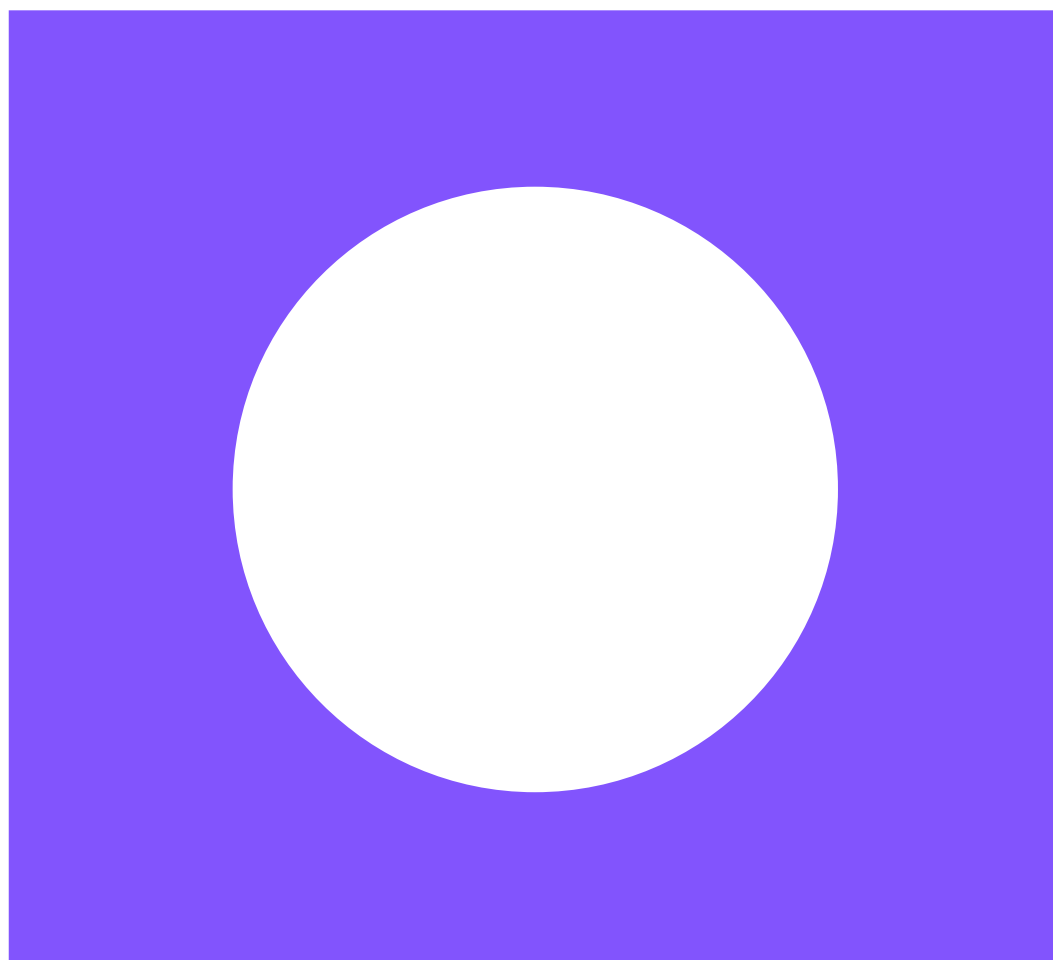




Afan WwTW

Geoenvironmental Technical Note

July 2026

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Afan WwTW

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Executive summary

Mott MacDonald Bentley (MMB) have been commissioned by Dŵr Cymru Welsh Water (DCWW) to undertake works at Afan Wastewater Treatment Works (WwTW).

This Geoenvironmental Technical Note was prepared by Mott MacDonald Bentley, on behalf of DCWW to support pre-commencement planning conditions for the construction of a permanent cabin containing offices and welfare facilities in Afan Wastewater Treatment Works (WwTW), hereafter referred to as the 'Proposed Scheme'.

This Geoenvironmental Technical Note presents a Phase 1 Desk Study and a review of the 2025 Jackson Geoservices Ground Investigation to assess potential land contamination risks associated with the development. A Conceptual Site Model (CSM) has been developed to identify potential source–pathway–receptor linkages and to inform a Generic Quantitative Risk Assessment (GQRA).

The site is located within an operational wastewater treatment works, historically reclaimed from tidal flats and situated within a heavily industrialised setting associated with the Tata Steel Complex. Ground conditions comprise Made Ground (including slag, clinker and industrial materials) overlying superficial deposits (blown sand and tidal flat deposits) of considerable thickness, with the South Wales Lower and Middle Coal Measures bedrock at depth. No groundwater was encountered during the ground investigation.

During the ground investigation chemical testing of soils identified low concentrations of hydrocarbons (primarily heavy fractions), PAHs and metals consistent with the industrial history and presence of Made Ground. Soils testing results did not exceed the human health Generic Assessment Criteria (GAC) for a commercial land use, and asbestos was not detected. Leachate testing identified minor exceedances of lead and mercury; however, these are low-level and not considered indicative of a significant contaminant source or risk to controlled waters.

Ground gas is not considered to pose a significant risk to the proposed development. Made Ground was encountered at thicknesses of up to 3.7 m and comprised predominantly ash and clinker, which are not considered to represent a significant source of ground gas generation. Soil testing identified only limited hydrocarbon contamination, predominantly comprising heavier fraction hydrocarbons of low volatility. Ground gas monitoring was undertaken and did not identify elevated gas concentrations. In addition, the proposed concrete slab foundation will not require piling and is therefore unlikely to create preferential pathways for ground gas migration. Accordingly, the ground gas risk to the proposed development is considered to be low.

Waste classification indicates that site materials tested would be classified as non-hazardous.

Overall, the risk assessment concludes that risks to human health, controlled waters, property, and off-site ecological receptors are low, with no significant pollutant linkages identified.

The Proposed Scheme is therefore considered suitable for its intended commercial use without the need for remediation, subject to standard good practice during construction.

1 Introduction

1.1 Overview

This Geoenvironmental Technical Note was prepared by Mott MacDonald Bentley, on behalf of DCWW to support pre-commencement planning conditions for Planning Application P2026/0169, the construction of a permanent cabin containing offices and welfare facilities, hereafter referred to as the 'Proposed Scheme' within Afan Wastewater Treatment Works (WwTW).

The welfare unit is required to support the operations undertaken by DCWW at the site as there are currently inadequate welfare facilities on the site.

1.2 Site Location and Description

The Proposed Scheme is located within Afan WwTW which is located inside the wider Tata Steel Complex in Port Talbot, Neath Port Talbot (National Grid Reference: SS 76073 87401) (Post Code: SA13 2NG).

The site consists primarily of hardstanding within the wider Afan WwTW site and is bordered by a fence to the west and by the remainder of the WwTW to the north, east and south with an internal transit road running along the northeast side of the Proposed Scheme. The site boundary is outlined in red, and the land ownership boundary is outlined in blue on the extract of the Location Plan, Figure 1.1.

Further details of the Proposed Scheme including General Arrangement drawings and Sections submitted with the planning application are included in Appendix A.

Figure 1.1: Extract of Location Plan



Source: Mott MacDonald Bentley (2026)

With regard to design of the welfare unit, the foundation for the unit will be a 650mm deep excavation, and the associated drainage pipes will be less than 1m below ground level (bgl). The excavation for the soakaway chamber as part of the Sustainable Drainage Approval Body (SAB) application to capture surface runoff from the welfare unit is the deepest construction, at 2.5m deep.

The surrounding area is predominantly industrial in nature as it consists of the former Tata Steel complex to the north and east, to the south is a storage yard and the Bristol Channel and Port Talbot Harbour to the west.

1.3 Scope of Work

The aim of this report is to address the following pre-commencement conditions for Planning Application P2026/0169 as set out by Neath Port Talbot Council:

Table 1.1: Planning Condition 3 and location of response

Planning Condition 3	Location of Response
A desk top study to identify all previous uses at the site and potential contaminants associated with those uses and the impacts from those contaminants on land and controlled waters. The desk study shall establish a 'conceptual site model' (CSM) which identifies and assesses all identified potential source, pathway, and receptor linkages	Chapter 2
An intrusive investigation to assess the extent, scale and nature of contamination which may be present, if identified as required by the desk top study	Appendix B
An assessment of the potential risks to: - human health, - groundwater and surface waters - adjoining land, - property (existing or proposed) including buildings, crops, livestock, pets, woodland and service lines and pipes, - ecological systems, - archaeological sites and ancient monuments; - any other receptors identified at (i)	Chapter 4
An appraisal of remedial options, and justification for the preferred remedial option(s).	Chapter 5

Planning Condition 4

Should Condition 3 identify that a remediation strategy is necessary, no development shall commence on site until a remediation scheme to bring the site to a condition suitable for the intended use by removing any unacceptable risks to human health, buildings, other property and the natural and historic environment shall be prepared and submitted to and approved in writing with the Local Planning Authority. The scheme shall include all works to be undertaken, proposed remediation objectives, remediation criteria and site management procedures. The measures proposed within the remediation scheme shall be implemented in accordance with an agreed programme of works.

Planning Condition 5

Should a remediation strategy have been required by condition 4, prior to beneficial use of the proposed development commencing, a verification report which demonstrates the effectiveness of the agreed remediation works carried out in accordance with condition 4 shall have been submitted to and approved in writing by the Local Planning Authority.

1.4 Sources of Information

The following principal sources of information have been utilised in the preparation of this report:

- Afan Water Treatment Works Ground Investigation Factual and Interpretative Report July 2025 (Appendix B)¹.
- Dwr Cymru Welsh Water / Arup. Afan Advanced Digestion Project. Geotechnical Desk Study September 2008 (Appendix C)²

In addition, the following sources of publicly available information have been utilised (referenced as footnotes within the report):

- DEFRA Magic Maps³
- British Geological Survey (BGS) map and map data viewers⁴
- British Geological Survey. 2011. Swansea. England and Wales Sheet 247. Bedrock and Superficial Deposits⁵
- BGS Lexicon of Named Rock Units⁶
- National Library of Scotland (NLS) Side by Side Viewer⁷
- Mine Remediation Authority Interactive Map Viewer⁸
- UKradon Mapping⁹
- Zetica Limited Unexploded Ordnance Mapping¹⁰
- DataMapWales¹¹

¹ Jackson Geoservices Ltd. July 2025. Afan Water Treatment Works Ground Investigation Factual and Interpretative Report.

² Dwr Cymru Welsh Water / Arup. September 2008. Afan Advanced Digestion Project. Geotechnical Desk Study

³ Defra Magic Map. Available at: [Magic Map Application](#). [Last accessed May 2026]

⁴ BGS GeoIndex. Available at: [GeoIndex - British Geological Survey](#). [Last accessed May 2026].

⁵ British Geological Survey. 2011. Swansea. England and Wales Sheet 247. Bedrock and Superficial Deposits. 1:50,000. (Keyworth, Nottingham: British Geological Survey).

⁶ British Geological Survey. Lexicon of Named Rock Units. Available at: [SEARCH Rock Name Database | Lexicon of Named Rock Units | British Geological Survey \(BGS\)](#). [Last accessed May 2026].

⁷ NLS Side by Side Viewer. Available at: [Side by side georeferenced maps viewer - Map images - National Library of Scotland](#). [Last accessed May 2026].

⁸ Mine Remediation Authority Interactive Map Viewer. Available at: [Mining Remediation Authority Map Viewer](#). [Last accessed May 2026].

⁹ UKradon Interactive Map. Available at: [UKradon - UK maps of radon](#). [Last accessed May 2026]

¹⁰ Zetica Risk Maps. Available at: [Risk Maps | Zetica UXO](#). [Last accessed May 2026].

¹¹ DataMapWales. Available at: [Home | DataMapWales](#). [Last accessed May 2026]

2 Site Setting

2.1 Published Geology

Details of the underlying geology have been obtained from BGS GeoIndex 1:50,000 Onshore Viewer⁴ and the British Geological Survey 1:50,000 Geology Series mapping of Bedrock and Superficial Deposits 'Swansea' Sheet 247⁵. Descriptions are as provided by the BGS Lexicon of Named Rock Units⁶. Features within a study area of 250m from the site boundary are included.

2.1.1 Artificial ground

Landscaped Ground (artificially modified ground) is mapped underlying the site and immediately surrounding the site as part of the Tata Steel Complex⁴.

2.1.2 Superficial geology

The BGS GeoIndex⁴ maps the underlying Superficial Deposits as Blown Sand described as '*sand that has been transported by wind, or sand consisting of predominantly of wind-borne particles*'⁶ and Tidal Flat Deposits described as '*mud flat and sand flat deposits, form extensive nearly horizontal marshy land in the intertidal zone that is alternately covered and uncovered by the rise and fall of the tide, consisting of unconsolidated sediment, mainly mud and/or sand*'⁶.

Storm Beach Deposits and Beach Deposits are also mapped immediately west of the site, described as '*low rounded ridge of coarse materials (gravels, cobbles and boulders) piled up by very powerful storm waves at the inland margin of a beach*'⁶ and '*intertidal zone deposits consisting mainly of sands with subsidiary gravels, shell fragments may be present, shingle, sand, silt and clay may be bedded or chaotic; beach deposits may be in the form of dunes, sheets or banks*'⁶, respectively.

2.1.3 Bedrock geology

BGS GeoIndex⁴ maps the South Wales Lower Coal Measures Formation and South Wales Middle Coal Measures Formation, described as '*grey, (productive) coal-bearing mudstones/siltstones, with seatearths and minor sandstones*'⁶ underlying the site. The thickness of the Lower Coal Measures is reported as between 80m and 300m, and the thickness of the Middle Coal Measures is reported as between 120m and 240m⁶.

An inferred fault is mapped 330m east of the site.

2.1.4 Coal Mining Risk

A coal seam is mapped approximately 130m north of the site. The Proposed Scheme is located within the Coal Mining Reporting Area, however, is located outside of the Development High Risk Area⁸. The Morfa Colliery is mapped 1.7km southeast of the Proposed Scheme.

2.1.5 Existing exploratory holes

24No. boreholes within the Afan WwTW site were extracted from the BGS GeoIndex⁴, and a ground model summarised within Table 2.1.

Table 2.1: Existing exploratory holes ground model

Stratum	Depth to top – Depth to base (m bgl)*	Description summary and notes
Made Ground	0.00 – 4.00	Black ash and slag boulders. Medium dense dark grey/black slightly silty sandy sub-angular to angular fine to medium gravel. Brown medium to coarse sand with hard compacted slag. Compacted slag.
Blown Sand	0.60 – 14.10	Light brown medium to coarse sand. Medium dense dark yellowish brown slightly silty fine to medium occasionally coarse sand.
Tidal Flat Deposits	6.00 – 29.10	Medium dense dark brownish grey silty medium to coarse sand with some black sub-angular fine gravel and some shell fragments. Peat bands (8.7 to 9.6m) Black occasionally dark brown fibrous peat (14.30 – 14.60) Firm dark greenish grey silty clay with occasional fine gravel sized patches of organic matter. Very dense bluish grey slightly silty fine to coarse gravelly sand. Soft dark greenish grey clayey silt with occasional thin peat pockets. Very dense dark greenish grey slightly silty medium to coarse sandy fine to coarse gravel with occasional cobbles. Soft greenish grey sandy silt with many large cobble sized pieces of decomposed wood.
South Wales Middle Coal Measures	29.10 – >39.60	Black fine grained sub-metallic slightly weathered sub-anthracite. Weak with trace sulphides. Dark brownish grey argillaceous completely weathered mudstone, very weak. Dark grey argillaceous thinly laminated slightly weathered very closely to closely fractured mudstone.

2.2 Hydrology and hydrogeology

2.2.1 Hydrology

2.2.1.1 Water Framework Directive

The nearest Water Framework Directive (WFD) catchment to the site is located approximately 900m northeast, the Tawe to Cadoxton Ffrwd Wyllt Headwaters to Tidal Limit (ID: GB110058026100). According to Water Watch Wales Cycle 3 (2021), the catchment is classified as being of 'moderate' status, 'high' for chemical status and 'moderate' for ecological status.

2.2.1.2 Hydrological features

There are no main rivers mapped on or within 250m of the site¹². The known hydrological features in the area of the site are:

- Port Talbot Harbour, Swansea Bay and Bristol Channel,
- There are no known springs in the area.
- There are no known surface water abstractions within 500m of the site.

¹² DataMapWales. Main Rivers. Available at: [New map | DataMapWales](#). [Last accessed June 2026].

Outside of the 250m buffer, the following surface water features are mapped:

- 1No. pond mapped 600m east,
- 1No drain mapped 600m northeast,
- 1No. pond mapped 800m northeast,
- 1No. pond mapped 1.1km north,
- Works Reservoir mapped 1.3km southeast,
- Port Talbot Impounded Dock mapped 1.3km north,
- River Afan Main River mapped 1.4km northeast,
- Nant Ffrwddwyllt mapped 1.7km northeast.

The Proposed Scheme is not located within any Drinking Water Protected Areas (DrWPAs) for lakes or rivers¹³.

2.2.2 Hydrogeology

2.2.2.1 Water Framework Directive

The site is located in the WFD Groundwater Body of the Swansea Carboniferous Coal Measures (ID: GB41002G201000). The status of the Groundwater Body was classified in Cycle 3 2021 as 'poor', including 'poor' classification of chemical status.

2.2.2.2 Aquifer classifications

The aquifer classifications for the natural strata identified in Section 2.1 are summarised in Table 2.2.

All groundwater bodies in Wales are designated as Drinking Water Protection Areas (DrWPAs). The Proposed Scheme is located within the Swansea Carboniferous Coal Measures DrWPA, classified as 'not at risk'¹⁴. The site is not located within a groundwater Source Protection Zone (SPZ)¹⁵.

Table 2.2: Aquifer classifications

Strata	Aquifer Classification
Blown Sand	Secondary A: Permeable strata capable of supporting water supplies at a local rather than strategic scale and in some cases forming an important source of base flow to rivers.
Tidal Flat Deposits	Secondary (undifferentiated): In cases where it has not been possible to attribute either category A or B to a rock type.
Beach Deposits	
South Wales Lower Coal Measures Formation	Secondary A: Permeable strata capable of supporting water supplies at a local rather than strategic scale and in some cases forming an important source of base flow to rivers.
South Wales Middle Coal Measures Formation	

¹³ Natural Resources Wales. Wales Environment Information Portal. Available at: [NRW Open Data | Wales Environmental Information Portal](#). [Last accessed May 2026].

¹⁴ DataMapWales. Drinking Water Protected Areas. Available at: [New map | DataMapWales](#). [Last accessed May 2026].

¹⁵ DataMapWales. Source Protection Zones. Available at: [New map | DataMapWales](#) [Last accessed May 2026].

2.3 Site History

Table 2.3 summarises the site history of the development site⁷ to inform potentially contaminative site uses and sources.

Table 2.3: Site history

Date	On site (within Afan WwTW)	Off site (within 250m)
OS Six Inch 1888 - 1915	Area of WwTW at high water mark, on tidal flats labelled 'Margam Sands'	Site surrounds at high water mark, on tidal flats labelled 'Margam Sands'. 'Old River' mapped immediately to the east of Afan WwTW. The site was located at the former mouth of the River Afan, the course of which has been diverted to enter the sea some 2km north ² .
OS 25 Inch 1892 - 1914	No change	Rail sidings mapped at the northern extent of the 170m N of the Proposed Scheme. The Port Talbot Railway Docks Branch extended onto the Morfa Newydd area raised and reclaimed via tipping ² .
OS One Inch 3 rd ed 1902 - 1923	No change	No change
OS Quarter Inch 3 rd ed 1919 - 1923	No change	No change
OS Quarter Inch 1929 - 1934	No change	'Old River' now mapped further east outside of 250m buffer.
OS Quarter Inch 4 th ed 1934 - 1937	No change	No change
OS 1:25,000 1937 - 1961	Reclaimed land, labelled 'Morfa Newydd' or 'New Marsh'	No change
OS Air Photos 1944 - 1950	Marsh area / Dunes	No change
OS 1:25,000 1945 - 1965	No change	No change
2 nd Land Utilisation Survey 1:10,000 1958 - 1974	No change	No change <u>Outside of 250m buffer:</u> 'Slag tips' mapped 280m east of Proposed Scheme, in place of 'Old River' which is now not visible on mapping.
OS 1:1250/1:2500 1944 - 1975	Access track mapped within area of Proposed Scheme, and Afan WwTW.	Pipeline mapped to underly Afan WwTW, 70m SE of the Proposed Scheme, discharging to Swansea Bay. Original source of pipeline not mapped. 'Slag heap' mapped 90m E of the Proposed Scheme. <u>Outside of 250m buffer:</u> Rail sidings 260m NE of Proposed Scheme. 'Slag heap' mapped 280m E of the Proposed Scheme. Sand Pit 390m NE of the Proposed Scheme. Two refuse tips 440m NE of the Proposed Scheme.
OS 1:10000/1:10560 1949 - 1975	No change	No change

Date	On site (within Afan WwTW)	Off site (within 250m)
		Outside of 250m buffer: 'Works' mapped 350m east of the Proposed Scheme.
Aerial Imagery 1998	Afan WwTW constructed onsite	Further expansion of the steelworks with the slag mound originally extending into the southern part of the WwTW.
Aerial Imagery 2006	Afan Welsh Water present on site including sludge tanks	Material stockpile areas immediately north and east of the Proposed Scheme.

Source: National Library of Scotland Side by Side Viewer

2.3.1 Historical Landfills

There are no historical landfills mapped on site or within 500m¹⁶. However historical mapping shows two refuse tips located 440m north-east of the Proposed Scheme⁷.

2.3.2 Current Landfills

The nearest current landfill is the Morfa Tip located within the Tata Steel Complex, approximately 800m northeast of the site¹⁷.

2.3.3 Potentially contaminative land uses

The site currently comprises a sewage treatment works and may be associated with elevated phosphorous, nitrogen and ammonium and heavy metals associated with the wastes being treated at the facility.

Within 250m, the site has largely been used for heavy industry, such as the Tata Steel Complex as shown on historical mapping, where potentially contaminative land uses include rail sidings, slag heaps and two refuse tips. Historical mapping indicates that the site was formerly comprised of tidal flats and salt marsh. Following land reclamation associated with historical heavy industrial development, the area is now underlain by approximately 4m of Made Ground consisting of slag and ash.

The site surrounds currently comprise the Tata Steel Complex with material storage areas within 250m.

2.4 Sensitive land uses

2.4.1 Statutory Protected Sites

The site is not located within any statutory protected areas¹¹. The closest protected site is Margam Moors Site of Special Scientific Interest (SSSI) located 3km south of the site. The Kenfig SSSI and Special Area of Conservation (SAC) and the Kenfig Pool and Dunes National Nature Reserve (NNR) are located 4km south.

2.4.2 Invasive Species

The Preliminary Ecological Appraisal Report summarises that no invasive non-native species (INNS) have been identified within the working area. Japanese Knotweed and Himalayan Balsam are present within the wider industrial complex however all INNS are located outside of the WwTW fence line.

¹⁶ DataMapWales. Historic Landfills. Available at: [New map | DataMapWales](#) [Last accessed May 2026].

¹⁷ DataMapWales. Authorised Landfill Site Points. Available at: [New map | DataMapWales](#) [Last accessed May 2026].

2.5 Radon

The area lies within a 'lower probability radon area', described as areas where 'less than 1% of homes are estimated to be at or above the Action Level'¹⁸.

2.6 Unexploded ordnance (UXO)

Unexploded ordnance risk mapping from Zetica Limited indicated that the site is located within a 'low' bomb risk area. Such areas are designated as low risk by showing as 'areas indicated as having 15 bombs per 1000 acres or less' (Appendix D).

Whilst the site is currently understood to be at low risk from unexploded ordnance (UXO), a Zetica preliminary UXO assessment was commissioned as a precautionary measure given the site's extensive industrial history. The conclusions of this report states that a detailed desk study is not considered essential in this instance.

2.7 Receptor Summary

In line with the pre-commencement Planning Condition 3 (Section 1.3), Table 2.4 provides a summary of potential receptors highlighted by a review of the Proposed Scheme and site setting, as well as rationale to determine whether they are taken forward to the preliminary Conceptual Site Model (CSM).

Table 2.4: Receptor summary

Receptor	Conceptual Site Model Y/N	Rationale
Human Health		
Construction workers, future site users and personnel	Y	Construction and maintenance workers and site end users were taken forward to the CSM to assess risks to human health from existing contamination on site and off site.
Controlled Waters		
WFD Groundwater Body of the Swansea Carboniferous Coal Measures (ID: GB41002G201000) and DrWPA	Y	Whilst these receptors are not within a SPZ, are anticipated to be impacted by saline intrusion, and will not be forming baseflow to a river, they are designated aquifers and bedrock DrWPA directly underlying the Proposed Scheme. Therefore they have been taken forward to the preliminary CSM.
Superficial Secondary A (Blown Sand) and Secondary Undifferentiated (Tidal Flat Deposits, Beach Deposits) aquifers	Y	
Bedrock Secondary A aquifer (South Wales Lower and Middle Coal Measures)	Y	
Tawe to Cadoxton Ffrwd Wylt Headwaters to Tidal Limit WFD Catchment (ID: GB110058026100), 900m NE.	N	Located a considerable distance from the Proposed Scheme, there is not considered to be a viable pathway to the receptor, due to the small-scale localised nature of the Proposed Scheme and lack of connectivity.
1No. drain 600m NE, 3No. ponds 600m E, 800m NE and 1.1km N, Works Reservoir 1.3km SE and River Afan Main River 1.4km NE.	N	
Construction Materials		
Pipes, buried concrete, foundations	Y	Construction elements of the Proposed Scheme will include buried concrete which is likely to contact existing Made Ground.
Other Offsite Receptors		
Property - Tata Steel Complex	N	Given the small-scale and localised nature of the proposed development, it is not anticipated that the scheme will create a significant pollutant linkage or viable pathway to the adjacent steelworks, and

¹⁸ UKradon. Interactive Map. Available at: [UKradon - UK maps of radon](#) [Last accessed May 2026].

Receptor	Conceptual Site Model Y/N	Rationale
		therefore the steelworks is not considered to represent a sensitive off-site receptor.
Ecological Receptors: - Margam Moors SSSI 3km S - Kenfig SSSI and SAC 4km S - Kenfig Pool and Dunes NNR 4km S	Y	Due to the distance and the small-scale nature of the Proposed Scheme, a viable pathway to the receptor is considered unlikely. However, due to the sensitive nature of the sites, these were considered in the CSM in view of considerations of groundwater quality and baseflow.
Other		
Crops, livestock, pets, woodland, archaeological sites	N	These receptors have not been identified within 500m of the Proposed Scheme, and have therefore been discounted from the CSM.

2.8 Preliminary Conceptual Site Model

2.8.1 Overview

A Preliminary Conceptual Site Model (CSM) has been developed using information obtained from the previous desk study assessment², Table 2.5. The CSM identifies potential sources of contamination, pathways for contaminant migration, and sensitive receptors that may be present at the site.

The purpose of the preliminary CSM is to identify potential pollutant linkages and provide a basis for assessing contaminated land risks. Chapter 4 will review and refine the CSM based on further information available through intrusive investigation.

The contaminated land qualitative risk descriptions can be found in Appendix H.

2.8.2 Source Pathway Receptor (SPR)

2.8.2.1 Sources

S1: Current use as a WwTW including incoming industrial effluents and concentrated heavy metals, organics and inorganics are a result of the treatment process.

S2: Made Ground associated with steelworks waste materials (slag, ash and clinker), including ground gas potential.

S3: Presence of Tata Steel Works and associated metals and metal compounds and leakages associated with storage areas, refuse tips, tanks and pipes.

2.8.2.2 Pathways

P1: Human uptake pathways: inhalation, ingestion, dermal contact.

P2: Direct contact with contaminated or corrosive soils.

P3: Contaminant leaching.

P4: Surface run-off.

P5: Vertical/horizontal contaminant migration via tidal groundwater.

P6: Contaminant migration along manmade pathways, e.g. services, foundations.

2.8.2.3 Receptors

R1: Construction and maintenance workers.

R2: Future site users and personnel.

R3: Construction materials (e.g. pipes, buried concrete, foundations)

R4: Controlled Waters: Superficial and Bedrock Aquifers.

R5: Offsite ecological receptors (Margam Moors SSSI, Kenfig SSSI and SAC, Kenfig Pool and Dunes NNR)

Table 2.5: Preliminary Conceptual Site Model

Sources	Pathways	Receptors	Risk Classification	Comment
S1: Current use as a WwTW including incoming industrial effluents and concentrated heavy metals, organics and inorganics are a result of the treatment process. S2: Made Ground associated with steelworks waste materials (slag, ash and clinker) S3: Presence of Tata Steel Works and associated metals and metal compounds and leakages associated with storage areas, refuse tips, tanks and pipes.	P1: Human uptake pathways: inhalation, ingestion, dermal contact	R1: Construction and maintenance workers	Probability: Likely Consequence: Medium Risk: Moderate	There is potential that construction and maintenance workers may encounter soils which contain steelworks waste (slag, ash and clinker) within shallow Made Ground soils. Construction workers should adhere to site specific risk assessments, method statements and the use of Personal Protective Equipment (PPE).
		R2: Future site users and personnel	Probability: Low Consequence: Mild Risk: Low	Future site users are limited to site personnel using the permanent cabin and are unlikely to come into contact with contaminated shallow Made Ground deposits. It is considered there is no viable pathway from source to receptor once the cabin is constructed and used in line with a commercial end use, as the concrete foundation will sever the pathway. Ground gas risk is considered low, as Made Ground comprising predominantly inorganic ash and clinker is considered low risk, and the proposed concrete slab foundation will not create preferential migration pathways to potential receptors.
	P2: Direct contact with contaminated or corrosive soils P3: Contaminant leaching	R3: Construction materials (e.g. pipes, buried concrete, foundations)	Probability: Likely Consequence: Mild Risk: Moderate	It is considered likely that concrete foundations will come into contact with potential aggressive ground conditions due to the presence of Made Ground.

Sources	Pathways	Receptors	Risk Classification	Comment
	P3: Contaminant leaching	R5: Controlled Waters: Superficial and Bedrock Aquifers	Probability: Low Consequence: Mild Risk: Low	Perched groundwater is considered a possibility within superficial deposits. Due to the anticipated depth of bedrock aquifer (>29.10mbgl according to BGS GeolIndex borehole data), the proposed scheme is not anticipated to interact with the bedrock aquifer, significantly below the depth of foundations associated with the Proposed Scheme.
	P5: Vertical/horizontal contaminant migration via tidal groundwater	R6: Offsite ecological receptors (Margam Moors SSSI, Kenfig SSSI and SAC, Kenfig Pool and Dunes NNR)	Probability: Unlikely Consequence: Mild Risk: Very Low	The nearest statutory protected site is located 3km south of the Proposed Scheme. Due to the distance, the small-scale nature of the development, and depth to bedrock aquifer, it is not anticipated that offsite ecological receptors will be impacted to the Proposed Scheme, including any groundwater baseflow to protected sites.

3 Ground Investigation

3.1 Summary of Ground Investigation Works

Alun Griffiths Limited and Jackson Geoservices completed a ground investigation at Afan WwTW on 25th and 26th June, and 7th July 2025. The details of the exploratory holes are summarised in Table 3.1.

Table 3.1: Ground Investigation Summary 2025 Jackson Geoservices GI

Exploratory Hole ID	Construction Method	Termination Depth (m)	Installation Details		
			Type	Diameter (mm)	Response Zone (mbgl)
TP1	Machine excavated trial pit	2.40		Backfilled with gravel	
TP2		2.20			
TP3		1.65			
TP3A		1.55			
WS1	Dynamic windowless sampling	5.00	SP	50	2.00-3.50
WS2		1.43		Backfilled with bentonite	
WS3		4.80	SP	50	1.00-3.50
WS4		4.90	SP	50	2.00-3.50
WS5		2.00	SP	50	1.00-2.00

Source: Jackson Geoservices Factual and Interpretative Report

3.2 Geo environmental testing suites

Laboratory testing for geoenvironmental purposes was completed at GSTL, UKAS registration number 2183. The testing undertaken is summarised in Table 3.2.

Table 3.2: Geoenvironmental Testing 2025 Jackson Geoservices GI

Test Type	Number of Tests
BRE SD1 Suite D	5
General Soil Suite	5
Asbestos Screen	5
TPH CWG	5
PAH	5
General Soil Leachate Suite	3
PAH Leachate	3
WAC Suite	4

Source: Jackson Geoservices Factual and Interpretative Report¹

3.3 Fieldwork and Post Fieldwork Installation Monitoring

Monitoring of ground gas and groundwater was undertaken post fieldwork by Jackson Geoservices. One post fieldwork monitoring visit was undertaken, completed on 18th July 2025.

No groundwater samples were obtained as all exploratory holes were dry.

3.4 Ground Model

3.4.1 Encountered geology

The ground conditions encountered during the 2025 Jackson Geoservices GI are summarised in Table 3.1.

Table 3.3: Summary of encountered geology

Stratum	Top Depth (m bgl)	Maximum thickness (m)	Maximum depth (m)	Remarks
Made Ground	Ground level	3.70	3.7	Variable in nature and predominantly comprised a brown to dark brown and grey sandy angular to subangular fine to coarse gravel of various materials including limestone, slag, clinker, ironstone, sandstone, concrete and brick with medium cobble content. Sand is fine to coarse. Cobbles are subangular to subrounded of various materials including sandstone, concrete, brick and slag,
Blown Sand	0.6	4.20	5	Loose to medium dense, occasionally dense yellow fine slightly gravelly sand. Gravel is rounded fine to medium of sandstone. Occasional shells and shell fragments.

Source: Jackson Geoservices Factual and Interpretative Report

3.4.2 Groundwater monitoring

As part of the 2025 Jackson Geoservices GI, no groundwater was encountered within the exploratory hole locations during drilling nor within the standpipes during monitoring. The following remarks were stated within the Jackson Geoservices Factual Report:

- WS1: Exploratory hole dry.
- WS3: Exploratory hole dry.
- WS4: Exploratory hole dry.
- WS5: Exploratory hole dry.

4 Generic Quantitative Risk Assessment

4.1 Introduction

This chapter includes the Generic Quantitative Risk Assessment for the Proposed Scheme and a conceptual site model (CSM), in line with Pre-commencement Planning Condition 3 (Chapter 1.3). Measured concentrations have been compared to generic assessment criteria (GAC) to ensure that the development can be carried out safely without unacceptable risks from land contamination to site personnel and future users, controlled waters, ecological systems and property.

4.2 Human Health Risk Assessment

Risks to human health from historically contaminated soils have been assessed by comparison of laboratory contamination data with Generic Assessment Criteria (GAC) established using the UK Contaminated Land Exposure Assessment (CLEA) framework. Assessment criteria used includes:

- Category 4 Screening Levels (C4SLs)¹⁹ published in the SP1010 policy companion document by DEFRA (2014) (where available) and re-modelled for 1% Soil Organic Matter.
- Suitable for Use Levels (S4ULs) developed by Land Quality Management (LQM)²⁰ in accordance with the CLEA framework, based on Health Criteria Values (HCVs) representing a minimal / tolerable level of risk.
- Generic Assessment Criteria (GAC) developed by CL:AIRE, AGS, and EIC²¹ derived based on the CLEA model and are designed to estimate levels of contamination at which risks are likely to be negligible or minimal and far from posing a Significant Possibility of Significant Harm (SPOSH) to human health.

The following considerations with regard to the Proposed Scheme determined the selection of the most appropriate GAC:

- The most applicable generic land use scenario for the Proposed Scheme comprising a permanent cabin containing offices and welfare facilities is and *Industrial/Commercial* end use.
- The Soil Organic Matter (SOM) (%) content of soils ranged from 1% to 2.75%, with an average of 1.8%. Therefore, a conservative 1% SOM was used.
 - Anomalous elevated SOM of 30% recorded in TP3 was considered unrepresentative of true soil organic content. The corresponding stratum is described as *“Black sandy angular to subrounded fine to coarse gravel of slag, limestone, sandstone, concrete, brick and clinker with medium cobble content. Sand is fine to coarse. Cobbles are subangular to subrounded of slag, sandstone, concrete and brick”*. Made Ground comprising slag, clinker, and demolition materials may bias TOC-based SOM determinations. The result is therefore interpreted as an artefact of the material composition rather than the presence of natural organic soils.

¹⁹ CL:AIRE (Contaminated Land: Applications in Real Environments), 2014. SP1010 – Development of Category 4 Screening Levels of Assessment of Land Affected by Contamination.

²⁰ Land Quality Management and Chartered Institute of Environmental Health, Suitable 4 Use Levels [S4UL3142].

²¹ EIC/AGS/CL:AIRE, 2010. Soil Generic Assessment Criteria for Human Health Risk Assessment.

As part of the Jackson Geoservices GI, 6No. soil samples were tested for asbestos, metals, total petroleum hydrocarbons (TPH) and poly-aromatic hydrocarbons (PAH), Appendix E. The results are included within the Factual Report.

No exceedances of GACs were recorded in any of the samples. Asbestos was not detected in any of the samples.

Total chromium concentrations (up to 39 mg/kg) were detected across all soil samples and are considered within typical background ranges for soils and particularly for Made Ground. Only total chromium and hexavalent chromium were tested. The absence of measurable hexavalent chromium in all samples indicates a low risk to human health receptors.

Low level hydrocarbon presence is indicated in soils consistent with the presence of slag within Made Ground and nearby historical slag tips, largely within TP1, TP3 and WS4, between 0.3mbgl and 0.6mbgl. Concentrations of aliphatic hydrocarbons in the C10–C40 range were recorded at concentrations of up to 250 mg/kg predominantly comprising from the heavier fractions C16 – C35. No evidence of gross contamination, such as sheen or free product, was identified during GI.

These concentrations are reflective of the general conditions of the Made Ground and are considered unlikely to pose a human health risk due to the low solubility and mobility of these fractions. Contractors should nonetheless ensure standard health and safety procedures are in place to ensure good practices are followed during construction and maintenance works, to prevent soil ingestion and dermal contact. The C35–C40 fraction are heavy and non-volatile, which is an indication of bituminous material and industrial residues rather than free product with a mobile plume consistent with lighter fractions. The absence of lighter, more volatile petroleum hydrocarbons confirms that there is unlikely to be a significant vapour risk and that contamination is not recent in origin.

PAHs were detected at generally low concentrations, with the exception of one localised sample (up to 75 mg/kg Total PAHs within TP3 0.5mbgl), with a benzo[a]pyrene concentration within TP3 of 5.5 mg/kg however this is significantly below the GAC of 35 mg/kg. PAH concentration is consistent with the presence of slag, ash and clinker within the Made Ground.

Overall, the contamination is reflective of heterogeneous Made Ground with no significant contaminant source within the soil. Risks to human health are considered low for an Industrial/Commercial land use.

4.3 Risk to Controlled Waters

4.3.1 Leachate

It should be noted that the laboratory testing for leachates is significantly more aggressive than would usually be expected in the natural environment with the sample being saturated and agitated to maximise the capture of leachable contaminants. This is not fully representative of the natural environment where leachate will generally be produced through the slow percolation of water through a static medium and as such the results of leachate testing should be considered a 'worst case' scenario.

Results of three soil leachate tests have been screened against Environmental Quality Standards (EQS) Annual Average for Coastal and Transitional Waters, Appendix F. Drinking Water Standards (DWS) were not used in this assessment due to the absence of a drinking water receptor and the likelihood of saline groundwater. Two exceedances of lead and mercury were recorded within the leachate samples:

- 1No. exceedance of mercury within WS04 (0.6-1.25 mbgl), with a measurement of 0.06 ug/l relative to an EQS of 0.05 ug/l.
- 2No. exceedances of lead WS1 (0.5-0.6 mbgl), with a measurement of 2.5 ug/l and TP2 (1 mbgl) with a measurement of 1.8 ug/l, relative to an EQS of 1.3 ug/l)

Low level concentrations of metals are present across the site, including concentrations of dissolved chromium (total chromium) detected in all three leachate samples (0.68 – 3.1 ug/l). Chromium speciation has not been tested for within the leachate, but due to no measurable CrVI in any of the soil samples, the total chromium is considered to reflect CrIII across the site, and there is not considered to be a significant CrVI source on site.

The exceedances of mercury and lead are considered to be relatively minor as the measured concentration is not significantly above the EQS. The presence of metals on site is consistent with the industrial history, presence of Made Ground and use of the site as a WwTW.

All PAHs and phenols returned concentrations below the LOD.

Using the soil data, it is considered that the low level hydrocarbon presence is limited to heavier fractions which are poorly soluble and strongly bind to soil and therefore have low leaching potential.

It should be noted that the laboratory testing for leachates is significantly more aggressive than would usually be expected in the natural environment with the sample being saturated and agitated to maximise the capture of leachable contaminants. This is not fully representative of the natural environment where leachate will generally be produced through the slow percolation of water through a static medium and as such the results of leachate testing should be considered a 'worst case' scenario.

Overall, the leachate data is reflective of heterogeneous Made Ground with no significant contaminant source, and does not represent a significant risk to controlled waters due to the low solubility and low mobility of metals and heavy hydrocarbon fractions.

4.3.2 Groundwater

As part of the Jackson Geoservices 2025 GI, no groundwater was encountered within the exploratory hole locations during construction or within the standpipes during monitoring, therefore no laboratory sampling of groundwater was undertaken. The following remarks were stated within the Jackson Geoservices Factual Report:

- WS1: Exploratory hole dipped, dry.
- WS3: Exploratory hole dipped, dry.
- WS4: Exploratory hole dipped, dry.
- WS5: Exploratory hole dipped, dry.

Exploratory holes WS1 and WS3 were dipped on 15th June 2026 to confirm groundwater levels. Groundwater was encountered in WS1 at 4.35 mbgl, and within WS3 at 4.61 mbgl, with groundwater at 3.49 mbgl at its highest throughout the day, considered deeper than the proposed excavations.

The foundation for the welfare unit will be 650mm deep excavation, and the drainage pipes associated with the welfare unit will be less than 1m deep. The excavation for the soakaway chamber as part of the SAB application to capture surface runoff from the welfare unit is the deepest construction, at 2.5m deep. Based off recent borehole dips, it is unlikely that groundwater will be encountered during excavations.

4.4 Waste Classification

Soil quality data from 2025 Jackson Geoservices GI was entered into a hazard assessment tool, HazWasteOnline™. The tool uses the current WM3 technical guidance²² document to determine whether the substances contained in the soils tested would render materials hazardous waste.

The assessment presented in Appendix G indicated that, if treated as waste materials, all samples would be considered 'non-hazardous'. Waste Acceptance Criteria (WAC) testing may be needed should offsite disposal of excess soil be required.

4.5 Ground Gas

Ground gas is not considered to pose a significant risk to the proposed development. The Made Ground encountered during the GI was recorded at thicknesses of up to 3.7 m and comprised predominantly ash and clinker. These materials are not considered to provide a substantial source for ground gas generation. Furthermore, soil testing identified only limited hydrocarbon contamination, with detected hydrocarbons largely comprising heavier fraction compounds with relatively low volatility.

As a precautionary measure, a round of ground gas monitoring was undertaken, the results of which did not indicate the presence of significant ground gas concentrations. The proposed development will comprise a concrete slab foundation and does not include piled foundations; therefore, no significant preferential pathways for ground gas migration are expected to be created. On this basis, the risk posed by ground gas to the proposed development is considered to be low.

The results of the ground gas monitoring round are shown in Table 4.1, with the full ground gas monitoring data located in Appendix B.

Table 4.1: Summary of Ground Gas Monitoring

Determinant	Units	WS1	WS3	WS4	WS5
Date / Time		18/07/2025 10:26	18/07/2025 10:38	18/07/2025 10:48	18/07/2025 11:01
Flow Rate	l/hr	0.2	0.1	0.3	0.3
Carbon Dioxide	%	0.2	0.1	0.8	0.1
GSV	-	0.0004	0.0001	0.0024	0.0003
Methane	%	<0.1	<0.1	<0.1	<0.1
GSV	-	<0.0001	<0.0001	<0.0001	<0.0001
Carbon Monoxide	ppm	0	0	0	0
Hydrogen Sulphide	ppm	0	1	1	1

Source: Jackson Geoservices Factual and Interpretative Report

4.6 Conceptual Site Model

4.6.1 Overview

The conceptual site model describes the environmental features of the site together with the expected interaction of potential contamination sources and the wider environment, Table 4.2.

²² Environment Agency. Waste classification technical guidance. Available at: Waste Classification – Guidance on the Classification and Assessment of Waste (Technical Guidance WM3). [Last accessed June 2026].

The risk assessment considers site contamination data against generic risk-based thresholds for the contamination linkages identified in the conceptual model. The contaminated land qualitative risk descriptions can be found in Appendix H.

4.6.2 CSM Parameters and Assumptions

The following parameters of the CSM, including relevant assumptions and exclusions are listed below:

- The assessment assumed that no new sources of contamination will be introduced during the development – i.e. construction materials will be non-hazardous and inert, all imported topsoil will be compliant with BS 3882:2015.
- It is assumed that a robust Pollution Prevention Plan will be adopted during the works and, as a result, no contamination will occur from leaks and spills during construction.
- The assessment only applies to a commercial land use, as detailed within this report.
- The risk assessment does not consider asbestos, toxic mould or radiological contamination.
- The proposed scheme is expected to only impact the area directly below the works, and it is not considered that the works will not create or exacerbate any contaminant linkages, with the current site use being a WwTW.

4.6.3 Source Pathway Receptor (SPR)

4.6.3.1 Sources

S1: Current use as a WwTW and the Proposed Scheme area being used for the storage of waste product and sludge associated with the WwTW.

S2: Made Ground associated with historic activities on site (gravel of slag), low level hydrocarbons and PAH indicating the presence of bituminous material and industrial residues.

S3: Presence of potentially leachable metals within Made Ground.

4.6.3.2 Pathways

P1: Human uptake pathways: inhalation, ingestion, dermal contact.

P2: Direct contact with contaminated or corrosive soils.

P3: Contaminant leaching.

P4: Surface run-off.

P5: Vertical/horizontal contaminant migration via tidal groundwater.

P6: Contaminant migration along manmade pathways, e.g. services, foundations.

4.6.3.3 Receptors

R1: Construction and maintenance workers.

R2: Future site users and personnel.

R3: Construction materials (e.g. pipes, buried concrete, foundations).

R5: Controlled Waters: Superficial and Bedrock Aquifers.

R6: Offsite receptors (Tata Steel Complex, Ecological Receptors).

Table 4.2: Generic Quantitative Risk Assessment

Sources	Pathways	Receptors	Risk Classification	Comment
S1: Current use as a WwTW and the Proposed Scheme area being used for the storage of waste product and sludge associated with the WwTW. S2: Made Ground associated with historic activities on site (gravel of slag), low level hydrocarbons and PAH indicating the presence of bituminous material and industrial residues. S3: Presence of potentially leachable metals within Made Ground.	P1: Human uptake pathways: inhalation, ingestion, dermal contact	R1: Construction and maintenance workers	Probability: Likely Consequence: Mild Risk: Moderate	There is potential that construction and maintenance workers may encounter soils which contain heavy metals, TPH and PAH within shallow Made Ground soils. No free product has been identified, and no volatile petroleum hydrocarbons confirming there is no significant vapour risk. Construction workers should adhere to site specific risk assessments, method statements and the use of Personal Protective Equipment (PPE).
		R2: Future site users and personnel	Probability: Very Low Consequence: Minor Risk: Very Low	Site end users are unlikely to come into contact with contaminated shallow Made Ground deposits. Future site users are limited to site personnel using the permanent cabin. It is considered there is no viable pathway from source to receptor once the cabin is constructed and used in line with a commercial end use, as the concrete foundation will sever the pathway. No volatile petroleum hydrocarbons have been identified, confirming there is no significant vapour risk. With regard to ground gases, the site has been determined as CS1 in accordance with BS 8485:2015+A1:2019, therefore no specific gas protection measures are considered necessary; however, standard good practice measures during maintenance should be adopted.
	P2: Direct contact with contaminated or corrosive soils P3: Contaminant leaching	R3: Construction materials (e.g. pipes, buried concrete, foundations)	Probability: Likely Consequence: Minor Risk: Low	Within the Factual and Interpretative report, the risk to buried concrete has been assessed in accordance with the guidance presented in BRE Special Digest: 2005 and concludes that a DS ACEC classification of DS-3 AC-3 would be acceptable for all materials which would mitigate the moderate risk, given the likelihood that foundations will be in contact with Made Ground.
	P3: Contaminant leaching P5: Vertical/horizontal contaminant migration via tidal groundwater	R5: Controlled Waters: Superficial and Bedrock Aquifers	Probability: Low Consequence: Mild Risk: Low	As part of the 2025 Jackson Geoservices GI, the leachate data was considered reflective of heterogeneous Made Ground with no significant contaminant source and does not represent a significant risk to controlled waters due to the low solubility and low mobility of metals and heavy hydrocarbon fractions.
		R6: Offsite receptors (Tata Steel Complex, Ecological Receptors)	Probability: Low Consequence: Mild Risk: Low	As part of the 2025 Jackson Geoservices GI, no groundwater was encountered within the exploratory hole locations where the deepest exploratory hole base at 3.53m was dry. The dry exploratory holes indicate that the groundwater table is likely to be greater than 3.53mbgl. Exploratory holes WS1 and WS3 were dipped on 15th June 2026 to confirm groundwater levels. Groundwater was encountered in WS1 at 4.35 mbgl, and within WS3 at 4.61 mbgl, with groundwater at 3.49 mbgl at its highest throughout the day, considered deeper than the proposed excavations. Perched groundwater is considered a possibility within sand and gravel superficial deposits, however due to limited groundwater quantity and lack of connectivity with the bedrock aquifer, groundwater in superficial deposits is not anticipated to be impacted by the Proposed Scheme. The proposed scheme is not anticipated to interact with the bedrock aquifer. The depth to bedrock was found to be in excess of 30mbgl which is significantly below the depth of foundations associated with the Proposed Scheme. The nearest statutory protected site is located 3km south of the Proposed Scheme. Due to the distance, the small-scale nature of the development, and depth to bedrock aquifer, it is not anticipated that offsite ecological receptors will be impacted to the Proposed Scheme, including any groundwater baseflow to protected sites.
		R2: Future site users and personnel	Probability: Low Consequence: Mild Risk: Low	Site end users are unlikely to come into contact with contaminated shallow Made Ground deposits. It is considered there is no viable pathway between off site Made Ground, and future site users receptor.

5 Conclusion

Ground investigations carried out in 2025 determined that the Made Ground underlying the site contains typical contaminants associated with historical industrial activity; however, concentrations are low, largely immobile (heavy hydrocarbon fractions), and do not pose a significant risk to human health under the proposed commercial end use. There is no evidence of significant contamination sources, free product, or vapour risks. Risks to construction workers are recommended to be suitably managed through standard health and safety procedures and appropriate use of personal protective equipment.

Risks to controlled waters are considered negligible due to the low leachability and mobility of identified contaminants, the absence of shallow groundwater during investigation, and the limited scale and shallow depth of the Proposed Scheme. The development is not expected to impact underlying aquifers or nearby surface water features.

Ground gas is not considered a significant constraint to the proposed development. The Made Ground encountered on site, comprising predominantly ash and clinker and recorded at thicknesses of up to 3.7 m, is not considered to provide a viable source of significant ground gas generation. Limited hydrocarbon impacts were identified within soils and these consisted predominantly of heavier fraction compounds with low volatility. Ground gas monitoring results did not indicate the presence of significant ground gas concentrations. Furthermore, the proposed concrete slab foundation is not expected to create preferential migration pathways. On this basis, the risk from ground gas to the proposed development is considered to be low.

Materials encountered on site are suitable for reuse under an appropriate exemption of Material Management Plan or disposal offsite as non-hazardous waste.

In summary, the assessment demonstrates that there are no significant contaminant linkages that would preclude development. The site is considered suitable for the proposed use without the requirement for remediation, provided that:

- Appropriate construction phase controls (e.g. PPE, Pollution Prevention Plan) are implemented;
- If unforeseen contamination is found during groundworks, works are to be paused and MMB SHEQ Advisor contacted; and
- Any unforeseen contamination is assessed and managed in accordance with current guidance.

Subject to these measures, the proposed development can proceed in accordance with planning requirements and without unacceptable risk to human health, controlled waters, or the wider environment.