aliphatic) ^Δ	THPHSDS (Aliphatic)	mg/kg	-	-	-	6	3	<4.72	7.95	5.9	1.4	-	5.24	<4.78	<4.72	<5.27	7.47	7.95	
	>C21-C35 (Aliphatic) ^Δ	THPHSDS (Aliphatic)	mg/kg	-	-	-	6	1	<11.8	27.3	-	-	-	<12.7	<11.9	<11.8	<13.2	<15.5	27.3	
	>C16-C35 (Aliphatic) ³	THPHSDS (Aliphatic)	mg/kg	1600000000	1600000	S4UL	6	1	<16.52	35.25	-	-	0	<17.94	<16.68	<16.52	<18.47	<22.97	35.25	
	>C35-C44 (Aliphatic) ^Δ	THPHSDS (Aliphatic)	mg/kg	1600000000	1600000	S4UL							0							
	Total TPH >C8-C40 (Aliphatic) ^Δ	THPHSDS (Aliphatic)	mg/kg	-	-	-	6	2	<23.6	58.9	34.3	15.1	-	<25.4	<23.9	<23.6	<26.4	47.6	58.9	
	>C10-C12 (Aromatic) ^Δ	THPHSDS (Aromatic)	mg/kg	16000000	16000	S4UL	6	0	<4.72	<6.19	-	-	0	<5.09	<4.78	<4.72	<5.27	<6.19	<4.77	
	>C12-C16 (Aromatic) ^Δ	THPHSD																		

Table H2 - Data Summary and Analysis - Groundwater Test Data vs Assessment Criteria from Drinking Water Standards (DWS)



Site:	NPT - Nant Y Cafn	Project No:	H3091_N
Data Description:	Tier 2 GQRA	Hardness	<40 mg
Sample Matrix:	Groundwater	Completed By:	MW
Receptor:	Groundwater (Potable - Consumers Tap)	Checked By:	-

Key to Assessment Criteria: UK DWS : UK Drinking Water Standards; WHO DWS : World Health Organisation Drinking Water Standard

- Notes on Calculated Values:
- 1 - Sum of results for Benzo[b]fluoranthene, Benzo[g,h,i]perylene, Benzo[k]fluoranthene and Indeno[1,2,3-cd]pyrene.
 - 2 - Sum of m/p-Xylene and O-Xylene; 3 - Sum of TPH results for >C6-C7 Aliphatic and >C7-C8 Aliphatic.
 - 4 - Sum of VOC results for Tetrachloroethane and Trichloroethane.
 - 5 - Sum of results for Trihalomethanes (Bromodichloromethane, Bromoform, Chloroform and Dibromochloromethane).
 - 6 - Sum of results for Tetrachloroethene and Trichloroethene.

Laboratory Test Results			Assessment Criteria (AC)			Summary Statistics							Sample Identifiers (Ref, Type, Lab No, Sampling Date) and Analytical Data									
Contaminant	Test Method	Units	Units (Calculated equivalent units shown in <i>italics</i>)		Source (see key)	Number of Samples Tested	Results Above Detection Limit	Min Value	Max Value	Arithmetic Mean	Standard Deviation	Number of results >AC	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7	Sample 8	Sample 9	
			µg/l	mg/l									WSN01-1-W-1.20									
													Ground Water									
													24012842-001									
													24/01/2024									
Metals	Boron as B	ICPMSW (Disaluted)	mg/l	1000	1	UK DWS						0										
	Arsenic as As	ICPMSW (Disaluted)	mg/l	10	0.01	UK DWS	1	1	0.003	0.003	-	-	0	0.003								
	Cadmium as Cd	ICPMSW (Disaluted)	mg/l	5	0.005	UK DWS	1	0	<0.00002	<0.00002	-	-	0	<0.00002								
	Copper as Cu	ICPMSW (Disaluted)	mg/l	2000	2	UK DWS	1	0	<0.001	<0.001	-	-	0	<0.001								
	Lead as Pb	ICPMSW (Disaluted)	mg/l	10	0.01	UK DWS	1	0	<0.001	<0.001	-	-	0	<0.001								
	Mercury as Hg	ICPMSW (Disaluted)	mg/l	1	0.001	UK DWS	1	0	<0.00003	<0.00003	-	-	0	<0.00003								
	Nickel as Ni	ICPMSW (Disaluted)	mg/l	20	0.02	UK DWS	1	1	0.007	0.007	-	-	0	0.007								
	Selenium as Se	ICPMSW (Disaluted)	mg/l	10	0.01	UK DWS							0									
	Total Chromium as Cr	ICPMSW (Disaluted)	mg/l	50	0.05	UK DWS	1	0	<0.001	<0.001	-	-	0	<0.001								
Zinc as Zn	ICPMSW (Disaluted)	mg/l	-	-	-	1	1	0.014	0.014	-	-	-	0.014									
Chromium (VI) as Cr	ICPMSW (Disaluted)	mg/l	-	-	-							-										
Misc	pH	PHCONDW	pH units	-	-	-	1	1	6.7	6.7	-	-	-	6.7								
	Total Sulphur as SO4	ICPMSW (Disaluted)	mg/l	250000	250	UK DWS	1	1	26	26	-	-	0	26								
	Fluoride as F	ISEF-LPL1	mg/l	-	-	-							-									
	Chloride as Cl	KONENS-LPL1	mg/l	-	-	-							-									
	Free Cyanide	SFAP1	mg/l	50	0.05	UK DWS							0									
	Phenol Index	SFAP1-LPL1	mg/l	-	-	-							-									
Polycyclic Aromatic Hydrocarbons (PAH)	Acenaphthene	PAHMSW	µg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10								
	Acenaphthylene	PAHMSW	µg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10								
	Anthracene	PAHMSW	µg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10								
	Benzo[a]anthracene	PAHMSW	µg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10								
	Benzo[a]pyrene	PAHMSW	µg/l	0.01	0.00001	UK DWS	1	0	<0.1	<0.1	-	-	0	<0.10								
	Benzo[b]fluoranthene	PAHMSW	µg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10								
	Benzo[g,h,i]perylene	PAHMSW	µg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10								
	Benzo[k]fluoranthene	PAHMSW	µg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10								
	Indeno[1,2,3-cd]pyrene	PAHMSW	µg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10								
	Sum of Selected PAH ¹	-	µg/l	0.1	0.0001	UK DWS	1	0	<0.4	<0.4	-	-	0	<0.4								
	Chrysene	PAHMSW	µg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10								
	Dibenzo[a,h]anthracene	PAHMSW	µg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10								
	Fluoranthene	PAHMSW	µg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10								
	Fluorene	PAHMSW	µg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10								
	Naphthalene	PAHMSW	µg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10								
	Phenanthrene	PAHMSW	µg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10								
	Pyrene	PAHMSW	µg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10								
	BTEX	Benzene	BTEXHSA	µg/l	10	0.01	WHO DWS	1	0	<5	<5	-	-	0	<5							
		Ethylbenzene	BTEXHSA	µg/l	300	0.3	WHO DWS	1	0	<5	<5	-	-	0	<5							
m/p-Xylene		BTEXHSA	µg/l	-	-	-	1	0	<10	<10	-	-	-	<10								
o-Xylene		BTEXHSA	µg/l	-	-	-	1	0	<5	<5	-	-	-	<5								
Xylene ²		-	µg/l	500	0.5	WHO DWS	1	0	<15	<15	-	-	0	<15								
Toluene		BTEXHSA	µg/l	700	0.7	WHO DWS	1	0	<5	<5	-	-	0	<5								
C5-C6 Aliphatic		GRHSA/BTEXHSA	mg/l	15000	15	WHO DWS	1	0	<0.1	<0.1	-	-	0	<0.100								
>C6-C7 Aliphatic		GRHSA/BTEXHSA	mg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.100								
>C7-C8 Aliphatic		GRHSA/BTEXHSA	mg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.100								
>C6-C8 Aliphatic ³		-	mg/l	15000	15	WHO DWS	1	0	<0.2	<0.2	-	-	0	<0.2								
>C8-C10 Aliphatic		GRHSA/BTEXHSA	mg/l	300	0.3	WHO DWS	1	0	<0.1	<0.1	-	-	0	<0.100								
C5-C7 Aromatic		GRHSA/BTEXHSA	mg/l	-	-	-	1	0	<0.005	<0.005	-	-	-	<0.005								
>C7-C8 Aromatic		GRHSA/BTEXHSA	mg/l	-	-	-	1	0	<0.005	<0.005	-	-	-	<0.005								
>C8-C10 Aromatic		GRHSA/BTEXHSA	mg/l	-	-	-	1	0	<0.02	<0.02	-	-	-	<0.020								
Total GRO C5-C10		GRHSA/BTEXHSA	mg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.100								
>C10-C12 (Aliphatic)		TPHFD (Aliphatic)	mg/l	300	0.3	WHO DWS	1	0	<0.1	<0.1	-	-	0	<0.10								
>C12-C16 (Aliphatic)		TPHFD (Aliphatic)	mg/l	300	0.3	WHO DWS	1	0	<0.1	<0.1	-	-	0	<0.10								
>C16-C21 (Aliphatic)		TPHFD (Aliphatic)	mg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10								
>C21-C35 (Aliphatic)		TPHFD (Aliphatic)	mg/l	-	-	-	1	1	0.13	0.13	-	-	-	0.13								
>C35-C44 (Aliphatic)	TPHFD (Aliphatic)	mg/l	-	-	-							-										
Total TPH >C8-C40 (Aliphatic)	TPHFD (Aliphatic)	mg/l	-	-	-							-										
>C10-C12 (Aromatic)	TPHFD (Aromatic)	mg/l	90	0.09	WHO DWS	1	0	<0.1	<0.1	-	-	0	<0.10									
>C12-C16 (Aromatic)	TPHFD (Aromatic)	mg/l	90	0.09	WHO DWS	1	0	<0.1	<0.1	-	-	0	<0.10									
>C16-C21 (Aromatic)	TPHFD (Aromatic)	mg/l	90	0.09	WHO DWS	1	0	<0.1	<0.1	-	-	0	<0.10									
>C21-C35 (Aromatic)	TPHFD (Aromatic)	mg/l	90	0.09	WHO DWS	1	1	0.17	0.17	-	-	1	0.17									
>C35-C44 (Aromatic)	TPHFD (Aromatic)	mg/l	-	-	-							-										
Total TPH >C8-C40 (Aromatic)	TPHFD (Aromatic)	mg/l	-	-	-	1	1	0.29	0.29	-	-	-	0.29									
Volatile Organic Compounds (VOC)	1,1,1,2-Tetrachloroethane	VOCHSAW	µg/l	-	-	-	1	0	<1	<1	-	-	-	<1								
	1,1,1-Trichloroethane	VOCHSAW	µg/l	-	-	-	1	0	<1	<1	-	-	-	<1								
	1,1,2,2-Tetrachloroethane	VOCHSAW	µg/l	-	-	-	1	0	<1	<1	-	-	-	<1								
	1,1,2-Trichloroethane	VOCHSAW	µg/l	-	-																	

Table H3 - Data Summary and Analysis - Groundwater Test Data vs Assessment Criteria from Environmental Quality Standards (EQS) for Fresh Water



Site:	NPT - Nant Y Cafi	Project No:	H3091_N
Data Description:	Tier 2 GQRA		
Sample Matrix:	Groundwater	Completed By:	MW
Receptor:	Surface water (Fresh water)	Checked By:	-

Notes on
Calculated
Values:

1 - Sum of results for
Benzo[a]pyrene,
Benzo[b]fluoranthene,
Benzo[g,h,i]perylene,
Benzo[k]fluoranthene and
Indeno[1,2,3-cd]pyrene.
2 - Sum of m/p-Xylene and O-
Xylene.

Key to EQS

Assessment

Values:

FW EQS_{pa}: Freshwater EQS Value (Priority Substance)

FW EQS_{sp}: Freshwater EQS Value (Specific Pollutant)

FW EQS_{pha}: Freshwater EQS Value (Priority Hazardous Substance)

FW EQS_{op}: Freshwater EQS Value (Other Pollutant)

Laboratory Test Results			Assessment Criteria (AC)			Summary Statistics							Sample Identifiers (Ref, Type, Lab No, Sampling Date) and Analytical Data					
Contaminant	Test Method	Units	Units (Calculated equivalent units shown in italics)		Source (see key)	Number of Samples Tested	Results Above Detection Limit	Min Value	Max Value	Arithmetic Mean	Standard Deviation	Number of results >AC	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6
			µg/l	mg/l									WSN01-1-W-1.20					
													Ground Water 24012842-001					
Metals	Boron as B	CPMSW (Disolved)	mg/l	2000	2	FW EQS _{sp}						0						
	Arsenic as As	CPMSW (Disolved)	mg/l	50	0.05	FW EQS _{sp}	1	1	0.003	0.003	-	-	0	0.003				
	Cadmium as Cd	CPMSW (Disolved)	mg/l	0.08	0.00008	FW EQS _{pha}	1	0	<0.00002	<0.00002	-	-	0	<0.00002				
	Copper as Cu	CPMSW (Disolved)	mg/l	1	0.001	FW EQS _{sp}	1	0	<0.001	<0.001	-	-	0	<0.001				
	Lead as Pb	CPMSW (Disolved)	mg/l	1.2	0.0012	FW EQS _{sp}	1	0	<0.001	<0.001	-	-	0	<0.001				
	Mercury as Hg	CPMSW (Disolved)	mg/l	0.07	0.00007	FW EQS _{sp}	1	0	<0.00003	<0.00003	-	-	0	<0.00003				
	Nickel as Ni	CPMSW (Disolved)	mg/l	4	0.004	FW EQS _{sp}	1	1	0.007	0.007	-	-	1	0.007				
	Selenium as Se	CPMSW (Disolved)	mg/l	-	-	-					-	-	-					
	Total Chromium as Cr	CPMSW (Disolved)	mg/l	4.7	0.0047	FW EQS _{sp}	1	0	<0.001	<0.001	-	-	0	<0.001				
	Zinc as Zn	CPMSW (Disolved)	mg/l	10.9	0.0109	FW EQS _{sp}	1	1	0.014	0.014	-	-	1	0.014				
Chromium (VI) as Cr	CPMSW (Disolved)	mg/l	3.4	0.0034	FW EQS _{sp}							0						
Misc	pH	PHCONDW	pH units	-	-	-	1	1	6.7	6.7	-	-	-	6.7				
	Total Sulphur as SO4	IONSELECT (Disolved)	mg/l	400000	400	FW EQS _{sp}	1	1	26	26	-	-	0	26				
	Fluoride as F	ISEF-LPL1	mg/l	1000	1	FW EQS _{sp}							0					
	Chloride as Cl	KONENS-LPL1	mg/l	250000	250	FW EQS _{sp}							0					
	Free Cyanide	SFAP1	mg/l	1	0.001	FW EQS _{sp}							0					
Polycyclic Aromatic Hydrocarbons (PAH)	Phenol Index	SFAP1-LPL1	mg/l	7.7	0.0077	FW EQS _{sp}						0						
	Acenaphthene	PAHMSW	µg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10				
	Acenaphthylene	PAHMSW	µg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10				
	Anthracene	PAHMSW	µg/l	0.1	0.0001	FW EQS _{pha}	1	0	<0.1	<0.1	-	-	0	<0.10				
	Benzo[a]anthracene	PAHMSW	µg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10				
	Benzo[a]pyrene	PAHMSW	µg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10				
	Benzo[b]fluoranthene	PAHMSW	µg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10				
	Benzo[g,h,i]perylene	PAHMSW	µg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10				
	Benzo[k]fluoranthene	PAHMSW	µg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10				
	Indeno[1,2,3-cd]pyrene	PAHMSW	µg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10				
	Sum of Selected PAH ¹	-	µg/l	0.00017	0.00000017	FW EQS _{pha}	1	0	<0.5	<0.5	-	-	0	<0.5				
	Chrysene	PAHMSW	µg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10				
	Dibenzo[a,h]anthracene	PAHMSW	µg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10				
	Fluoranthene	PAHMSW	µg/l	0.0063	0.00000063	FW EQS _{pha}	1	0	<0.1	<0.1	-	-	0	<0.10				
	Fluorene	PAHMSW	µg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10				
	Naphthalene	PAHMSW	µg/l	2	0.002	FW EQS _{pha}	1	0	<0.1	<0.1	-	-	0	<0.10				
Phenanthrene	PAHMSW	µg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10					
Pyrene	PAHMSW	µg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10					
BTX	Benzene	BTEXHSA	µg/l	10	0.01	FW EQS _{pha}	1	0	<5	<5	-	-	0	<5				
	Ethylbenzene	BTEXHSA	µg/l	-	-	-	1	0	<5	<5	-	-	-	<5				
	m/p-Xylene	BTEXHSA	µg/l	-	-	-	1	0	<10	<10	-	-	-	<10				
	o-Xylene	BTEXHSA	µg/l	-	-	-	1	0	<5	<5	-	-	-	<5				
	Xylene ²	-	µg/l	30	0.03	FW EQS _{sp}	1	0	<15	<15	-	-	0	<15				
Total Petroleum Hydrocarbons (TPH)	Toluene	BTEXHSA	µg/l	-	-	-	1	0	<5	<5	-	-	-	<5				
	C5-C6 Aliphatic	GRHSA/BTEXHSA	mg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.100				
	>C6-C7 Aliphatic	GRHSA/BTEXHSA	mg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.100				
	>C7-C8 Aliphatic	GRHSA/BTEXHSA	mg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.100				
	>C8-C10 Aliphatic	GRHSA/BTEXHSA	mg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.100				
	C5-C7 Aromatic	GRHSA/BTEXHSA	mg/l	-	-	-	1	0	<0.005	<0.005	-	-	-	<0.005				
	>C7-C8 Aromatic	GRHSA/BTEXHSA	mg/l	-	-	-	1	0	<0.005	<0.005	-	-	-	<0.005				
	>C8-C10 Aromatic	GRHSA/BTEXHSA	mg/l	-	-	-	1	0	<0.02	<0.02	-	-	-	<0.020				
	Total GRO C5-C10	GRHSA/BTEXHSA	mg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.100				
	>C10-C12 (Aliphatic)	TPHFD (Aliphatic)	mg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10				
	>C12-C16 (Aliphatic)	TPHFD (Aliphatic)	mg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10				
	>C16-C21 (Aliphatic)	TPHFD (Aliphatic)	mg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10				
	>C21-C35 (Aliphatic)	TPHFD (Aliphatic)	mg/l	-	-	-	1	1	0.13	0.13	-	-	-	0.13				
	>C35-C44 (Aliphatic)	TPHFD (Aliphatic)	mg/l	-	-	-					-	-	-					
	Total TPH >C8-C40 (Aliphatic)	TPHFD (Aromatic)	mg/l	-	-	-					-	-	-					
	>C10-C12 (Aromatic)	TPHFD (Aromatic)	mg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10				
>C12-C16 (Aromatic)	TPHFD (Aromatic)	mg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10					
>C16-C21 (Aromatic)	TPHFD (Aromatic)	mg/l	-	-	-	1	0	<0.1	<0.1	-	-	-	<0.10					
>C21-C35 (Aromatic)	TPHFD (Aromatic)	mg/l	-	-	-	1	1	0.17	0.17	-	-	-	0.17					
>C35-C44 (Aromatic)	TPHFD (Aromatic)	mg/l	-	-	-					-	-	-						
Total TPH >C8-C40 (Aromatic)	TPHFD (Aromatic)	mg/l	-	-	-	1	1	0.29	0.29	-	-	-	0.29					
Volatile Organic Compounds (VOC)	1,1,1,2-Tetrachloroethane	VOCHSAW	µg/l	-	-	-	1	0	<1	<1	-	-	-	<1				
	1,1,1-Trichloroethane	VOCHSAW	µg/l	100	0.1	FW EQS _{sp}	1	0	<1	<1	-	-	0	<1				
	1,1,2,2-Tetrachloroethane	VOCHSAW	µg/l	-	-	-	1	0	<1	<1	-	-	-	<1				
	1,1,2-Trichloroethane	VOCHSAW	µg/l	400	0.4	FW EQS _{sp}	1	0	<1	<1	-	-	0	<1				
	1,1-Dichloroethane	VOCHSAW	µg/l	-	-	-	1	0	<1	<1	-	-	-	<1				
	1,1-Dichloroethene	VOCHSAW	µg/l	-	-	-	1	0	<1	<1	-	-	-	<1				
	1,1-Dichloropropene	VOCHSAW	µg/l	-	-	-	1	0	<1	<1	-	-	-	<1				
	1,2,3-Trichlorobenzene	VOCHSAW	µg/l	-	-	-	1	0	<5	<5	-	-	-	<5				
	1,2,3-Trichloropropane	VOCHSAW	µg/l	-	-	-	1	0	<1	<1	-	-	-	<1				
	1,2,4-Trichlorobenzene	VOCHSAW	µg/l	-	-	-	1	0	<5	<5	-	-	-	<5				
	1,2,4-Trimethylbenzene	VOCHSAW	µg/l	-	-	-	1	0	<1	<1	-	-	-	<1				
	1,2-Dibromo-3-chloropropane	VOCHSAW	µg/l	-	-	-	1	0	<5	<5	-	-	-	<5				
	1,2-Dibromoethane	VOCHSAW	µg/l	-	-	-	1	0	<1	<1	-	-	-	<1				
	1,2-Dichlorobenzene	VOCHSAW	µg/l	-	-	-	1	0	<5	<5	-	-	-	<5				
	1,2-Dichloroethane	VOCHSAW	µg/l	10	0.01	FW EQS _{pha}	1	0	<1	<1	-	-	0	<1				
	1,2-Dichloropropane	VOCHSAW	µg/l	-	-	-	1	0	<1	<1	-	-	-	<1				
	1,3,5-Trimethylbenzene</																	

Site Name:

A1280 Nant Y Cafn Industrial Units

Job No:

H3091-23/N

Carried out For:

**Neath Port Talbot County Borough
Council**



KEY TO GENERIC QUALITY RISK ASSESSMENT

CLASSIFICATION OF SEVERITY	
SEVERITY	DEFINITION AND EXAMPLES
Severe	Acute risk to human health, resulting in significant harm, or short-term pollution risk; eg high concentration of contaminants, major spillage to controlled water, explosion.
Medium	Chronic (long-term) risk to human health, or pollution of controlled waters; eg Contamination exceeding assessment criteria, leaching of contaminant to aquifer.
Mild	Damage to non-sensitive species or ecosystems, buildings or services; eg. pollution of non-classified groundwater, or damage to building making it unsafe.
Minor	Non-permanent health effects, or repairable damage to buildings; eg. Contamination at levels requiring PPE, the loss of plants in landscaping, or discolouration of concrete.

CLASSIFICATION OF LIKELIHOOD	
LIKELIHOOD	TYPICAL EXAMPLES
High Likelihood	Pollutant linkage may be present, and risk is almost certain to occur in the long term, or there is evidence of existing harm to the receptor.
Likely	Pollutant linkage is present, and it is probable that the risk will occur over the long term.
Low Likelihood	Pollutant linkage may be present and there is a possibility of the risk occurring, although there is no certainty that it will do so.
Unlikely	Pollutant linkage may be present but the circumstances under which harm would occur are improbable , even in the very long term.

Definition of Terms:

1. SEVERITY: The potential consequence of a risk, should it occur.
2. LIKELIHOOD: The probability of the risk occurring
3. RISK RATING: An expression of the combination of severity and likelihood. (here assessed by multiplying severity and likelihood expressed numerically)

Note:

Severity, likelihood and risk classifications based on CIRIA C552.

RISK RATING MATRIX						
LIKELIHOOD	4	High likelihood	4	8	12	16
	3	Likely	3	6	9	12
	2	Low likelihood	2	4	6	8
	1	Unlikely	1	2	3	4
			Minor	Mild	Medium	Severe
			1	2	3	4
SEVERITY						

RISK CLASSIFICATION	
Risk Scoring	Risk level and recommended action
1 / 2	VERY LOW RISK: There is a low possibility of harm to a receptor which, if it occurs, would not be severe.
3	LOW RISK: There is a possibility of harm to the receptor, but such harm would be mild.
4 / 6	LOW / MODERATE RISK: Should harm arise it is most likely to be mild. Investigation would be beneficial.
8 / 9	MODERATE RISK: Severe harm is possible but is unlikely. Investigation normally required to confirm the risk.
12	HIGH RISK: Harm to the receptor is likely. Urgent investigation is required, and probable remediation.
16	VERY HIGH RISK: A high probability of severe harm arising (or evidence of existing severe harm). Urgent investigation and remediation is required.

POTENTIAL SOURCES OF CONTAMINATION							
REF.	LOC	DIRECTION	DISTANCE (m)	YEARS	SITE USE / ACTIVITY	CONTAMINATION MECHANISM	POSSIBLE CONTAMINANTS
1	On site	-	-	-	Aggregate access road construction and site activities such as emplacement of fill materials and operation / storage of site plant	Source and contaminant status of imported materials is unknown. Possible reclaimed aggregates	Heavy metals, PAHs. Asbestos, cyanide, aliphatic and aromatic hydrocarbons and phenols. Low grade source of ground gases inc. methane and carbon dioxide
2	Off site	-	-	-	Shallow mine workings and coal seams (potentially impacted by historical off site mine workings)	Generation and migration of coal mine gas emissions from historical offsite workings through permeable sandstone strata, faulted bedrock, deep drainage systems and foundations (where piled solution required) and ingress through floor slab, service entry and / or into excavations during construction	Heavy metals, polycyclic aromatic hydrocarbons (PAH), methane, carbon dioxide and monoxide and hydrogen sulphide gas

POTENTIAL MIGRATION PATHWAYS
INGESTION (Soil, soil dust and/or water)
INHALATION (Soil dust, soil vapour and/or water vapour)
DERMAL CONTACT (Soil, soil dust and/or water)
LEACHING AND MIGRATION (Soil contaminants into groundwater)
MIGRATION AND INHALATION (Gases and/or vapours in permeable strata)

POTENTIAL RECEPTORS	
RECEPTOR	DETAIL
HUMAN HEALTH:	
Future site users	Industrial units (commercial land use). Future site users: Employees
Construction workers	
Neighbouring site users	
CONTROLLED WATERS:	
Groundwater (GW)	Secondary A Undifferentiated aquifer (superficials), Secondary A aquifer (bedrock)
Surface water (SW)	River Dulais (181 m west)
ENVIRONMENTAL:	None within 50 m of site

CONCEPTUAL SITE MODEL (CSM)					GENERIC QUALITY RISK ASSESSMENT (GQRA)						
POTENTIAL SOURCES OF CONTAMINATION					POTENTIAL MIGRATION PATHWAYS	POTENTIAL RECEPTORS	SEVERITY OF RISK	LIKELIHOOD OF RISK	RISK SCORE & CATEGORY		REMARKS
REF	LOC	SITE USE / ACTIVITY	CONTAMINATION MECHANISM	POSSIBLE CONTAMINANTS							
1	On site	Aggregate access road construction and site activities such as emplacement of fill materials and operation / storage of site plant	Source and contaminant status of imported materials is unknown. Possible reclaimed aggregates	Heavy metals, PAHs. Asbestos, cyanide, aliphatic and aromatic hydrocarbons and phenols. Low grade source of ground gases inc. methane and carbon dioxide	INGESTION (Soil, soil dust and/or water).	Future site users	3 (Medium)	1 (Unlikely)	3	Low	Limited on site development and potentially contaminative land uses since the earliest historical records. Potential sources of contamination restricted to the importation of materials from an unknown source and operation of construction plant (possible plant storage / lay down area).
1	On site	Aggregate access road construction and site activities such as emplacement of fill materials and operation / storage of site plant	Source and contaminant status of imported materials is unknown. Possible reclaimed aggregates	Heavy metals, PAHs. Asbestos, cyanide, aliphatic and aromatic hydrocarbons and phenols. Low grade source of ground gases inc. methane and carbon dioxide	INHALATION (Soil dust, soil vapour and/or water vapour)	Future site users	3 (Medium)	1 (Unlikely)	3	Low	
1	On site	Aggregate access road construction and site activities such as emplacement of fill materials and operation / storage of site plant	Source and contaminant status of imported materials is unknown. Possible reclaimed aggregates	Heavy metals, PAHs. Asbestos, cyanide, aliphatic and aromatic hydrocarbons and phenols. Low grade source of ground gases inc. methane and carbon dioxide	DERMAL CONTACT (Soil, soil dust and/or water)	Future site users	3 (Medium)	1 (Unlikely)	3	Low	
1	On site	Aggregate access road construction and site activities such as emplacement of fill materials and operation / storage of site plant	Source and contaminant status of imported materials is unknown. Possible reclaimed aggregates	Heavy metals, PAHs. Asbestos, cyanide, aliphatic and aromatic hydrocarbons and phenols. Low grade source of ground gases inc. methane and carbon dioxide	INGESTION (Soil, soil dust and/or water)	Construction workers	3 (Medium)	1 (Unlikely)	3	Low	
1	On site	Aggregate access road construction and site activities such as emplacement of fill materials and operation / storage of site plant	Source and contaminant status of imported materials is unknown. Possible reclaimed aggregates	Heavy metals, PAHs. Asbestos, cyanide, aliphatic and aromatic hydrocarbons and phenols. Low grade source of ground gases inc. methane and carbon dioxide	INHALATION (Soil dust, soil vapour and/or water vapour)	Construction workers	3 (Medium)	1 (Unlikely)	3	Low	
1	On site	Aggregate access road construction and site activities such as emplacement of fill materials and operation / storage of site plant	Source and contaminant status of imported materials is unknown. Possible reclaimed aggregates	Heavy metals, PAHs. Asbestos, cyanide, aliphatic and aromatic hydrocarbons and phenols. Low grade source of ground gases inc. methane and carbon dioxide	DERMAL CONTACT (Soil, soil dust and/or water)	Construction workers	3 (Medium)	1 (Unlikely)	3	Low	
1	On site	Aggregate access road construction and site activities such as emplacement of fill materials and operation / storage of site plant	Source and contaminant status of imported materials is unknown. Possible reclaimed aggregates	Heavy metals, PAHs. Asbestos, cyanide, aliphatic and aromatic hydrocarbons and phenols. Low grade source of ground gases inc. methane and carbon dioxide	INHALATION (Soil dust, soil vapour and/or water vapour).	Neighbouring site users	3 (Medium)	1 (Unlikely)	3	Low	Limited on site development and potentially contaminating land uses since the earliest historical records. Potential sources of contamination restricted to the importation of materials from an unknown source and operation of construction plant (possible plant storage / lay down area). Construction of hardstanding covers as part of the proposed development is likley to sever the pathway and reduce leaching of Made Ground though potentially may occur in soft landscaped areas. The drift deposists beneath the site are mapped as Till which is likely to comprise low permeability cohesive materials that may act as an aquitard and restrict the downward migration of souble contaminants into groundwater.
1	On site	Aggregate access road construction and site activities such as emplacement of fill materials and operation / storage of site plant	Source and contaminant status of imported materials is unknown. Possible reclaimed aggregates	Heavy metals, PAHs. Asbestos, cyanide, aliphatic and aromatic hydrocarbons and phenols. Low grade source of ground gases inc. methane and carbon dioxide	LEACHING AND MIGRATION (Soil contaminants into groundwater)	Groundwater (GW)	3 (Medium)	1 (Unlikely)	3	Low	
1	On site	Aggregate access road construction and site activities such as emplacement of fill materials and operation / storage of site plant	Source and contaminant status of imported materials is unknown. Possible reclaimed aggregates	Heavy metals, PAHs. Asbestos, cyanide, aliphatic and aromatic hydrocarbons and phenols. Low grade source of ground gases inc. methane and carbon dioxide	LEACHING AND MIGRATION (Soil contaminants into groundwater)	Surface water (SW)	3 (Medium)	1 (Unlikely)	3	Low	
1	On site	Aggregate access road construction and site activities such as emplacement of fill materials and operation / storage of site plant	Source and contaminant status of imported materials is unknown. Possible reclaimed aggregates	Heavy metals, PAHs. Asbestos, cyanide, aliphatic and aromatic hydrocarbons and phenols. Low grade source of ground gases inc. methane and carbon dioxide	SURFACE FLOW (Contaminated runoff)	Surface water (SW)	3 (Medium)	1 (Unlikely)	3	Low	

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REF	LOC	SITE USE / ACTIVITY	CONTAMINATION MECHANISM	POSSIBLE CONTAMINANTS							
2	Off site	Shallow mine workings and coal seams (potentially impacted by historical off site mine workings)	Generation and migration of coal mine gas emissions from historical offsite workings through permable sandstone strata, faulted bedrock, deep drainage systems and foundations (where piled solution required) and ingress through floor slab, service entry and / or into excavations during construction	Heavy metals, polycyclic aromatic hydrocarbons (PAH), methane, carbon dioxide and monoxide and hydrogen sulphide gas	MIGRATION AND INHALATION (Gases and/or vapours in permeable strata)	Future site users	4 (Severe)	1 (Unlikely)	4	Low/Mod	The site is outside the zone of influence of historic coal mines and no mine entries are recorded on the site (or within 50m from the boundary). However, there may be shallow seams under the site is also potential for worked shallow seams and faults which may enable gases to migrate through permable sandstones of the South Wales Middle Coal Measures. Nearest historic underground workings located 285 m south of the site. Red Vein shown to the south of the site and indicated to dip 10 degrees to the south, therefore not underlying the site.
2	Off site	Shallow mine workings and coal seams (potentially impacted by historical off site mine workings)	Generation and migration of coal mine gas emissions from historical offsite workings through permable sandstone strata, faulted bedrock, deep drainage systems and foundations (where piled solution required) and ingress through floor slab, service entry and / or into excavations during construction	Heavy metals, polycyclic aromatic hydrocarbons (PAH), methane, carbon dioxide and monoxide and hydrogen sulphide gas	MIGRATION AND INHALATION (Gases and/or vapours in permeable strata)	Construction workers	4 (Severe)	1 (Unlikely)	4	Low/Mod	