Ground Contamination Phase 1 Assessment
Plot 1

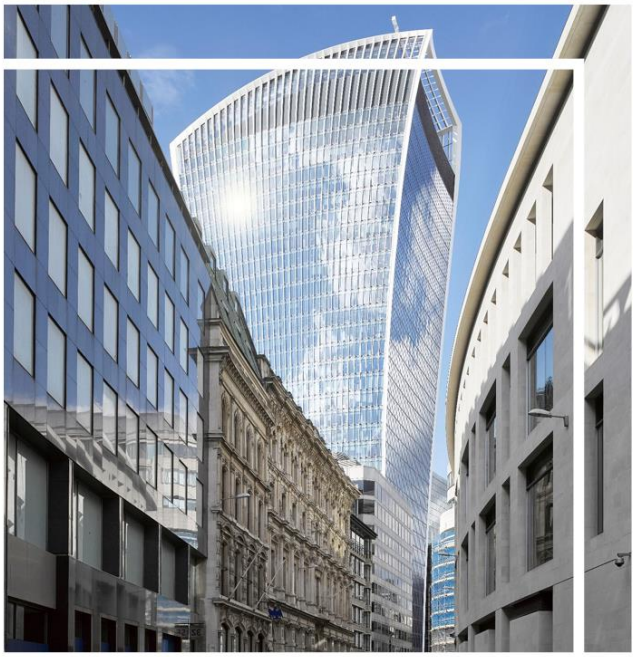
Cardiff Peninsula

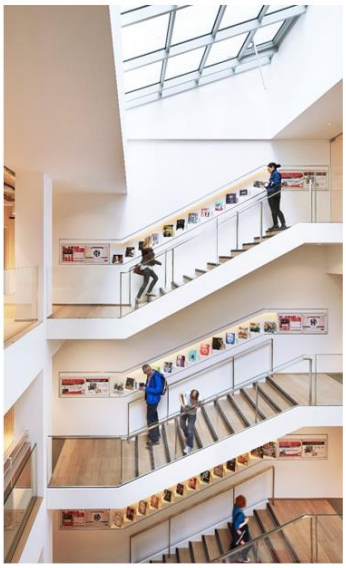
Orion Land & Leisure Ltd

26 April 2024

CPM-HIL-1A-0000-RP-E-PL-1001

Issue P01





Project Name:	Cardiff Peninsula
Report Name:	Ground Contamination Phase 1 Assessment
	Plot 1
Issue Status:	Final
Reference:	CPM-HIL-1A-0000-RP-E-PL-1001
Date of Issue:	26 April 2024
Issue:	P01
Author:	F PARSONS
Checker:	T READE
Approver:	C BIRCH
HM Project No:	35172

HM Office:

Shackleton House
Hays Galleria
4 Battlebridge Lane
London
SE1 2HP

T: +44 (0)20 7940 8888
hilsonmoran.com
@HilsonMoran
hilson_moran
Hilson Moran

Document History:

Issue	Date	Details
P01	26/4/2024	FINAL

Contents

1. Introduction

Hilson Moran has been commissioned to undertake a Phase 1 Ground Contamination Assessment to support a full detailed planning application for a residential scheme in relation to Plot 1 (the Site) on the Cardiff Peninsula.

The Plot 1 development is located adjacent to the River Ely, situated between the Cardiff Pointe development and the Cardiff International White Water Centre. The Application Site is currently used as a surface level car park. The location of the Site is shown in **Figure 1.1**. The National Grid Reference for the approximate site centre is ST 18044 72861.

Figure 1.1 Site Location (Source: Ascot Design, The Cardiff Peninsula Plot 1 – Stage 2 Report)

The Proposed Development is a C3 (Residential) development comprising senior living accommodation (circa 77 no. apartments) with associated car parking, cycle parking and landscaping, as illustrated in **Figure 1.2** overleaf.

The proposed scheme involves construction of a 4 to 5-storey residential block. The ground floor features a mixed-use layout, with residential units situated along the River Ely waterfront to the south, while amenity and plant rooms are positioned to the north. No basement is proposed for the development. The upper levels are designated for residential use exclusively.

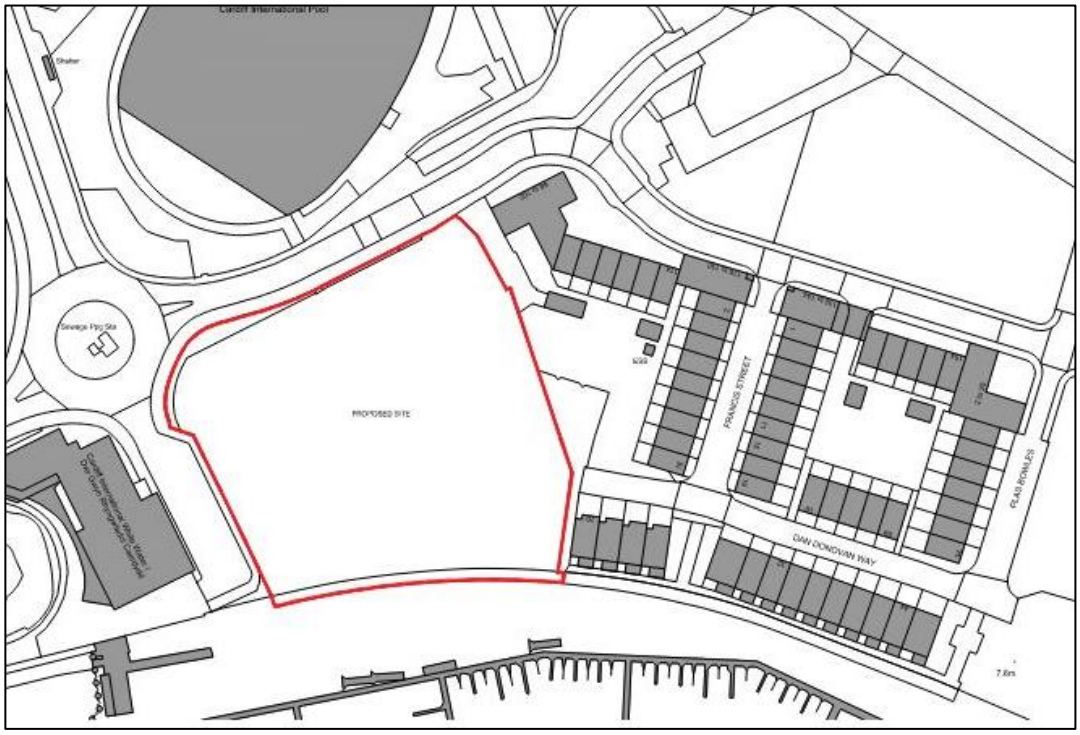


Figure 1.1 Application Site Boundary

1.1. Scope of Service

The purpose of the Phase 1 Contaminated Land Assessment is to determine the likely ground conditions below the site, what potentially contaminative activities may have occurred at the property or in the surrounding area which may pose an environmental or geological risk to site users, the surrounding environment or Proposed Development, either at present or in the future.

The Phase 1 Assessment will inform the development design, where relevant, and accompany the planning application for the redevelopment of the site.

There are numerous reports relating to ground conditions for the Cardiff Peninsula site (and wider Cardiff International Sports Village (CISV) development area) spanning over nearly two decades and these include work on the Plot 1 site. These detail the site history, potentially contaminative uses, intrusive site investigations completed, remediation works undertaken to address risks associated with identified ground contamination, ground conditions pre and post remediation and validation of the remediation works.

In order to verify the historical data for the Site, provide an indication of current ground conditions and obtain data upon which there is reliance, the Client commissioned a preliminary (Phase 0) geotechnical and geoenvironmental ground investigation on the Site. The ground investigation was carried out by A2 Site Investigation (A2SI) between April and June 2024. The information from the A2SI ground investigation has been used within this Phase 1 Assessment.

The scope of the Phase 1 Ground Contamination Assessment can be summarised to include the following:

- A review of existing ground investigation, remediation and validation reports for the Site.
- A walkover inspection of the Site and surrounding area;
- A search of archive records encompassing historical mapping and aerial photographs from publicly available resources and on-line sources.
- A desk-based review and collation of relevant data to identify other potential sources of contamination. This includes data on current surrounding land use, planning history, waste management sites, permits and consents and hazardous substances.
- A review of the environmental sensitivity of the Site to identify environmental receptors based upon available and collated geological, hydrological, hydrogeological, built environment and ecological data;
- Review and interpretation of the A2SI Phase 0 Ground Investigation Data for Plot 1.
- Development of a conceptual model of potential Source-Pathway-Receptor (SPR) linkages (known as pollutant or contaminant linkages);
- A preliminary assessment of the risk associated with the identified pollutant linkages for the proposed development with recommendations for the requirement for further site investigation and risk assessment and/or remediation to address uncertainties in the conceptual site model.

The Phase 1 Ground Contamination Assessment is focussed on the Proposed Development site, identified in **Figure 1.2**, and considers the potential for contamination risk associated with the site and surrounding area up to 250 m from the site boundary.

1.2. Environmental Risk Assessment

The contaminated land regime, set out in Part IIA of the Environmental Protection Act 1990 (as amended), was introduced to identify and clean-up land where contamination poses unacceptable risks to human health or the environment. Part IIA, its accompanying regulations, and statutory guidance came into force on 1st April 2000.

The main objective of Part IIA is to “provide an improved system for the identification and remediation of land where contamination is causing unacceptable risks to human health, or the wider environment given the current use and circumstances of the land”.

Part IIA defines contaminated land as “any land which appears to the Local Authority in whose area it is situated to be in such a condition, by reason of substances in, or under the land that:

- Significant harm is being caused or there is a significant possibility of such harm being caused; or,
- Pollution of controlled waters is being or is likely to be caused”.

Contaminated land is a material planning consideration and implications of contamination for development should be considered through the planning process to the extent that it is not addressed by other regimes, including Part IIA but also under Building Regulations and the Environmental Permitting Regulations. The role of planning when dealing with land that may be contaminated is to ensure a site is suitable for its proposed new use and to prevent unacceptable risk from pollution, for instance to water

resources such as groundwater and rivers. As a minimum following any development and remediation land should not be capable of being determined as contaminated land under Part IIA.

This report has been prepared in accordance with current planning policy and guidance on contaminated land for Wales, as detailed in Section 2. This includes guidance contained in the land contamination risk management (LCRM) guidance.

The LCRM guidance was published in October 2020, replacing CLR 11 'The Model Procedures for the Management of Land Contamination' dated 2004. The LCRM is used to:

- Identify and assess if there is an unacceptable risk (from land contamination);
- Assess what remediation options are suitable to manage the risk;
- Plan and carry out remediation; and,
- Verify that remediation has worked.

LCRM can be used in a range of regulatory and management contexts, including planning, assessing liabilities or under the Part IIA contaminated land regime. The LCRM guidance has been adopted by NRW and incorporated into the latest update (Version 4 September 2023) of the Welsh Local Government Association (WLGA) and Natural Resources Wales (NRW) contaminated land guidance document for developers: *WLGA & NRW, Development of Land Affected by Contamination: A Guide for Developers, 2023.*

NRW state that the LCRM guidance therefore should form the basis of any approach taken by developers to the risk posed by potentially contaminated land.

Stage 1 of the LCRM guidance is risk assessment based on the source-pathway-receptor (S-P-R) approach. Risk assessment is an iterative process which starts with a Preliminary Risk Assessment (PRA) and moves though generic and detailed tiers as more information is gathered, including intrusive site investigation data, and the level of uncertainty in the risk assessment is reduced.

This report presents the findings of a PRA that has been completed for the Proposed Development. The PRA comprises a desk-based study and site reconnaissance to provide information to allow development of an initial conceptual site model of potential S-P-R (contaminant) linkages and a qualitative evaluation of risk for the Proposed Development. This has been supplemented by intrusive site investigation data.

1.3. Disclaimer

This report has been prepared on behalf of and for the exclusive use of Orion Land & Leisure Ltd for whom the services were undertaken and is subject to and issued in connection with the provisions of the agreement set out by Hilson Moran Partnership Ltd. Hilson Moran Partnership Ltd accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report by any third party. Furthermore, this report is subject to the following limitations:

1) The concepts and information contained in this document are the property of Hilson Moran Partnership Ltd. Use or copying of this document in whole or in part without

the written permission of Hilson Moran Partnership Ltd constitutes an infringement of copyright.

2) Hilson Moran Partnership Ltd accept no responsibility for the completeness or accuracy of any information or documents upon which this report is based and which were provided to us by Orion Land & Leisure Ltd (or any other third parties).

3) The contents of and findings of this report are relevant as of the original date of the report and do not incorporate any facts or information which may have come into existence after the date of the report.

4) Hilson Moran Partnership Ltd has not taken any steps to update this report since it was produced and it accept no liability for any part of this report that has or may become inaccurate as a result of circumstances that have occurred or arisen in relation to the project after the date of this report.

2. Legislation and Guidance

2.1. Legislative Context

The assessment will be carried out with due regard to the following legislation:

- The Environmental Protection Act 1990 (as amended): Part 2A (created by Section 57 of the Environment Act 1995);
- Contaminated Land (Wales) Regulations 2006 (as amended);
- Environmental Damage (Prevention and Remediation) (Wales) Regulations 2009 (as amended);
- Planning Wales Act 2015 and Well-being of Future Generations (Wales) Act 2015
- Water Environment Regulations 2017.

2.2. Planning Policy and Guidance

The assessment will be carried out with due regard to the following policy and guidance:

- Environmental Protection Act 1990: Part 2A – Welsh Government Contaminated Land Statutory Guidance 2012 (Number WG192430).
- Planning Policy Wales (PPW), Edition 11, 2021 and Technical Advice Notes (TANs).
- WLGA & NRW, Development of Land Affected by Contamination: A Guide for Developers, 2023.
- Land Contamination Risk Management (LCRM) Guidance.
- CIRIA C552, Contaminated Land Risk Assessment: A Guide to Good Practice

3. Methodology

3.1. Desk Study

A desk-based study has been completed which has involved searching for, obtaining and reviewing available information regarding the history of the site and surrounding area, the current land uses and the local environmental setting including geology, hydrogeology, surface waters, ecologically important and designated sites.

As stated in Section 1.1, many reports have been produced relating to ground conditions for the Cardiff Peninsula site (and wider Cardiff International Sports Village (CISV) development area). There are previous site investigation reports spanning from 1995 through to 2012. Many of these reports have been produced by Ove Arup & Partners Ltd (Arup) who have been heavily involved with the investigation and remediation of the site.

A summary and overview of this historical work is provided in a report prepared by Arup in 2021, namely:

- Ground Conditions Technical Due Diligence, Cardiff International Sports Village, prepared for Cardiff County Council. Dated 6 August 2021.

This is the principal source of information for this assessment.

Other key previous reports and source of information for this assessment, particularly in relation to post remedial ground conditions, include:

- Arup Environmental Desk Study and Contamination Review Dated 17/01/12, Ref: 216460
- Arup Report Geo-Environmental Generic Quantitative Risk Assessment Rev B Dated 9/1/13 Ref: REP002
- Arup 2012 Report – ISV Waterfront Site – Review of Existing Geo-Environmental Information Rev B Dated 10 October 2012 for Greenbank Partnerships

The information obtained from the previous reports has been supplemented and updated by reference to present day environmental data searches (i.e., Envirocheck Reports) and by conducting online searches of readily available information sources which includes the following:

- Desk study completed by AKTII Ltd as part of their geotechnical assessment for the proposed development;
- A2SI Phase I Desk Study for Cardiff Bay Peninsula which was completed in May 2024 to support the A2SI ground investigation;
- Natural Resources Wales Interactive Map Viewer (https://naturalresources.wales/evidence-and-data/maps/browse-map-of-data-about-the-natural-environment/);
- British Geological Survey Map Viewers (www.bgs.ac.uk);
- British Geological Survey GIS datasets (www.bgs.ac.uk);
- Aerial Imagery from Google Earth;
- GIS Open Data (www.data.gov.uk).

3.2. Walkover Survey

A site reconnaissance survey was completed by an Environmental Consultant from Hilson Moran on 15th March 2024. A general description of the site and details of observations made with respect to land quality during the visit are provided in Section 4.1.

Photographs from the site visit are provided in Appendix A.

3.3. A2SI Phase 0 Ground Investigation

A2 Site Investigation (A2SI) were commissioned by the Client to carry out some preliminary intrusive ground investigation work to verify the existing data for the Site and provide up to date data on ground conditions including soil quality, groundwater conditions and ground gas. A summary of the scope and findings of the ground investigation are provided in Section 6 of this report with full details provided in the A2SI Cardiff Peninsula Interim Factual Ground Investigation Report (Ref: 48224-A"SI-XX-XX-RP-X-0002-00 dated June 2024.)

3.4. Preliminary Geo-Environmental Risk Assessment

The UK approach to managing contaminated land is risk-based. Risk management principles underlie the legislative requirements of Part IIA of the Environmental Protection Act 1990 (as amended) and the 'suitable for use' approach used in planning and development control. The process of identifying, estimating and evaluating the risks associated with contaminated land is described in the Land Contamination Risk Management (LCRM) guidance published in October 2020 and updated in 2021[i]. The assessment is based on the concept of identifying pollutant linkages that connect a pollutant source, via a pathway to a receptor (for example people, buildings, rivers, *etc*.).

Table 3.1 Definitions of Terms in the LCRM

Term	Definition
Source	The location from which an environmentally hazardous / contaminative substance is (or was) derived.
Receptor	An environmentally sensitive object or condition, *e.g.* person, property, controlled water or ecological system, which may be present now or in the future.
Pathway	A route or mechanism via which a source could come into contact with a receptor to cause significant harm.

If all three factors are identified, there is the potential for a 'pollutant linkage' to be active, which could result in significant harm being caused to the environment or human health. A preliminary conceptual model describing plausible pollutant linkages is developed using the data gathered during the desk study and a qualitative risk assessment completed. The risk classification is based on the framework presented in CIRIA C552[ii], outlined in Appendix E, which combines the probability of an event (pollutant linkage) occurring and the consequence if the event (linkage) was realised.

4. Site Description

4.1. Site Context

4.1.1. Development Site and Surrounding Area

A site visit was carried out by a ground contamination specialist from Hilson Moran on 15th March 2024.

The site is 0.85 ha in size and currently used as a car park which is accessed off Empire Way. To the north of the site is the Cardiff International Pool and Gym, to the west is the Cardiff International White Water Centre and to the east is the Cardiff Pointe residential units centred on Francis Way. The south of the car park is bound by trees and scrub which border the River Ely.

The car park comprised an asphalt surface with some kerbing, timber edging and metal barrier around the perimeter. There are a number of lighting columns and there are ACO drainage channels running across the car park.

There was no evidence of any significant surface staining by oils or hydrocarbons from vehicles and no other potential sources of contamination identified from the current use during the site visit.

4.1.2. Topography

The site is relatively flat laying, with ground level approximately at +7.5 to +8.0 mAOD throughout.

4.2. Site History

The following section provides a description of the site history from a review of historical maps and descriptions of site uses and activities that have occurred at the Site contained within the various sources of information listed in Section 3.1. A full set of historical maps can be found in the A2SI Desk Study Report.

4.2.1. Development Site and Surrounding Area

Cardiff Peninsula Background

Cardiff Peninsula (and wider CISV area) was predominantly mudflats and saltmarsh in the early 1800s but was reclaimed by surface tipping in the late 1800s and then became occupied by railway lines, embankments and warehouses. Later the Peninsula area was occupied by storage yards, warehouses, waste facilities and small industrial units.

To the west of the Peninsula was the former channel of the River Ely which was abandoned when the river was straightened and progressively filled with domestic refuse as part of a wider area of landfilling in the 1970s and 1980s.

Following several phases of intrusive site investigation and assessment, the Peninsula area was remediated as part of the CISV development between 2003 and 2005, this included remediation on Plot 1. Some additional remediation work was undertaken in 2008 in the southern end of the Cardiff Peninsula site, following additional investigation

work in 2006 by Arup. This supplementary remediation work did not include any areas within Plot 1.

The wider Cardiff Peninsula site has remained largely as undeveloped/vacant land since this date, except for parts of the site utilised for parking (including Plot 1) or as access roads for development in the wider area. In addition, two areas of the Cardiff Peninsula site have been utilised for the stockpiling of soils (under a Materials Management Plan) that were generated from the enabling works of the construction of Phases 1 and 2 of Cardiff Pointe. There are no stockpiles on the Plot 1 site.

Plot 1

The specific history of Plot 1 (previously known as ISV Site 2 in the Arup assessments) and immediate surrounds is detailed in Table 4.1 below. This information is taken from the Arup Technical Due Diligence Report and historical maps.

Table 4.1 Site History of Plot 1

Map Survey Date	Development Site and Immediate Surrounds
1880	Railway line running NE to SW through centre of the site leading to a jetty on the River Ely, which bounds the Site to the south 'Mooring' shown along this boundary. Second railway line in NW corner. Part of wider rail sidings across Peninsula leading to River Ely.
1900	An 'Engine House' present in the east of the Site along with associated sidings. An 'Iron Ore Wharf' is located to the south off the dockland/mooring.
1920	No significant change on Site. 'Old Reservoir' shown directly east of the Site.
1942	Engine House no longer shown. Development of the works directly east of the Site.
1954	Rail sidings appear to have been dismantled but not labelled as such.
1970-75	A domestic refuse tip encroaches on the eastern side of the site. Rail sidings to west now shown as dismantled with former rail line through centre of the Site shown as a 'Path'. Several 'Tanks' shown immediately east of the Site.
1982-84	No significant change
1990-94	Refuse tip no longer annotated. Surface is mainly comprising vegetation, with a depot yard to the north. Wharf still shown to the south.
2000-01	Wharf to the south is derelict. Site is overgrown with vegetation with exception of NE corner.

Map Survey Date	Development Site and Immediate Surrounds
2003-05	Remedial works undertaken on the site to prepare area for ISV development.
2009	Site is now shown as a car park (associated with the swimming pool to the north).
2016	No significant change (Ice rink has been constructed to north of swimming pool and residential housing constructed to the east)
Present Day	No change

Figure 4.1 below is an aerial photograph from circa 1940 and **Figure 4.2** shows the Site in 2000.

Figure 4.1 Historical Aerial Photograph 1940 (Source: DAS in production)

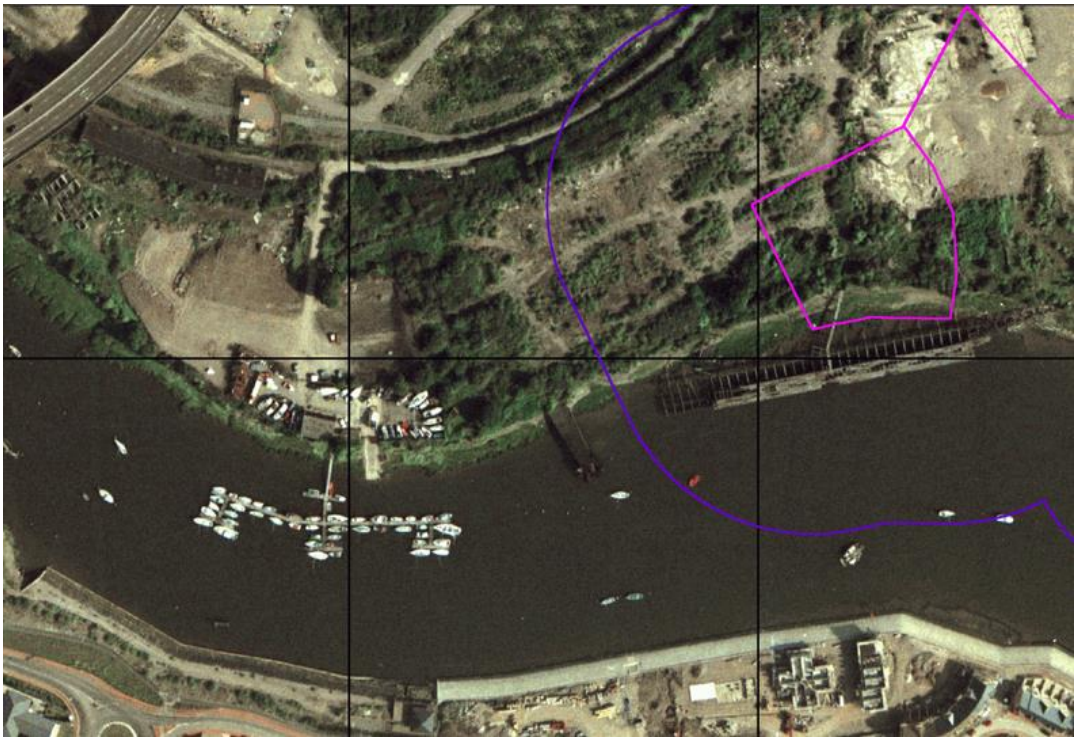


Figure 4.2 Historical Aerial Photograph Published 2000 (Source: A2SI Phase I Desk Study Report, Cardiff Bay Peninsula, May 2024 Ref: 48224-A2SI-XX-XX-RP-Y-0001-00)

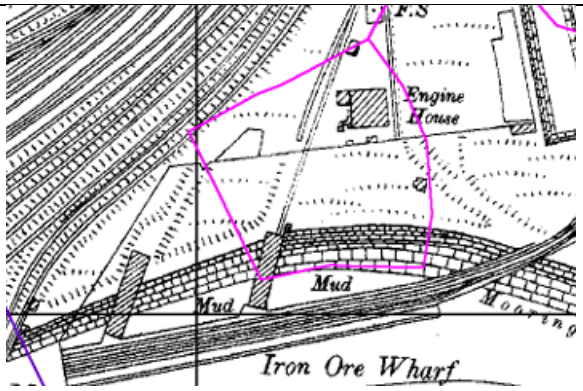
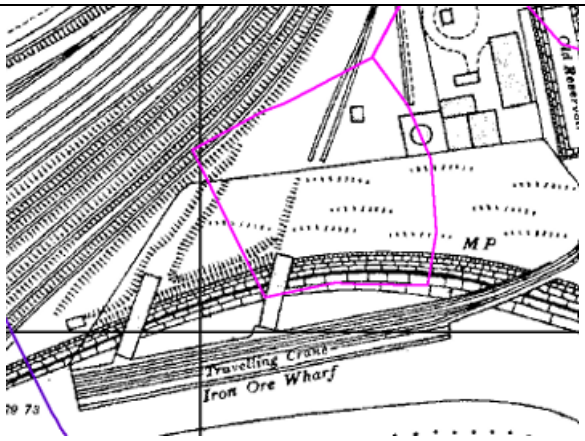
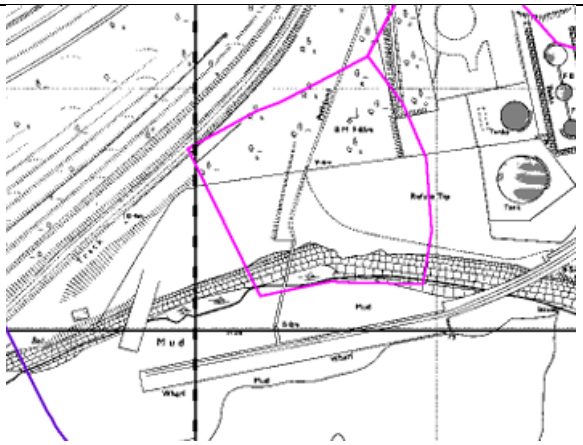
Extract from 1900 1:2500 Scale Ordnance Survey Map	
Extract from 1942 1:2500 Scale Ordnance Survey Map	
Extract from 1970 1:2500 Ordnance Survey Map	

Figure 4.3 Extracts from Historical Maps to Illustrate the Changes in Land Use (Source: A2SI Phase I Desk Study, Cardiff Bay Peninsula, May 2024, Ref: 48224-A2SI-XX-XX-RP-Y-0001-00)

5. Baseline

5.1. Site Context and Environmental Setting

The context and environmental setting of the site is summarised in Table 2.1 below. This is based on data contained within the information sources listed in Section 3.1, in particular the A2SI Desk Study Report and on-line data searches of publicly available information.

Table 5.1 Summary of Site Context and Environmental Setting

Item	Brief Description
Published Geology (BGS)	Superficial deposits - Tidal flat deposits characterized by clay, silt, and sand. Solid Geology – Mercia Mudstone Group. Additionally, information shows the presence of Made Ground, composed of artificial deposits present at the ground surface.
BGS Historical Boreholes	None shown on Site. Nearest is ST17SE154 located approx. 100m east dated 1963. Shows Made Ground over organic silty clay and silt.
Soils	Reclaimed Land.
Geological Hazards	Collapsible Ground - No Hazard Compressible Ground – Very Low to Moderate Hazard Ground Dissolution – No Hazard Landslide – Very Low to Low Hazard Running Sand – Very Low to Moderate Hazard Shrinking or Swelling Ground – Very Low Hazard
Mining or Worked Land	The area is not in area affected by coal mining and there is no hazard recorded from non-coal mining activities. There is an historic area of potentially infilled land to the east – on the Peninsula. Refuse tip on-site which indicates previous worked ground. Infilled channel of the River Ely to the N which again shows worked ground.
Radon	The majority of the Site falls within a 1km grid square within which there are bands of elevated radon potential. Maximum radon potential is 3-5%. See Figure 5.1. This represents a medium risk and basic radon protection measures are recommended in accordance with Building Regulations in England & Wales.

Item	Brief Description
Unexploded Ordnance	Preliminary threat assessment report provided in AKTII Plot 1 Stage 2 Report: During WWII, the Cardiff County Borough documented nine High Explosive (HE) bomb strikes per 100 hectares, categorizing the area as having a "very low" level of bombing. Luftwaffe aerial reconnaissance photography identified Penarth Docks (located 180m south of the site) as a primary bombing target. Further research revealed that during WWII, Penarth Docks became a major facility for handling military and naval stores and equipment. In 1943, the docks also hosted US soldiers in preparation for Operation Overlord. Air Raid Precaution (ARP) records associated with the site identified two HE bomb strikes within 1000m, 980m north-west and 990m north-west of the site area. However, supplementary research indicated that numerous houses on Queen's Road (520m south-east), Arcot Street (555m south), and Salop Street (705m south) were damaged by HE bombs and Incendiary Bombs (IBs) during WWII. Consequently, it is likely that additional bombing occurred in closer proximity to the site than documented within ARP records. Detailed UXO threat and risk assessment recommended and completed ahead of A2 ground investigation. Risk Level was classified as 'Medium' for Plot 1. Mitigation measures included a Risk Mitigation Strategy, the presence of an EOD Engineer during the ground investigation and an intrusive UXO survey.
Hydrogeology	Aquifer Designation: Superficial Deposits - Secondary Undifferentiated Aquifer Bedrock – Secondary B Aquifer Not located in a Source Protection Zone (SPZ). Medium Groundwater Vulnerability Previous investigations have encountered groundwater in both the Made Ground and the Fluvio-Glacial Gravels. Groundwater Abstractions: None indicated or recorded within 500m of the Site based on available information.
Hydrology	River Ely runs along the southern site boundary, flowing south-eastward into Cardiff Bay beyond the adjacent Yacht club. Sheet piled walls are installed along the southern boundary. Nearest Surface Water Abstraction: River Ely -Licence No. 21/57/31/0065 - 86m SW. Operator is Cardiff Harbour

Item	Brief Description
	Authority. Use for Sports Ground/Facilities: Fish Pass/Canoe Pass.
Flood Risk*	Zone 3 Flood Risk (Rivers and Sea) A low risk of flooding from surface water. Groundwater Flooding risk indicates the site as negligible flood risk.
Ecologically Sensitive Sites**	None located on Site or within 250m. Nationally & Internationally Designated Sites: None within 250m. Nearest approx. 1km east - Severn Estuary SSSI/SAC/SPA/Ramsar Priority Habitats: None within 250m NNRs/LNRs: None within 250m (nearest LNR approx. 1km away on north side of Cardiff Bay – Cardiff Bay Wetlands And Hamadryad Park) Ancient Woodland: None within 250m. Nearest >650m SW.
Visual & Cultural Designations	Based on available data at: https://datamap.gov.wales/maps/new?layer=inspire-wg:Cadw_ListedBuildings#/ There are no Listed Buildings within 250m of the Site.
Landfill and Waste Management Facilities	Site is known to have been used as a 'refuse tip' but this area was remediated in 2003-05. The historical landfill site was located in the central and eastern part of the site. Known as Tidal Harbour operating between 1963 and 1973, deposited waste recorded as including inert and industrial waste (WRC Ref 6815/0101). Infilled former River Ely Channel to the north-west (approx. 100m). Cut-off barrier and gas / leachate management system installed as part of remediation in early 2000s. Historical waste transfer station approx. 250m E – Atlantic Terminal (Licence Ref 88/03 Dated 1/4/1988 – now lapsed/cancelled/surrendered).
Current Industrial Land Use	None on-site – the Site is currently used as a car park. Approx 40m to the SW there is a sewage pumping station.
Hazardous Substances	There are no records of hazardous substance consents within 250m of the Site. The Oil Terminal on the opposite side of Cardiff Bay (approx. 1.75km east of the Site) is a COMAH Registered Site.

Item	Brief Description
Environmental Permits, Incidents, Registers, Consents	There are no Environmental Permits recorded within 250m. Nearest recorded Discharge Consents are historic: 2008 - Trade Discharge (Construction) to the River Ely from the Cardiff Canoe Facility (~100m E). 1987 – Trade Discharge to River Ely from Victoria Wharf – operated by Cardiff Bay Development Corporation (~130m W). There is one historic pollution incident recorded within 250m of the Site within the River Ely (not associated with the Site). It was a Category 3 Minor Incident involving Oils in 1998.
*For further information regarding flood risk refer to AKTII Drainage Strategy report and to Hilson Moran (HM) Flood Consequence Assessment. ** Further information on the ecology of the Site and surrounds is provided in the Ecological Assessment Report for the site.	

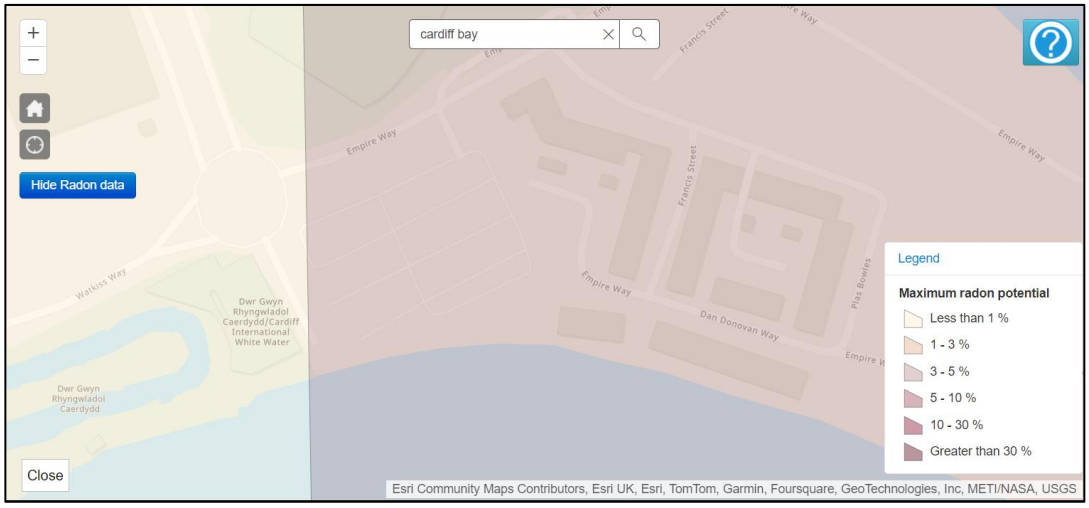


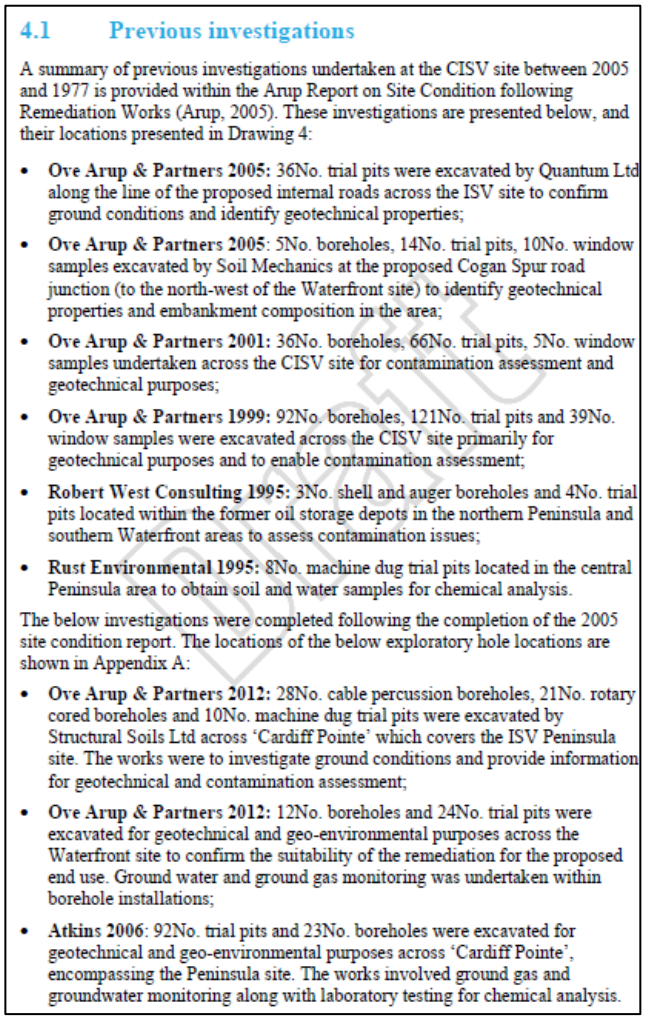
Figure 5.1 Radon Indicative Atlas of Radon Coverage Surrounding Development Site (Contains public sector information licensed under the Open Government Licence v3.0, British Geological Survey Materials © UKRI 2022 and Ordnance Survey data © Crown copyright and database right 2022)

5.2. Previous Ground Investigation

A summary of the previous investigations carried out at the CISV is provided in the Arup 2021 Technical Due Diligence Report, namely:

- Ground Conditions Technical Due Diligence, Cardiff International Sports Village, prepared for Cardiff County Council. Dated 6 August 2021.

Figure 5.2 below is an extract from the Technical Due Diligence Report which shows the number of previous investigation reports that exist for the CISV site.



4.1 Previous investigations

A summary of previous investigations undertaken at the CISV site between 2005 and 1977 is provided within the Arup Report on Site Condition following Remediation Works (Arup, 2005). These investigations are presented below, and their locations presented in Drawing 4:

- **Ove Arup & Partners 2005:** 36No. trial pits were excavated by Quantum Ltd along the line of the proposed internal roads across the ISV site to confirm ground conditions and identify geotechnical properties;
- **Ove Arup & Partners 2005**: 5No. boreholes, 14No. trial pits, 10No. window samples excavated by Soil Mechanics at the proposed Cogan Spur road junction (to the north-west of the Waterfront site) to identify geotechnical properties and embankment composition in the area;
- **Ove Arup & Partners 2001:** 36No. boreholes, 66No. trial pits, 5No. window samples undertaken across the CISV site for contamination assessment and geotechnical purposes;
- **Ove Arup & Partners 1999:** 92No. boreholes, 121No. trial pits and 39No. window samples were excavated across the CISV site primarily for geotechnical purposes and to enable contamination assessment;
- **Robert West Consulting 1995:** 3No. shell and auger boreholes and 4No. trial pits located within the former oil storage depots in the northern Peninsula and southern Waterfront areas to assess contamination issues;
- **Rust Environmental 1995:** 8No. machine dug trial pits located in the central Peninsula area to obtain soil and water samples for chemical analysis.

The below investigations were completed following the completion of the 2005 site condition report. The locations of the below exploratory hole locations are shown in Appendix A:

- **Ove Arup & Partners 2012:** 28No. cable percussion boreholes, 21No. rotary cored boreholes and 10No. machine dug trial pits were excavated by Structural Soils Ltd across 'Cardiff Pointe' which covers the ISV Peninsula site. The works were to investigate ground conditions and provide information for geotechnical and contamination assessment;
- **Ove Arup & Partners 2012:** 12No. boreholes and 24No. trial pits were excavated for geotechnical and geo-environmental purposes across the Waterfront site to confirm the suitability of the remediation for the proposed end use. Ground water and ground gas monitoring was undertaken within borehole installations;
- **Atkins 2006**: 92No. trial pits and 23No. boreholes were excavated for geotechnical and geo-environmental purposes across 'Cardiff Pointe', encompassing the Peninsula site. The works involved ground gas and groundwater monitoring along with laboratory testing for chemical analysis.

Figure 5.2 List of Previous Ground Investigation Reports

Key documents describing the ground conditions at CISV post remediation and hence likely present-day conditions are:

- Arup Environmental Desk Study and Contamination Review Dated 17/01/12, Ref: 216460
- Arup Report Geo-Environmental Generic Quantitative Risk Assessment Rev B Dated 9/1/13 Ref: REP002
- Arup 2012 Report – ISV Waterfront Site – Review of Existing Geo-Environmental Information Rev B Dated 10 October 2012 for Greenbank Partnerships

5.3. Ground Conditions Prior to Remediation

A Ground Model based on the previous investigations conducted across the Site and wider Peninsula area are presented in Section 4 of the AKTII Plot 1 – Stage 2 Report.

In summary, prior to remediation, ground conditions across the wider Cardiff Peninsula site generally comprised Made Ground (up to 7m thick) overlying Alluvium (between 5.0 to 18m thick) overlying Fluvio-glacial Gravels (3.0 – 8.0m thick) underlain by Mercia Mudstone. Made Ground was typically described as silty sandy gravelly clay with variable amounts of concrete, brick, limestone, ash, clinker, slag and rare amounts of organic matter, ash, plastic, metal and wood.

Plot 1 was previously identified as 'ISV Site 2 Area' with Made Ground identified typically as soft/firm, grey-brown, slightly sandy slightly gravelly very silty clay, gravel consisting of fine to coarse mudstone and sandstone, with occasional ash, coal, slag and brick ranging in thickness between 3.0 and 5.0m.

Historical investigations within the 'Site 2 Area' which was used as a landfill identified near surface hydrocarbon contamination including PAHs. No significant contamination was identified outside of the landfilled area within the Site 2 boundary. Elevated levels of ground gas (carbon dioxide greater than 1.5% v/v) were also recorded.

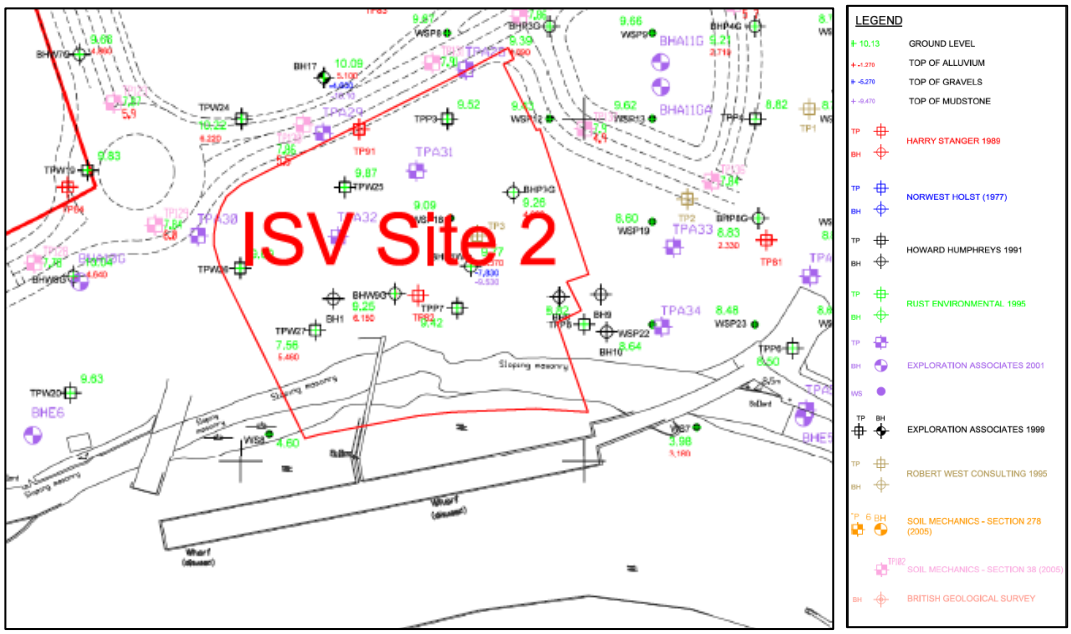


Figure 5.3 Site Investigations Conducted Prior to Remediation (Source: Extract from Figure 5, Arup 2012 Report – ISV Waterfront Site – Review of Existing Geo-Environmental Information)

5.4. Remediation

Available information indicates that the former landfilled area located on the eastern area of 'ISV Site 2' was found to be contaminated with hydrocarbons. As part of the remediation works undertaken by Churngold Remediation this area was known as 'Area 2' and was subject to excavation, sorting and removal off site of refuse to 3.0m below

ground level. In addition, ex-situ bioremediation of hydrocarbon contaminated soils was undertaken, where appropriate, together with the bioremediation of hydrocarbon contaminated materials from the wider Peninsula site to the east of the current day Plot 1 (referred to as Remediation Area 1).

The area was then backfilled with materials passing the compliancy standards set out in the Arup Remediation Strategy (Arup, 2002).

The area of contamination remediated in Plot 1 is shown on **Figure 5.4** below, which is an extract from the Arup Due Diligence Report.

It was originally proposed that future development would raise site levels to at least 8mOD for flood defence purposes and the remediation strategy for the wider CISV site requires future developers to provide at least 600mm of subsoil/topsoil conforming to a Class 1 standard (in residential gardens and children's play areas) or a Class 2b standard (in landscaped areas). Depending on the current and final site levels, this may require some excavation and replacement of the Class 2a and 2b material placed as part of the remediation works and/or the import of suitable material.

No additional remediation was carried out on Plot 1 as part of the 2008 remediation work.

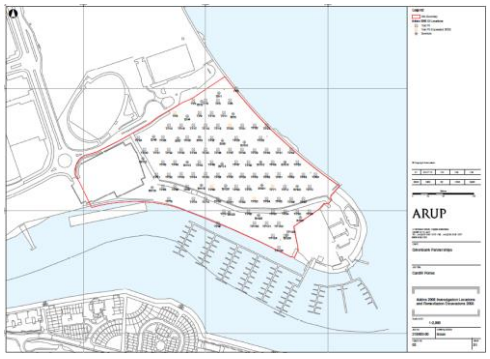
Figure 5.4 Areas Subject to Remediation in 2003-05 (Source: Drawing 003 from Arup Technical Due Diligence Note, Dated 2021 (Ref: 282542-00)

5.5. Ground Conditions Post Remediation

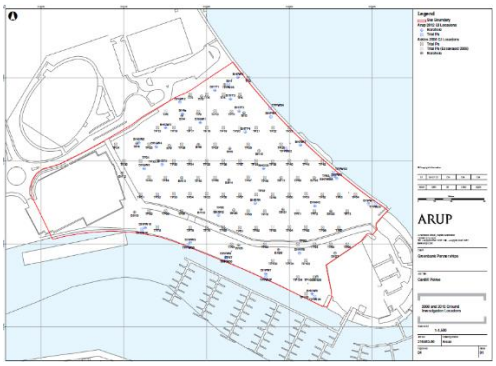
In their 2012 ISV Waterfront Site Report, Arup indicate that the only records of post-remediation ground conditions were those contained in the validation reports prepared by Churngold Remediation and possibly a report on ground improvement by Keller Ground Engineering. This original data is not available for review as part of this assessment. An assessment of the data against Generic Assessment Criteria and the Remediation Targets was carried out by Arup in 2012 however it is not clear from the Arup 2012 ISV Waterfront Site Report what data relates specifically to the ISV Site 2 (now Plot 1) area.

The overall conclusion by Arup in the 2012 Report was that as long as materials placed on-site met the Remediation Class 2a and 2b standards, then with respect to soils, the overall site was likely to be suitable for commercial use and suitable for residential use subject to placement of a clean cover layer. The report also states that there was no post-remediation ground gas data for ISV Site 2 to confirm the gassing regime post remediation.

Following a review of the 2013 Arup Geo-Environmental Generic Quantitative Risk Assessment Report for the Cardiff Pointe development it appears that neither the Atkins 2006 nor Arup 2012 ground investigations conducted following remediation works included the Plot 1 Site, as illustrated in **Figure 5.5** below.



Atkins 2006 Ground Investigation



2012 Arup Ground Investigation

Figure 5.5 Coverage of Previous Ground Investigations Post Remediation

It was indicated by Arup in their 2021 Technical Due Diligence Review that in terms of ground conditions post remediation for the ISV Site 2 area, that given the remediation involved excavations and general regrading that the original thickness of fill (which was found to be generally 3m to 5m thick) is likely to have been altered.

In terms of contamination status, it is inferred that soils are likely to be similar to those recorded outside of the 'refuse area'.

6. A2SI Ground Investigation 2024

6.1. Overview

In 2024, A2 Site Investigation (A2SI) were appointed by the Client to carry out a combined preliminary geotechnical and geo-environmental ground investigation. The intrusive elements of the ground investigation were carried out in April and May 2024 with subsequent groundwater and ground gas monitoring carried out in June 2024 together with geotechnical and chemical testing of soil and groundwater samples.

The scope and findings of the ground investigation are presented in the A2SI Factual Ground Investigation Report.

6.2. Geo-environmental Aims and Objectives

The overall aim of the ground investigation in relation to the geo-environmental aspects was to collect sufficient information to validate existing ground investigation information and support the risk assessments to be undertaken in relation to ground contamination and ground gas for planning purposes.

This included collecting preliminary information on the contamination status of soils and groundwater below the site and the ground gas regime to validate the existing data set, verify the remediation completed historically and provide an indication of the ground gas regime post remediation.

The specific objectives for the investigation in relation to ground contamination on Plot 1 were:

- Sampling of in-situ soils from selected proposed exploratory holes and chemical testing for contaminants of concern. Sampling focusing on the near surface soils (within the top 1m) but with additional limited sampling within deeper soils to assess residual hydrocarbon contamination is soils below 1m and within the remediated area.
- Monitoring for ground gas to provide an indication of the up-to-date data (post remediation) and provide an initial indication of the likely ground gas protection measures needed for the proposed new buildings.
- Gas monitoring included for volatiles due to the potential for residual hydrocarbons in soils and groundwater.
- Groundwater monitoring to verify groundwater regime, including flow direction and potential tidal fluctuations.
- Sampling and testing of groundwater (both perched groundwater within the Made Ground and deeper groundwater within the Fluvioglacial Gravels where appropriate) to provide an indication of the current groundwater quality below the Site.

6.3. Scope of Ground Investigation

In summary, the scope of the investigation on Plot 1 has comprised:

- The drilling of 3 no. deep boreholes to approx. 40m deep using rotary follow-on techniques. Groundwater and gas monitoring standpipes installed with response

zones targeting Made Ground in 2 no. holes (RC04 and RC05) with a VWP (piezometer) installed in RC06 targeting Tidal Flat Deposits.

- 1 no. shallow (5m deep) borehole using a dynamic sample rig installed with a groundwater/gas monitoring standpipe.
- 1 no. structural trial pit targeting the sheet piled wall on the south of the Site, adjacent to the River Ely.

Disturbed samples of soils were obtained from all exploratory holes and collected in suitable containers for chemical testing. Samples were taken within the top 200mm (to obtain representative samples of the overlying capping layer) and at 1m intervals or change in strata thereafter through the Made Ground. Representative samples of the underlying natural strata were also obtained.

Samples were screened on-site during drilling works for the presence of volatile hydrocarbons using a suitable Photo-ionisation Detector (PID), where appropriate.

Soil samples were scheduled by the appointed Hilson Moran Geo-Environmental Specialist as the ground investigation progressed.

A total 8 no. soil samples were scheduled for the following suite of chemical analysis:

pH, heavy metals, Total Petroleum Hydrocarbons (speciated), Polycyclic Aromatic Hydrocarbon (PAH)- speciated, BTEX compounds, Volatile Organic Hydrocarbons (VOCs), Semi-Volatile Organic Hydrocarbons (sVOCs), phenols, PCBs, sulphate, WS sulphate, sulphide, cyanide, asbestos screening & quantification where identified, organic content.

In addition, 1 no. sample was submitted for leachability testing and submitted for the following suite of analysis:

pH, EC heavy metals, Total Petroleum Hydrocarbons (speciated), Polycyclic Aromatic Hydrocarbon (PAH)- speciated, BTEX compounds, Volatile Organic Hydrocarbons (VOCs), Semi-Volatile Organic Hydrocarbons (sVOCs), phenols, PCBs, sulphate, WS sulphate, sulphide, cyanide, ammonia, nitrate.

Following the intrusive works, three rounds of groundwater and gas monitoring were conducted by A2SI. This included collecting a set of groundwater samples for chemical testing. Three number groundwater samples from Plot 1 (RC04 Deep, RC05A and WS04) were tested for the suite of analysis above.

Details of the monitoring installations are provided in Table 6.1.

Table 6.1 Details of Monitoring Installations – Plot 1

Monitoring Well	Response Zone	Strata
WS04	0.5 – 3.5m	Made Ground (Including reworked Tidal Flat Deposits)
RC04 – Shallow (S)	1.0 – 3.5m	Made Ground
RC04 – Deep (D)	15.5 – 19.0m	Glaciofluvial Deposits

Monitoring Well	Response Zone	Strata
RC05A	1.0 – 4.0m	Made Ground (Including reworked Tidal Flat Deposits)
RC06	1.0 – 3.5m	Made Ground

Ground gas monitoring on each visit included at a minimum for measuring the concentration of bulk and other gases (i.e. carbon dioxide, methane, oxygen, carbon monoxide, hydrogen sulphide). Gas flow rate was recorded together with peak and steady state concentrations of gases recorded. Ambient weather conditions were recorded including barometric pressure. Groundwater levels were measured following ground gas readings.

Monitoring also included measuring for the presence of volatile organic compounds within the soil gas using suitable analysing equipment and methods.

6.4. Findings of the Ground Investigation

6.4.1. Ground Conditions

Due to obstructions encountered during drilling a total of 7 no. exploratory holes were drilled/excavated within Plot 1 as part of the A2SI Phase 0 ground investigation (compared to the scheduled 5 no. exploratory holes):

- 3 no. deep (up to 20mbgl) boreholes (RC04, RC05A and RC06A),
- 1 no. shallow (5m deep) dynamic probe hole (WS04)
- 1 no. trial pit (TP01).
- 2 no. aborted boreholes. Due to obstructions boreholes RC05 and RC06 were terminated at 1.8mbgl and 6.5mbgl respectively. These boreholes were relocated and named RC05A and RC06A, as detailed above.

The location of the boreholes is shown on the A2SI Drawing No. 48224-A2SI-XX-XX-DR-Y-0001-01 Exploratory Hole Location Plan – Plot 1 Rev 00. This is replicated overleaf for ease of reference.

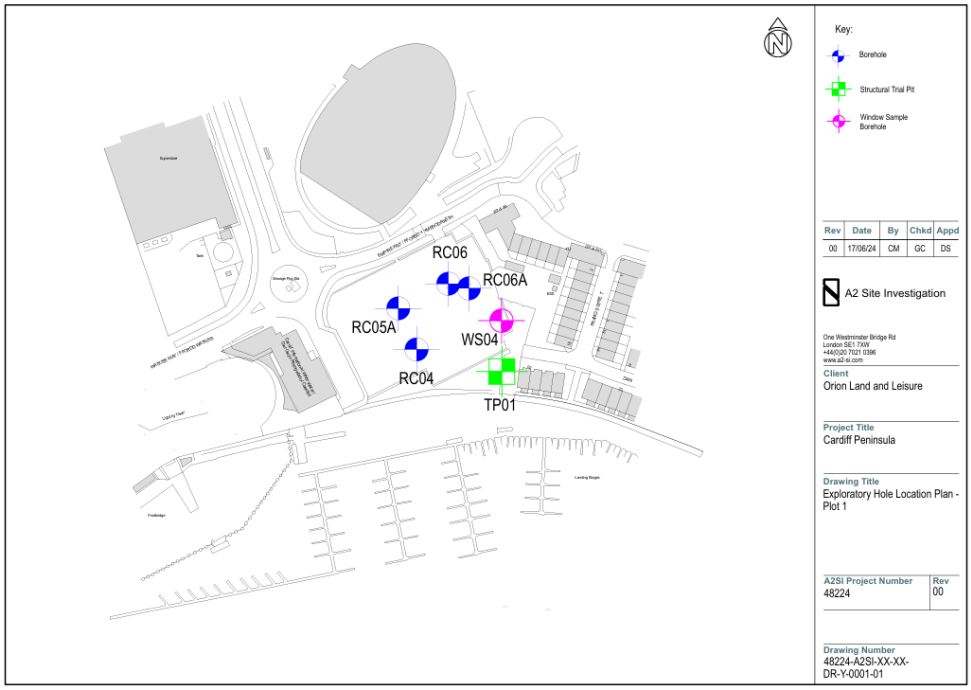


Figure 5.6 Location of Exploratory Holes – Plot 1 (A2SI Investigation)

Table 6.2 below provides a summary of the ground conditions encountered within these exploratory holes.

Table 6.2 Summary of Ground Conditions Based on A2SI Investigation

Strata	Depth Encountered (mbgl)	Thickness (m)	Description
Made Ground – Surface deposits within car park hardstanding area	0 to 0.7	0.7m RC04 0.6m RC05A 0.6m RC06	Within car park bituminous surface underlain by gravel and MOT Type 1 material Black membrane encountered around 0.6mbgl in RC05A and RC06. Plus 'tarmac' layer at 0.7mbgl in RC04.
Made Ground – Surface deposits outside car park hardstanding	0 to 0.5	0.5m in RC05	Grass over soft reddish brown very gravelly slightly sandy silty clay. Gravel is angular to sub-rounded fine to coarse mudstone, concrete, timber, plastic, membrane fragments and claystone.
Made Ground – General	0.6 to 4.0	2.8m RC04 1.9m RC05A 2.9m RC06 2.8m RC06A	Typically silty, sandy gravel of varying densities and with varying amounts plastic, brick, metal, slate, concrete and ash. Concrete slab at 1.20mbgl in RC04.

Strata	Depth Encountered (mbgl)	Thickness (m)	Description
			Obstruction at 1.8m (metal – possible anchor plie) in RC05.
Made Ground – Reworked Tidal Flats	2.5 to 6.0 (WS04 and RC05A)	1.0m RC04 2.20m RC05A 2.0m RC06A	Soft to very soft grey mottled orange-brown gravelly slightly sandy silty clay and soft to very soft brown mottled black silty clay with frequent organic fragments (roots) and rare gravel.
Tidal Flat Deposits/ Alluvium	3.5 to 15.5	11.0m RC04 9.8m RC05A >3m RC06 10m RC06A	Very soft dark greyish brown (mottled black in places) silty CLAY with frequent black organic material and slight organic odour. Becomes very dark grey with depth. No organic fragments from 4.8mbgl (in WS04). Sandy from 12.0m (in RC05A) RC06 terminated at 6.5m due to UXO Reading.
Glaciofluvial Gravels	14.5 to 19.0	3.5m RC04 3m RC05A 3m RC06A	Brownish, grey silty sandy GRAVEL of angular to sub-rounded fine to coarse sandstone, siltstone and mudstone with rare flint. Sand is fine to coarse.
Mercia Mudstone (weathered)	17.5 to 20.0 (base of boreholes)	0.4m proven RC04 0.2m proven RC05A 1.0m proven RC06A	Recovered as dense reddish-brown clayey sandy GRAVEL of sub-angular to sub-rounded fine to coarse mudstone becoming very stiff reddish brown mottled grey silty CLAY from 19.3m.

Hydrocarbon odours were encountered in three of the exploratory holes:

- WS04 – within the reworked tidal flat deposits between 2.5 and 3.5mbgl (PID reading 12.3ppm)
- RC06 – within the Made Ground between 0.6m and 0.8mbgl (PID reading of 11.5ppm recorded at 1.0mbgl in RC06)
- RC06A – within Made Ground between 1.2 and 4.0mbgl, becoming less below 3.0mbgl.

No other visual or olfactory evidence of contamination was encountered during the investigation with the exception of Made Ground which included ash deposits and possible fill deposits, such as the buried chain links encountered in TP01 at 1.5m.

6.4.2. Laboratory Test Results

Soils

The results of the chemical analysis of the 8 no. soil samples tested are provided in Appendix C with the original laboratory testing certificates provided in the A2SI Report.

A summary of the results is provided in Table 6.3 below.

Table 6.3 Summary of Chemical Analysis for Soil Samples

Parameter	Units	Min	Max
pH	pH Units	7.7	10.8
Arsenic	mg/kg	13	33
Cadmium	mg/kg	-	<0.2
Chromium	mg/kg	17	57
Copper	mg/kg	21	65
Lead	mg/kg	27	180
Mercury	mg/kg	-	<0.3
Nickel	mg/kg	11	34
Selenium	mg/kg	<1.0	1.9
Zinc	mg/kg	64	230
Speciated Total EPA 16 PAHs	mg/kg	<0.80	32.9
TPHCWG – Aliphatic >C5 – C35	mg/kg	<10	78
TPHCWG Aromatic >EC5 – EC35	mg/kg	<10	39
Total Phenols	mg/kg	-	<1.0
Total PCBs	mg/kg	-	<0.007
Total Cyanide	mg/kg	-	<1.0
Total Sulphate	mg/kg	640	2900
Water Soluble Sulphate*	mg/kg	87	740
Sulphide	mg/kg	13	49
Organic Matter	%	0.7	4.9

*Water Soluble Sulphate as SO_4 16hr extraction (2:1)

In addition to the results shown in Table 6.3:

- Asbestos was not detected in any of the soil samples.
- Volatile Organic Compounds (VOCs) were all recorded at below the level of detection (<5.0 ug/kg).
- The majority of Semi-Volatile Organic Compounds (SVOCs) were also recorded below the level of detection. There were three exceptions: Aniline, 2-Methylnaphthalene and Dibenzofuran were detected at very low levels in a total of five samples, as follows:
    - Aniline – RC06 0.2m (0.1 ug/kg)
    - 2-Methylnaphthalene – RC06 0.2m (0.1 ug/kg), TP01 1.5m (0.2 ug/kg), WS04 1.0m (0.8 ug/kg) and WS04 3.0m (0.1 ug/kg)
    - Dibenzofuran – RC05A 3.0m (1 ug/kg) and WS04 1.0m (0.4 ug/kg)

These are all either samples of Made Ground or Reworked Tidal Flat Deposits (WS04 3.0m and RC05A 3.0m)

Results have been compared against Generic Assessment Criteria (GAC) for Residential Use without Homegrown Produce (for 1% Soil Organic Matter) where available, as detailed in Appendix C. No exceedances of these GAC were recorded in any of the samples.

Leachability

Soil sample RC05A 1.50m comprising Made Ground was submitted for leachability testing. The results are provided in Appendix C with the laboratory certificates provided in the A2SI Report.

The results for organic contaminants are all recorded below the level of detection. For the inorganic contaminants tested, with the exception of a slight exceedance for copper, results are below water quality standards (which includes Drinking Water Standards (DWS) and Environmental Quality Standards (EQS)).

Groundwater

The results of the groundwater samples that were recovered and tested are provide in Appendix C with the full laboratory certificates provided in the A2SI Factual Report.

For the organic contaminants, including speciated PAHs, Petroleum Hydrocarbons, VOCs and Semi-VOCs results are below the level of detection. There are exceedances of WQS for heavy metals (arsenic and copper) in all 3 no. samples.

Table 6.4 summarises the recorded exceedances above Water Quality Standards (WQS).

Table 6.4 – Summary of Exceedances in Groundwater Data (A2SI Investigation)

	WQS	Range in Concentration (ug/l)	Exceedances above WQS
Arsenic	UKTAG – 5 ug/l DWS – 10 ug/l EQS – 50 ug/l	3.04-27.4	WS04 – 27.4ug/l
Copper	DWS – 10 ug/l EQS – 1 ug/l (AA)	0.8 – 2.3	RC05A – 2.3 ug/l WS04 – 1.9 ug/l
Mercury	UKTAG – 0.5 ug/l DWS – 1 ug/l EQS – 0.07 ug/l	<0.05 - 0.07	RC04 (D) – 0.07 ug/l
Selenium	DWS – 10 ug/l	7.7 - 19	RC04 (D) – 13ug/l WS04 – 19ug/l

Other notable points from the initial groundwater sampling data are:

- The range of Electrical Conductivity (EC) recorded. This ranged from 2500 uS/cm to 5700 uS/cm, with the highest recorded EC in RC04 (D). Conductivity ranges between water bodies, but typically lakes and streams have a conductivity range between 0-200 µS/cm, while major rivers can have a conductance value up to 1000 µS/cm. Water that has a conductivity range of 1000-10,000 µS/cm typically indicates that it is saline.
- A high Ammoniacal Nitrogen values was recorded in RC04 (D) at 39,000 ug/l (39 mg/l). This compares to a value of 1500 ug/l in RC05A.
- The pH is similar across the wells ranging from 7.2 to 7.7.

6.4.3. Groundwater Levels

The following observations on groundwater were made during drilling / excavation of the exploratory holes:

- RC04 – Arisings saturate from 15.0mbgl
- RC05 – No groundwater encountered (borehole terminated at 1.8mbgl)
- RC05A – Arisings wet from 4.0m
- RC06 - No groundwater encountered (borehole terminated at 6.5mbgl)
- RC06A – None recorded
- TP01 – No groundwater encountered
- WS04 – No groundwater encountered

Table 6.5 below provides a summary of the groundwater levels recorded in the monitoring wells on Plot 1.

Table 6.5 Summary of Groundwater Levels

	Visit 1 (mbgl)	Visit 2 (mbgl)	Visit 3 (mbgl)	Installation Base Recorded (mbgl)
WS04	2.60	2.79	2.62	3.50
RC04 (S)	3.48	Dry	3.48	3.49
RC04 (D)	4.92	4.84	4.99	19.46-1947
RC05A	2.67	2.64	2.55	3.76-4.11

6.4.4. Ground Gas

6.4.4.1. Monitoring Results

Monitoring for ground gas has been completed on 3 no. occasions following installation of the wells on Plot 1. A summary of the results for the bulk gases is provided in Table 6.6 below.

Table 6.6 Summary of Ground Gas Monitoring Results

	Strata	Methane (%v/v)	Carbon Dioxide (% v/v)	Oxygen (%v/v)	Flow Rate (l/hr)	VOCs (ppm)
Visit 1						
WS04	MG	<0.1	0.5	14.5	0.0	1
RC04 (S)	MG	<0.1	0.2	20.4	0.0	44
RC04 (D)	*TFD*	*54.6*	*0.6*	*3.4*	*0.0*	*<1*
RC05A	MG	<0.1	2.0	16.6	0.0	2
Visit 2						
WS04	MG	<0.1	2.1	13.9	0.0	<1
RC04 (S)	MG	<0.1	0.6	14.8	0.0	8
RC04 (D)	*TFD*	*52.6*	*1.7*	*0.3*	*0.0*	*<1*
RC05A	MG	<0.1	0.6	14.0	0.0	5
Visit 3						
WS04	MG	<0.1	0.7	14.7	0.0	1
RC04 (S)	MG	<0.1	<0.1	19.9	0.0	22
RC04 (D)	*TFD*	*50.0*	*1.5*	*2.2*	*0.0*	*<1*
RC05A	MG	<0.1	0.4	14.3	0.0	5

Notes to Table
Results are 'Steady' state recordings unless stated otherwise.

Visit 1 Carbon Monoxide and Hydrogen Sulphide both <10 ppm in all wells. Atmospheric Pressure: 1019 - 1021 mb ***Visit 2 - 10/6/24*** RC04 (D) Peak Flow Rate 25.2 l/hr with Peak Differential Pressure 261 Pa Carbon Monoxide and Hydrogen Sulphide both <10 ppm in all wells. Atmospheric Pressure: 1011 – 1013 mb **Visit 3 – 18/6/24** RC04 (S) Peak Concentrations CH4 – 0.4%v/v and CO2 9.6 %v/v Carbon Monoxide and Hydrogen Sulphide both <10 ppm in all wells. Atmospheric Pressure: 1020 – 1021 mb

Data for RC04 (D) has been included within Table 6.6 above, however, it should be noted that this monitoring installation is saturated across the response zone and therefore ground gas readings are not considered reflective of the ground gas conditions within the Glaciofluvial Gravels.

6.4.4.2. Gas Risk Assessment – Methane & Carbon Dioxide

In order to assess the risks to the new buildings and associated development, a preliminary ground gas risk assessment has been undertaken in accordance with guidance set out in British Standard BS8485:2015 Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide and with reference to CIRIA guidance C665 Assessing Risks Posed by Hazardous Gases to Buildings, 2007.

In accordance with the methodology set out in BS8485, hazardous gas flow rates (Q_{hg}) have been calculated for each of the monitoring wells, as shown in Appendix D. The hazardous gas flow rates are calculated as follows:

$$\textit{Hazardous gas flow rate } (Q_{hg})\ (l/hr) = \frac{\textit{Hazardous gas concentration (\% v/v) x Measured flow rate (l/hr)}}{100}$$

The Q_{hg} values in have been calculated using the maximum steady state flow rate and maximum gas concentrations measured at each monitoring well over the monitoring period.

In order to determine an appropriate Gas Screening Value (GSV) reference has been made to the guidance in BS8485, which states:

- That the selection of an appropriate Gas Screening Value (GSV) for the development should be made by inspection of all the data based on the conceptual site model for the situation with the developments sub-structure and foundations in place.
- Where a development is to be built directly on or over the source of gas then the hazardous gas flow rate (Q_{hg}) adopted should be based on gas measurements of the source.
- Where the dataset is representative and comprehensive the GSV should be the maximum Q_{hg} measured for all monitoring events.
- If the data set is temporally or spatially limited peak or maximum steady state data can be combined from more than one monitoring location and different monitoring rounds.
- Irrespective of the apparent comprehensiveness of the dataset, as a cross check the plausible worst-case condition should be calculated for each hazardous gas by

multiplying the maximum recorded flow in any standpipe (in that strata and zone) with the maximum gas concentration in any other standpipe in that strata and zone.

The aim is to derive a GSV that is suitably precautionary in principle to take account of data set limitations but does not result in unnecessarily conservative protection of the development.

Given that the gas monitoring data set is spatially and temporally limited as only three rounds of monitoring have been completed from 3 no. gas monitoring wells (excludes RC04 (D)), then plausible worst-case conditions have been calculated. It should be noted that the readings recorded in the deep groundwater monitoring well RC04 (D) which include high methane readings have not been included within the calculations because this well is not a ground gas monitoring well and is flooded across the response zone.

With reference to the data contained in Appendix D, the maximum Q_{hg} value recorded for carbon dioxide is 0.0021 l/hr is WS04. The maximum Q_{hg} value recorded for methane is 0.0001 l/hr for all 3 no. wells (excludes RC04 (D)).

In order to provide a cross check, the worst case GSVs for the site have been calculated by multiplying the maximum flow rate recorded across all wells (0.1 l/hr) by the highest recorded methane and carbon dioxide concentrations (0.1% and 2.1% respectively). This provides GSVs of 0.0001 l/hr for methane and 0.0021 l/hr for carbon dioxide. This is the same as recorded for individual wells.

It should be noted that zero gas flow was recorded at all wells but for the purposes of the gas risk assessment a flow rate of 0.1 l/hr has been assumed.

As these Q_{hg} values fall below 0.07 l/hr and methane concentrations fall below 1% and carbon dioxide levels are <5% then this equates to Characteristic Situation CS1 (Very Low Risk), in accordance with Table 2 of BS8485:2015. Under CS1, the gas protection score is zero i.e. gas protection measures are not required. Historically a CS3 classification has been attributed to the site. Further ground gas monitoring is required at the site to provide a robust set of data to draw conclusions on the risk presented by ground gas to the proposed development. This includes further investigation around RC04 (D) to understand more fully the elevated methane readings that have been recorded in this well.

6.4.4.3. Volatiles

Ground gas monitoring also included recording VOC levels at the monitoring wells. As can be seen from Table 6.4 detectable levels of VOCs were recorded in RC04 (S) and RC05A, with a maximum value of 44ppm recorded in RC04 (S). There was no evidence of hydrocarbons, VOCs or SVOCs within the analytical data for the soils tested from these exploratory holes or on the exploratory hole logs. Detectable amounts of a few SVOCs were recorded in other exploratory holes. Further data is required to draw any conclusions on the risk presented to the proposed development by VOCs.

6.4.5. Conclusions from the A2SI Investigation

There was uncertainty regarding post remediation ground conditions and contamination status of soils on Plot 1 (formerly known as ISV Site 2), with limited data available from historical investigations. Atkins considered that the original thickness of fill (which was found to be generally 3m to 5m thick) was likely to have been altered and that in terms of contamination status, soils were likely to be similar to those recorded outside of the 'refuse area', which were found not to be significantly contaminated.

The results of the A2SI Phase 0 Investigation indicate that the thickness and depth of fill / Made Ground deposits are very similar to those recorded in the original ground investigations, varying in thickness between 3.5 to 6.0m, taking into account observed reworked alluvial deposits. Made Ground was recorded as comprising both granular and cohesive (clay) fill compared to the original investigations which recorded typically sandy slightly gravelly very silty clay. Similar materials including some plastic, brick, concrete and ash were recorded within the fill deposits. There was no evidence of significant 'refuse' deposits in the former landfill area. Natural ground deposits underlying the Made Ground were found to be consistent with previous findings, comprising Tidal Flat Deposits, Glaciofluvial Deposits and bedrock of Mudstone.

The results of the chemical analysis of the soils confirms the conclusions drawn by Atkins regarding the contamination status of soils i.e. they are not significantly contaminated, with no exceedances above adopted GAC. There was some evidence of low-level hydrocarbon contamination (hydrocarbon odours on soils and detection of VOCs using the PID during the investigation) however this is not considered significant in terms of the proposed end use.

In terms of ground gas, initial results indicate low levels of carbon dioxide, negligible methane and zero flow rates associated with the Made Ground deposits, which would accord with the composition of the Made Ground recorded during the investigation. A preliminary risk assessment indicates the site would fall into CS-1, where no gas protection measures are required. However, historically a CS3 classification has been attributed to the site and the current ground gas data set is limited spatially and temporally.

Further ground gas monitoring is, therefore, required to provide a robust set of data to draw conclusions on the actual risk presented by ground gas to the proposed development. Data at RC04 (D) showed very high methane concentrations, with some initial flow but no steady state flow. This monitoring well is flooded across the response zone and therefore the ground gas readings are not considered reflective of the gassing regime in the Glaciofluvial Deposits but are a function of the reducing environment and artesian pressure within the groundwater monitoring well. The groundwater data for this well indicates elevated ammoniacal nitrogen levels which may also be contributing to these conditions. In addition, no monitoring has taken place across a period of falling atmospheric pressure which would be provide an indication of likely worst-case conditions.

Similarly, further data is required to understand the risks from volatile contaminants. Historically, VOCs were detected at depth and considered to present a potential risk to previously proposed developments. Data from the A2SI Investigation did not indicate any significant contamination by VOCs or VOCs in Made Ground or underlying deeper natural ground deposits. Detectable levels of a few SVOCs were recorded in shallow Made Ground samples and VOCs were detected in two monitoring wells during the ground gas monitoring.

7. Preliminary Geo-Environmental Risk Assessment

7.1. Sources

The potential sources of contamination associated with the current and historic use of the site are identified in Table 7.1.

Table 7.1 Potential Sources of Contamination

Land Use Type	Description of Source
Historic – Within Development Site	
Reclaimed Land	Area was subject to tipping when marshland area was reclaimed. Potential for made ground and infill materials.
Wharf Area	An engine shed to the east along with associated sidings. An iron ore wharf located to the south off the dockland.
Historic landfill	Former Refuse Area was found to contain hydrocarbon contamination and was remediated in 2003-2005.
Current – Within Development Site	
Car Park	Oils and hydrocarbons from leaks and spillages from vehicles using car park.
Historic – Surrounding Development Site	
Various industrial uses of Peninsula	Includes railways, wharfs, oil depot, warehouses etc. Remediation completed in 2003-05 and in 2008.
Current – Surrounding Development Site	
None	No significant present day land uses which could lead to contamination. Area comprises residential and leisure facilities including an ice rink, swimming pool and white water rafting centre.

Based on the results of the A2SI Phase 0 Investigation and taking into account the previous ground investigations and assessments that have been completed the potential sources of contamination which may present a hazard to the proposed Plot 1 development are considered to be:

- Made ground which historically have been shown to contain concentrations of metals and PAHs above residential use criteria in the top 1m. The results of the A2SI Phase 0 Investigation indicate the concentration of these contaminants are below the GAC for a residential end use without significant consumption of homegrown produce (i.e. without private gardens) and hence are unlikely to present a risk to the proposed residential development.

- Detectable low level volatile contamination within the soils which may present a risk of indoor inhalation. Limited data set and hence uncertainty over level of risk presented but included as a potential source at this stage.
- Elevated levels of ground gas (worst case Characteristic Situation CS3 previously assigned) recorded historically which require gas protection measures for new buildings. However, there was no ground gas data available to characterise the gassing regime post remediation works. Initial results from the A2SI Investigation indicate low levels of carbon dioxide but negligible levels of methane and no detectable flow within the Made Ground deposits. This equates to Characteristic Situation CS1, for which no gas protection measures are required. There is , however, uncertainty associated with the ground gas regime as the preliminary data set is limited spatially and temporally and further monitoring is, therefore, required as part of the detailed design phase of the development.

7.2. Receptors

The receptors that are commonly identified on potentially contaminated land sites can be divided into four groups comprising human health, water environment, flora and fauna and the built environment. The key receptors associated with the Proposed Development are detailed in Table 7.2.

Table 7.2 Receptors Relevant to the Development Site and Surrounding Area

Receptor Group	Identified Receptors Relevant to the Assessment
Human Health	• Future residents, site users and workers • Residents, workers and site visitors of neighbouring properties and developments • Construction workers
Water Environment	• Surface water (Cardiff Bay & River Ely) • Severn Estuary Ecological Designations • Superficial deposits are classified as a Secondary (undifferentiated) Aquifer and the bedrock is a Secondary B Aquifer
Flora and Fauna	• Soft landscaped areas of Proposed Development
Built Environment	• New building and associated utilities (including water supplies)

7.3. Pathways

7.3.1. Human Health

Human health receptors could be at risk if exposed directly or indirectly to contaminated soils or groundwater. The potential for future site users to be in direct contact with any soil or groundwater contamination is limited in areas of buildings and hardstanding: such as roadways and car parking. Exposure may, however, occur in areas of soft landscaping. There is the potential for exposure via ingestion or dermal contact with contaminated

soils in these types of areas. There is very limited areas of soft landscaping within the proposed scheme.

There is also the potential for both indoor and outdoor inhalation of vapours if volatile contaminants are present.

There is a risk to human health if ground gas enters buildings and concentrates in confined areas causing an explosive hazard or posing a risk to human health via asphyxiation.

With respect to exposure pathways associated with users of neighbouring properties a pathway will only exist if there has been off-site migration of contamination via groundwater or due to migration of volatile vapours or ground gas.

Demolition or construction workers may come into direct contact with contaminated material or groundwater during demolition and/or construction works. The implementation of good construction practices and environmental management combined with the use of appropriate personal protective equipment (PPE) and sensible house-keeping practices (such as washing hands before eating and not smoking whilst working) should mitigate any potential short-term hazards.

7.3.2. Water Environment

The following pathways have been identified as plausible for contaminants to reach the underlying aquifer:

1) Leaching of contaminants and vertical migration through overlying soils. Infiltration of rain into soils, encourages leaching and vertical migration of any soluble contamination. This will be limited where there is the presence of buildings/hardstanding. Areas of soft landscaping increase the potential for contaminant leaching and migration through soils following redevelopment. Infiltration via any proposed SUDs drainage design can also encourage leaching and migration of contaminants.
2) Exposure and disturbance of soils during construction could encourage the vertical migration of contaminants. This includes the potential for additional preferential pathways to be created through piling for foundations or for contaminants to be driven into underlying aquifers. The management of construction activities to prevent pollution is therefore important, including the assessment of risks associated with piling and other foundation solutions.

7.3.3. Flora and Fauna

The presence of phytotoxic contaminants can lead to detrimental effects on plant growth and survival. This occurs due to direct contact with contaminated soils or groundwater.

During construction, there could be a risk of dust blowing off-site and impacting flora and fauna off-site. This can be mitigated through implementation of dust suppression measures as part of any Construction Environmental Management Plan (CEMP).

7.3.4. Built Environment

With respect to buildings and utilities the only pathway for exposure is direct contact with contaminated soil or groundwater. Risks include the permeation of water supply pipe by hydrocarbon contamination, tainting water supplies and degradation of building materials.

Depending upon the ground conditions there is the potential for ground gas generated from on-site sources (such as biodegradable fill materials) or off-site sources (such as infilled pits) migrating into buildings or underground utilities and building up in confined areas causing an explosive hazard or posing a risk to human health via asphyxiation. The ground gas generation potential on this site has been assessed to be low.

7.4. Conceptual Model of Pollutant Linkages and Preliminary Risk Assessment

A summary of the potential pollutant linkages identified from the desk study and Phase 0 (Preliminary) Site Investigation is provided on Table 7.3. A qualitative risk assessment of these pollutant linkages has been undertaken using the method set out in CIRIA 552 'Contaminated Land Risk Assessment'. The scale of risk is determined from a matrix that combines the consequence of a hazard with the likelihood of the event happening. Details of the assessment method are included in Appendix E. The results of the assessment are included on Table 7.3.

7.4.1. Uncertainties

This preliminary conceptual model is based on available desk-based information, the findings of previous ground investigations undertaken prior to remediation of the site, and a preliminary (Phase 0) site investigation which has reduced the level of uncertainty normally associated with a desk based Phase 1 Assessment. However, the investigation that has been completed for the proposed development is preliminary in nature with spatial and temporal limitations, particularly in terms of the ground gas monitoring data.

Table 7.7.3 Summary of Potential Pollutant Linkages for On-Site and Off-Site Contaminant Sources

Source	Pathway	Receptor	Consequence	Likelihood	Risk Classification	Comment/ Recommendations
Made ground (including general fill materials following remediation) which has been classified as suitable for use below hardstanding/ buildings.	Direct contact (dermal & ingestion)	Future site users (Direct contact exposure limited to areas of soft landscaping)	Mild	Low Likelihood	Low	Preliminary (A2SI Phase 0) investigation indicates contaminant levels in soils (including Made Ground) are below the adopted GAC for residential use. However, the original Remedial Strategy for the ISV specifies a clean cover of at least 600mm in areas of soft landscaping to prevent end users coming into direct contact with Made Ground. Due to the nature of the Made Ground deposits this is still considered a sensible precautionary approach and is likely to be required to bring levels up to the required formation levels.
	Direct Contact and/or inhalation	Construction workers	Mild	Likely	Moderate-Low	Short term exposure. Risks can be mitigated through implementation of Construction Environmental Management Plan (CEMP), risk reduction measures, use of suitable personal protective equipment and good house-keeping practices (Construction workers).
	Direct Contact and/or inhalation such as in wind-blown dust	Residents of neighbouring properties	Medium	Low Likelihood	Moderate-Low	Risks can be mitigated through implementation of Construction Environmental Management Plan (CEMP) and risk reduction measures to prevent dust from blowing onto neighbouring sites.
	Off-site migration (migration in groundwater)	Ecological designations of Severn Estuary Flora & Fauna	Mild	Low Likelihood	Low	Preliminary (A2SI Phase 0) investigation indicates low potential for leaching of contaminants from soils. Implementation of CEMP during construction will mitigate any unacceptable risks that may be identified (dust *etc.*) to surrounding ecologically sensitive sites.
	Direct contact & plant uptake	Planting in soft landscaped areas	Minor	Low Likelihood	Very Low	Preliminary (A2SI Phase 0) investigation does not indicate high levels of phytotoxic contaminants. Site currently supports trees and other vegetation which did not appear distressed at the time of the site visit so considered unlikely and hence very low risk. Plus 600mm clean cover recommended (and required by original Remediation Strategy) in landscaped areas. This will also

Source	Pathway	Receptor	Consequence	Likelihood	Risk Classification	Comment/ Recommendations
						aid with poor physical quality of soils in terms of a growing medium.
	Direct contact	Future buildings Utilities	Mild	Low Likelihood	Low	Historic and current investigation do not indicate potential for corrosive substances and sulphate rich compounds which could impact the fabric of any future buildings. No evidence of gross hydrocarbon contamination that could impact water supply pipes.
	Run-off / migration in groundwater	Surface Waters: Cardiff Bay River Ely	Mild	Unlikely	Very Low	Increased risk during construction phases when soils are disturbed and also with the introduction of SUDs (If applicable). Risks can be mitigated through implementation of a CEMP during construction. Results of leachability testing on Made Ground sample undertaken as part of A2SI Investigation indicates low leachability potential.
	Infiltration & leaching of contamination with vertical migration in groundwater or via preferential pathway	Secondary Aquifers – Superficial Deposits & Bedrock	Mild	Low Likelihood	Low	Historical investigations and assessments have ruled out significant risks to groundwater. Results of leachability testing on Made Ground sample undertaken as part of A2SI Investigation indicates low leachability potential.
Potential ground gas at CS3 historically Volatile contaminants in the MG (indoor inhalation risk)	Migration and ingress of hazardous gases into buildings and utilities	Future site users	Severe	Low Likelihood	Moderate	Ground gas monitoring carried out as part of A2SI site investigation indicates CS-1 and no gas protection measures needed. Monitoring programme was limited to 3 weekly visits and 3 no. wells, therefore there is spatial and temporal uncertainty in the data and further monitoring is required to understand the ground gas risk. Erroneous high levels recorded in RC04 (D) – a groundwater monitoring well which warrants further investigation. Detectable but low levels have of volatile contaminants recorded in soils and in ground gas. Risk to future site users from volatile contaminants is likely to be low but further data is required to fully understand the risk.
		Buildings	Severe	Low Likelihood	Moderate	

7.5. Wider Considerations

The following tables provide a preliminary assessment of risks associated with wider geo-environmental issues surrounding the redevelopment based on the findings of the desk study and preliminary site investigation. The risk classifications are based on the CIRIA C552 framework[iii].

Table 7.4 Assessment of Risk from Environmental Factors

Aspect	Description	Potential of Risk
Foundation Design	For the scheme the recommended foundation solution is DCIS piles to be adopted for the majority of the site. CFA piles proposed to the area in close proximity of DCWW's main sewers, e.g. within the 15m zone from the outer face of the sewer. (Ref: AKTII Plot 1 Stage 2 Report) A foundation risk assessment will be required to assess the risks associated with piling or other ground stability techniques to ensure no unacceptable risks to groundwater. Leachability tests indicate low leaching potential of contaminants from soils.	**Moderate-Low**
Radon	Falls in 1km square on radon map with highest radon level of 3-5%. Basic radon protection measures are required in accordance with Building Regulations.	**Moderate-High**
PCBs	Not shown to be a contaminant of concern in previous investigations and no detectable levels recorded in A2SI Investigation.	**Low**
UXO	Potential for UXO – detailed assessment completed for the ground investigation which showed Medium Risk on Plot 1. BH06 terminated at 6.5mbgl by UXO Supervising Engineer due to a high reading.	**Moderate - High**
Asbestos (Ground)	Asbestos has not been detected in soils at the site as part of the A2SI Investigation. If such material is detected as part of any construction work then this material will need investigation and removal, in accordance with the Control of Asbestos Regulations 2012: Interpretation for Managing and Working with Asbestos in Soil and Construction & Demolition materials: Industry Guidance (CAR-SOIL™)[iv]	**Low**

Aspect	Description	Potential of Risk
Asbestos (Buildings)	Not applicable	**n/a**
Earthworks and Material Management	The redevelopment may result in the generation of waste soils as part of enabling ground works. If material is required to be disposed of off-site then the material will need to be classified for waste disposal purposes. All materials to be disposed of off-site will need to be done so in accordance with the Duty of Care Regulations. If soils are able to be re-used on-site, then a Materials Management Plan (MMP) will need to be developed for the development and submitted ahead of the works. A verification report will need to be produced following the re-use of materials to demonstrate that the MMP has been followed. Details of the scope should be as outlined in the CL:AIRE Definition of Waste: Development Industry Code of Practice (the Code of Practice).	**Moderate**

Table 7.5 Assessment of Risk Considering Regulation

Aspect	Description	Potential of Risk
Regulatory Consideration	The site is not currently designated as 'Contaminated Land' under Part IIA EPA 1990.	**Low**

8. Conclusions and Recommendations

Conclusions and recommendations regarding ground contamination and ground gas based on the findings of the desk study and A2SI Preliminary (Phase 0) Investigation:

- Ground conditions comprise Made Ground (up to 6m thick) overlying Tidal Flat Deposits, Glaciofluvial Deposits and Mudstone and confirm previous conclusions regarding the likely post-remediation ground conditions.
- Residual ground contamination including elevated levels of heavy metals and hydrocarbons (and possibly asbestos in soils) was anticipated based on historical information. However, the results of the A2SI Investigation indicate that soils within Plot 1 are not significantly contaminated, with no exceedances of the GAC for Residential Use (without significant consumption of homegrown produce). No asbestos was detected in any of the samples analysed. There was some evidence of low level / residual hydrocarbon contamination noted during the investigation including hydrocarbon odours but these are not considered a significant risk in the context of the proposed development.
- Due to the physical nature of the fill/Made Ground a clean cover material (as specified in the original ISV Remediation Strategy) is recommended in areas of soft landscaping to provide a suitable growing medium. There is a requirement to raise site levels by circa 750mm for flood risk purposes therefore importation of soils is required in any case and are recommended as a precautionary measure.
- Groundwater quality is generally good given the history of the site and surrounding area and risks to water resources are considered low. With the exception of slightly elevated heavy metals above water quality standards in all three groundwater samples analysed other parameters were below the level of detection. A potentially high level of ammoniacal nitrogen was recorded in RC04 (D) which is located in the Glaciofluvial Gravels which warrants further investigation. An additional round of groundwater sampling is due to be undertaken as part of the A2SI Investigation. Results are not available at the time of writing.
- Initial ground gas monitoring results indicates gas characteristic situation CS-1, where no ground gas protection measures on buildings are required. However, only a limited ground gas monitoring programme has been undertaken as part of the A2SI Investigation. Further ground gas monitoring is required as part of the detailed design of the development to provide a robust dataset and aid the assessment and understanding the ground gas regime and risk to the proposed development.
- Potential risks of indoor inhalation of volatile contaminants by future site users which may require mitigating through incorporation of suitable VOC resistant membranes in building design. Dataset is limited and further information, including soil gas monitoring is required to fully understand the risk. A2SI Investigation only indicated low levels of volatiles in soil gas in some monitoring wells and very low levels of a few SVOCs in Made Ground.
- The site falls in a 1km square on the radon map with highest radon level of 3-5%. Basic radon protection measures are required in accordance with Building Regulations.
- As indicated above, raising of site levels is required for flood risk purposes (to 8.92mAOD which is broadly 750mm above existing ground level – Ref: AKTII Drainage & Earthworks Strategy Report, Dated March 2024). Excavation for foundations, roads, services and drainage will generate subsoil arisings however initial calculation by

AKTII indicate there will be a shortfall of approximately 2000m^3. There is a potential to utilise the stockpiled material located on the Peninsula to make up the shortfall. This material was previously classified as 'General Fill' in accordance with the original CISV/Cardiff Pointe remediation strategy. Use of this material will be subject to ensuring that there is an up to date Materials Management Plan for the site and confirmation of the suitability of the material.

- Drainage designs (including SUDs) will require consideration of residual ground contamination. An efficient system for the collection of storm and foul water from the site and conveyance to an appropriate receptor is required; and Measures to remove background contaminants from surface water drainage prior to discharge and to contain any accidental liquid spillages at the site also required. Initial indications from the A2SI Investigation are that the soils have a low leaching potential with respect to contaminants.
- Foundation designs include the use of piling therefore a piling risk assessment will be required as part of the detailed design to assess the risk to underlying Secondary Aquifers (Superficial and Bedrock). However, initial indications from the A2SI Investigation suggest risks will be low.
- There was evidence of residual hydrocarbon contamination in the Made Ground recorded during the A2SI Investigation. There may be risks to underground utilities (underground water supply pipes) from the presence of residual hydrocarbons in soils and perched groundwater which will need further assessment and possible mitigation by selection of appropriate supply pipe material.
- Potential for UXO. The detailed assessment completed for the ground investigation showed Medium Risk on Plot 1. Borehole BH06 terminated at 6.5mbgl by UXO Supervising Engineer due to a high reading. Further assessment and mitigation will be required as part of the construction work.

Appendix A Site Walkover Photos

Photo 1: Plot 1 – View south-east across car park towards residential properties

Photo 2: View west across car park towards White Water Centre

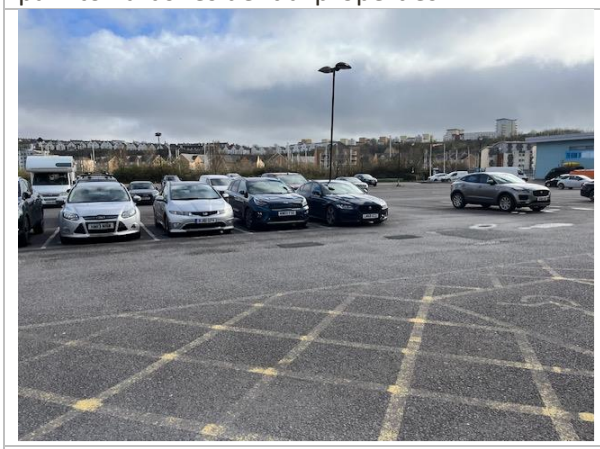


Photo 3: View south-west across car park

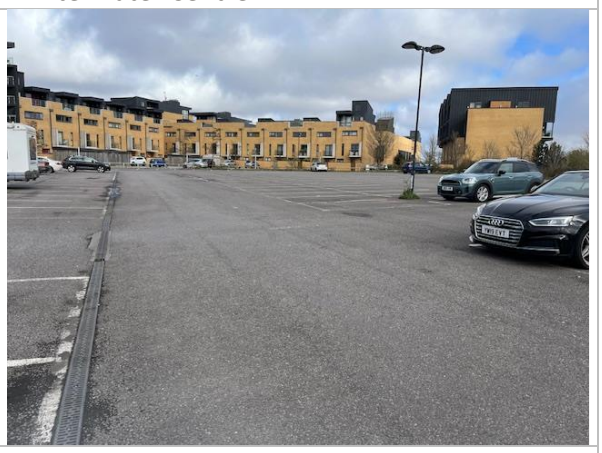


Photo 4: View east across car park

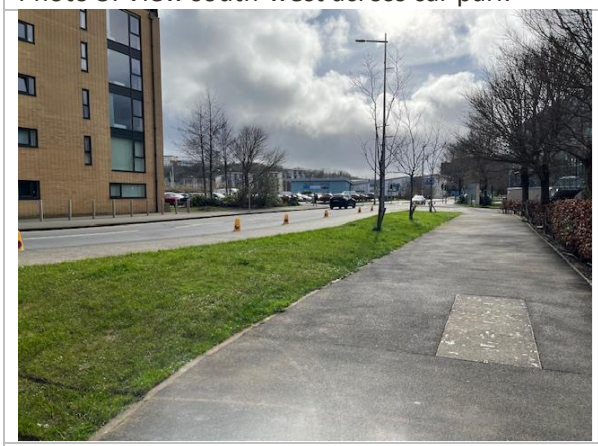


Photo 5: View east along northern boundary with Empire Way

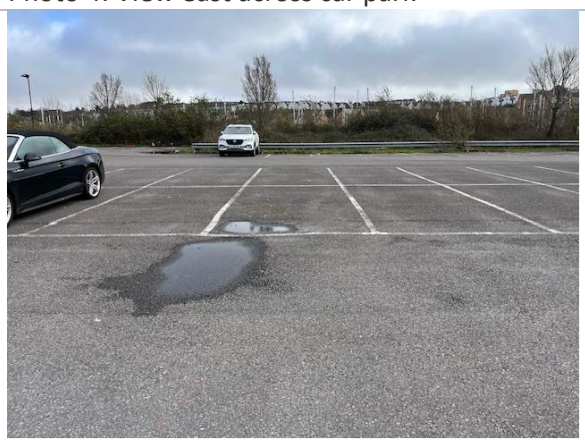


Photo 6: View south across car park towards River Ely

Appendix B Risk Classification Framework

Table B.8.1 Classification of Consequence

Classification	Definition	Examples
Severe	Short term (acute) risk to human health likely to result in 'significant harm' as defined by the Environmental Protection Act 1990 (as amended), Part IIA. Short-term risk if pollution [note: Water Resources Act does not contain provision for consideration of the significance of pollution] of sensitive water resource. A short-term risk to a particular ecosystem, or organism forming part of such an ecosystem. [Note: the definition of ecological systems in the Defra Contaminated Land Statutory Guidance, 2012).	High concentrations of cyanide on the surface of an informal recreation area. Major spillage of contaminants from site to a controlled water. Explosion, causing building collapse (can also equate to short-term human health risk if buildings are occupied).
Medium	Chronic damage to human health ('significant harm' as defined by Defra Contaminated Land Statutory Guidance 2012). Pollution of sensitive water resources. A significant change in a particular ecosystem, or organism forming part of such ecosystem. [Note: the definition of ecological systems in the Defra Contaminated Land Statutory Guidance 2012].	Concentration of contaminant from the site exceeds the generic or site-specific assessment criteria. Leaching of contaminants from a site to a principal or secondary aquifer. Death of species within a designated nature reserve.
Mild	Pollution of non-sensitive water resources. Significant damage to buildings, structures and crops ('Significant harm' as defined in Defra Contaminated Land Statutory Guidance 2012 and Environmental Protection Act 1990 (as amended) Part IIA). Damage to sensitive buildings/structures or the environment.	Pollution of non-classified groundwater. Damage to building, rendering it unsafe to occupy (*e.g.* foundation damage resulting in instability).
Minor	Harm, although no necessarily significant harm, which may result in a financial loss or expenditure to resolve. Non-permanent health effects to human health (easily prevented by means such as personal protective equipment *etc.*). Easily repairable effects of damage to buildings/structures.	The presence of contaminants at such concentration is that protective equipment is required during site works. The loss of plants in landscaping scheme. Discolouration of concrete.

Table B.8.2 Classification of Probability

Classification	Definition
High Likelihood	There is a pollution linkage and an event which would either appear very likely in the short-term and almost inevitable over the long-term, or there is evidence at the receptor of harm or pollution.
Likely	There is a pollution linkage and all the elements are present in the right place which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short-term and likely to occur over the long-term.
Low Likelihood	There is pollution linkage and circumstance are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place and is less likely in the shorter term.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long-term.

Table B.8.3 Risk Classification Matrix

		Consequence			
		Severe	Medium	Mild	Minor
Probability	High Likelihood	Very High Risk	High Risk	Moderate Risk	Moderate/Low Risk
	Likely	High Risk	Moderate Risk	Moderate/Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate/Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate/Low Risk	Low Risk	Very Low Risk	Very Low Risk

Appendix C - Chemical Test Results

Analytical Report Number: 24-024595
Project / Site name: Cardiff Peninsula

Lab Sample Number								224783	224784	224787	
Sample Reference								RC04(Deep)	RC05A	WS04	
Sample Number								None Supplied	None Supplied	None Supplied	
Depth (m)								None Supplied	None Supplied	None Supplied	
Date Sampled								Deviating	Deviating	Deviating	
Time Taken								None Supplied	None Supplied	None Supplied	
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	**DWS**	**EQS Freshwater Priority Haz Subs (Max Allowable)**	**EQS Freshwater Specific Pollutants (Annual Average)**	**UKTAG**	PLOT 1 GF Gravel	PLOT 1 MG	PLOT 1 MG	
General Inorganics											
pH (L099)	pH Units	N/A	ISO 17025			pH 6 - 9 (max)		7.2	7.6	7.7	
Electrical Conductivity at 20°C	µS/cm	10	ISO 17025					5700	2500	4700	
Total Cyanide	µg/l	10	ISO 17025	50		1		< 10	< 10	-	
Sulphate as SO_4	mg/l	0.045	ISO 17025			400,000		41.4	185	-	
Sulphide	µg/l	5	NONE					< 5.0	< 5.0	-	
Ammoniacal Nitrogen as NH_3	µg/l	15	ISO 17025					39000	1500	-	
Nitrate as N	mg/l	0.01	ISO 17025					0.12	0.17	-	
Nitrate as NO_3	mg/l	0.05	ISO 17025	50				0.51	0.76	-	
Speciated PAHs											
Naphthalene	µg/l	0.01	ISO 17025		130			< 0.01	< 0.01	< 0.01	
Acenaphthylene	µg/l	0.01	ISO 17025					< 0.01	< 0.01	< 0.01	
Acenaphthene	µg/l	0.01	ISO 17025					< 0.01	< 0.01	< 0.01	
Fluorene	µg/l	0.01	ISO 17025					< 0.01	< 0.01	< 0.01	
Phenanthrene	µg/l	0.01	ISO 17025					< 0.01	< 0.01	< 0.01	
Anthracene	µg/l	0.01	ISO 17025		0.1		0.05	< 0.01	< 0.01	< 0.01	
Fluoranthene	µg/l	0.01	ISO 17025		0.12			< 0.01	< 0.01	< 0.01	
Pyrene	µg/l	0.01	ISO 17025					< 0.01	< 0.01	< 0.01	
Benzo(a)anthracene	µg/l	0.01	ISO 17025					< 0.01	< 0.01	< 0.01	
Chrysene	µg/l	0.01	ISO 17025					< 0.01	< 0.01	< 0.01	
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025		0.017		0.05	< 0.01	< 0.01	< 0.01	
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025		0.017		0.05	< 0.01	< 0.01	< 0.01	
Benzo(a)pyrene	µg/l	0.01	ISO 17025	0.01	0.27		0.005	< 0.01	< 0.01	< 0.01	
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025				0.05	< 0.01	< 0.01	< 0.01	
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025					< 0.01	< 0.01	< 0.01	
Benzo(ghi)perylene	µg/l	0.01	ISO 17025		0.0082		0.05	< 0.01	< 0.01	< 0.01	
Total PAH											
Total EPA-16 PAHs	µg/l	0.16	ISO 17025	0.1	0.00017 (AA)			< 0.16	< 0.16	-	
Heavy Metals / Metalloids											
Arsenic (dissolved)	µg/l	0.15	ISO 17025	10		50	5	4.61	3.04	27.4	
Cadmium (dissolved)	µg/l	0.02	ISO 17025	5	0.45**			< 0.02	< 0.02	0.02	
Chromium (dissolved)	µg/l	0.2	ISO 17025	50		4.7[k]	5*	0.3	0.2	0.8	
Copper (dissolved)	µg/l	0.5	ISO 17025	2		1[k]		0.8	2.3	1.9	
Lead (dissolved)	µg/l	0.2	ISO 17025	10	14		5	< 0.2	< 0.2	0.6	
Mercury (dissolved)	µg/l	0.05	ISO 17025	1	0.07		0.5	0.07	< 0.05	< 0.05	
Nickel (dissolved)	µg/l	0.5	ISO 17025	20	34			4.3	3.1	12	
Selenium (dissolved)	µg/l	0.6	ISO 17025	10				13	7.7	19	
Zinc (dissolved)	µg/l	0.5	ISO 17025	-		10.9[k]		2.3	2	3.6	
Petroleum Hydrocarbons											
TPH - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	µg/l	1	ISO 17025					< 1.0	< 1.0	< 1.0	
TPH - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	µg/l	1	ISO 17025					< 1.0	< 1.0	< 1.0	
TPH - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	µg/l	1	ISO 17025					< 1.0	< 1.0	< 1.0	
TPH - Aliphatic >EC10 - EC12 $_{EH\_1D\_AL\_MS}$	µg/l	10	NONE					< 10	< 10	< 10	
TPH - Aliphatic >EC12 - EC16 $_{EH\_1D\_AL\_MS}$	µg/l	10	NONE					< 10	< 10	< 10	
TPH - Aliphatic >EC16 - EC21 $_{EH\_1D\_AL\_MS}$	µg/l	10	NONE					< 10	< 10	< 10	
TPH - Aliphatic >EC21 - EC35 $_{EH\_1D\_AL\_MS}$	µg/l	10	NONE					< 10	< 10	< 10	
TPH - Aliphatic >EC5 - EC35 $_{HS+EH\_1D\_AL\_MS}$	µg/l	10	NONE					< 10	< 10	< 10	
TPH - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	µg/l	1	ISO 17025					< 1.0	< 1.0	< 1.0	
TPH - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	µg/l	1	ISO 17025					< 1.0	< 1.0	< 1.0	
TPH - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	µg/l	1	ISO 17025					< 1.0	< 1.0	< 1.0	
TPH - Aromatic >EC10 - EC12 $_{EH\_1D\_AR\_MS}$	µg/l	10	NONE					< 10	< 10	< 10	
TPH - Aromatic >EC12 - EC16 $_{EH\_1D\_AR\_MS}$	µg/l	10	NONE					< 10	< 10	< 10	
TPH - Aromatic >EC16 - EC21 $_{EH\_1D\_AR\_MS}$	µg/l	10	NONE					< 10	< 10	< 10	
TPH - Aromatic >EC21 - EC35 $_{EH\_1D\_AR\_MS}$	µg/l	10	NONE					< 10	< 10	< 10	
TPH - Aromatic >EC5 - EC35 $_{HS+EH\_1D\_AR\_MS}$	µg/l	10	NONE					< 10	< 10	< 10	
VOCs											
Chloromethane	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
Chloroethane	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
Bromomethane	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
Vinyl Chloride	µg/l	3	NONE	0.5			0.25	< 3.0	< 3.0	< 3.0	
Trichlorofluoromethane	µg/l	3	NONE					< 3.0	< 3.0	< 3.0	
1,1-Dichloroethene	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
Trans 1,2-dichloroethylene	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
1,1-Dichloroethane	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
2,2-Dichloropropane	µg/l	3	NONE					< 3.0	< 3.0	< 3.0	
Chloroform	µg/l	3	ISO 17025				50	< 3.0	< 3.0	< 3.0	
1,1,1-Trichloroethane	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
1,2-Dichloroethane	µg/l	3	ISO 17025	3				< 3.0	< 3.0	< 3.0	
1,1-Dichloropropene	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
Cis-1,2-dichloroethene	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
Benzene	µg/l	3	ISO 17025	1	50		0.5	< 3.0	< 3.0	< 3.0	
Carbontetrachloride	µg/l	3	ISO 17025		12 (AA)		1.5	< 3.0	< 3.0	< 3.0	
1,2-Dichloropropane	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
Trichloroethene	µg/l	3	ISO 17025	10				< 3.0	< 3.0	< 3.0	
Dibromomethane	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
Bromodichloromethane	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
Cis-1,3-dichloropropene	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
Trans-1,3-dichloropropene	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
Toluene	µg/l	3	ISO 17025			74	350	< 3.0	< 3.0	< 3.0	
1,1,2-Trichloroethane	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
1,3-Dichloropropane	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
Dibromochloromethane	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
Tetrachloroethene	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
1,2-Dibromoethane	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
Chlorobenzene	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	

Analytical Report Number: 24-024595
Project / Site name: Cardiff Peninsula

Lab Sample Number								224783	224784	224787	
Sample Reference								RC04(Deep)	RC05A	WS04	
Sample Number								None Supplied	None Supplied	None Supplied	
Depth (m)								None Supplied	None Supplied	None Supplied	
Date Sampled								Deviating	Deviating	Deviating	
Time Taken								None Supplied	None Supplied	None Supplied	
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	**DWS**	**EQS Freshwater Priority Haz Subs (Max Allowable)**	**EQS Freshwater Specific Pollutants (Annual Average)**	**UKTAG**	PLOT 1 GF Gravel	PLOT 1 MG	PLOT 1 MG	
1,1,1,2-Tetrachloroethane	µg/l	3	ISO 17025			140		< 3.0	< 3.0	< 3.0	
Ethylbenzene	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
p & m-xylene	µg/l	3	ISO 17025			30		< 3.0	< 3.0	< 3.0	
Styrene	µg/l	3	ISO 17025			50		< 3.0	< 3.0	< 3.0	
Bromoform	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
o-xylene	µg/l	3	ISO 17025			30		< 3.0	< 3.0	< 3.0	
Isopropylbenzene	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
1,1,2,2-Tetrachloroethane	µg/l	3	NONE					< 3.0	< 3.0	< 3.0	
Bromobenzene	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
n-Propylbenzene	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
2-Chlorotoluene	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
4-Chlorotoluene	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
1,3,5-Trimethylbenzene	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
tert-Butylbenzene	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
1,2,4-Trimethylbenzene	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
sec-Butylbenzene	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
1,3-Dichlorobenzene	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
p-Isopropyltoluene	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
1,4-Dichlorobenzene	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
1,2-Dichlorobenzene	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
Butylbenzene	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
1,2-Dibromo-3-chloropropane	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
1,2,4-Trichlorobenzene	µg/l	3	ISO 17025				35	< 3.0	< 3.0	< 3.0	
Hexachlorobutadiene	µg/l	3	ISO 17025		0.6		0.05	< 3.0 ##	< 3.0 ##	< 3.0 ##	
1,2,3-Trichlorobenzene	µg/l	3	ISO 17025					< 3.0 ##	< 3.0 ##	< 3.0 ##	
Monoaromatics & Oxygenates											
Benzene	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
Toluene	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
Ethylbenzene	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
p & m-xylene	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
o-xylene	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025					< 3.0	< 3.0	< 3.0	
SVOCs											
Aniline	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
Phenol	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
2-Chlorophenol	µg/l	0.05	NONE			50	150	< 0.05	< 0.05	< 0.05	
Bis(2-chloroethyl)ether	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
1,3-Dichlorobenzene	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
1,2-Dichlorobenzene	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
1,4-Dichlorobenzene	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
2-Methylphenol	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
Hexachloroethane	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
Nitrobenzene	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
4-Methylphenol	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
Isophorone	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
2-Nitrophenol	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
2,4-Dimethylphenol	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
1,2,4-Trichlorobenzene	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
2,4-Dichlorophenol	µg/l	0.05	NONE			4.2	100	< 0.05	< 0.05	< 0.05	
4-Chloroaniline	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
Hexachlorobutadiene	µg/l	0.05	NONE		0.6		0.05	< 0.05	< 0.05	< 0.05	
4-Chloro-3-methylphenol	µg/l	0.05	NONE			40	350	< 0.05	< 0.05	< 0.05	
2,4,6-Trichlorophenol	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
2,4,5-Trichlorophenol	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
2-Methylnaphthalene	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
2-Chloronaphthalene	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
Dimethylphthalate	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
2,6-Dinitrotoluene	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
2,4-Dinitrotoluene	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
Dibenzofuran	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
Diethyl phthalate	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
4-Nitroaniline	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
Azobenzene	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
Bromophenyl phenyl ether	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
Hexachlorobenzene	µg/l	0.05	NONE		0.05		0.05	< 0.05	< 0.05	< 0.05	
Carbazole	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
Dibutyl phthalate	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
Anthraquinone	µg/l	0.05	NONE					< 0.05	< 0.05	< 0.05	
Butyl benzyl phthalate	µg/l	0.05	NONE			7.5		< 0.05	< 0.05	< 0.05	
3+4-Methylphenol	µg/l	0.1	NONE					< 0.10	< 0.10	< 0.10	
PCBs by GC-MS											
PCB Congener 28	µg/l	0.02	NONE					-	-	< 0.02	
PCB Congener 52	µg/l	0.02	NONE					-	-	< 0.02	
PCB Congener 101	µg/l	0.02	NONE					-	-	< 0.02	
PCB Congener 118	µg/l	0.02	NONE					-	-	< 0.02	
PCB Congener 138	µg/l	0.02	NONE					-	-	< 0.02	
PCB Congener 153	µg/l	0.02	NONE					-	-	< 0.02	
PCB Congener 180	µg/l	0.02	NONE					-	-	< 0.02	
Total ICES-7 PCBs	µg/l	0.14	NONE			25	0.25	-	-	< 0.14	

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Leachability Test Results Plot 1
Project / Site name: Cardiff Peninsula

Lab Sample Number								204159
Sample Reference								RC05A
Sample Number								None Supplied
Depth (m)								1.50
Date Sampled								16/05/2024
Time Taken								None Supplied
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	**DWS**	**EQS Freshwater Priority Haz Subs (Max Allowable)**	**EQS Freshwater Specific Pollutants (Annual Average)**	**UKTAG**	Plot 1 MG
General Inorganics								
pH (automated)	pH Units	N/A	ISO 17025			pH 6 - 9 (max)		8
Electrical Conductivity	µS/cm	10	ISO 17025					97
Total Cyanide	µg/l	10	ISO 17025	50		1		< 10
Sulphate as SO_4	mg/l	0.045	ISO 17025			400,000		7.05
Sulphide	µg/l	5	NONE					9.4
Ammoniacal Nitrogen as N	µg/l	15	NONE					49
Nitrate as NO_3	mg/l	0.05	NONE	50				0.05
Total Phenols								
Total Phenols (monohydric)	µg/l	10	ISO 17025			7.7		< 10
Speciated PAHs								
Naphthalene	µg/l	0.01	ISO 17025		130			< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025					< 0.01
Acenaphthene	µg/l	0.01	ISO 17025					< 0.01
Fluorene	µg/l	0.01	ISO 17025					< 0.01
Phenanthrene	µg/l	0.01	ISO 17025					< 0.01
Anthracene	µg/l	0.01	ISO 17025		0.1		0.05	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025		0.12			< 0.01
Pyrene	µg/l	0.01	ISO 17025					< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025					< 0.01
Chrysene	µg/l	0.01	ISO 17025					< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025		0.017		0.05	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025		0.017		0.05	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	0.01	0.27		0.005	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE				0.05	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	NONE					< 0.01
Benzo(ghi)perylene	µg/l	0.01	NONE		0.0082		0.05	< 0.01
Total PAH								
Total EPA-16 PAHs	µg/l	0.16	NONE	0.1	0.00017 (AA)			< 0.16
Heavy Metals / Metalloids								
Arsenic (dissolved)	µg/l	1	ISO 17025	10		50	5	< 1.0
Cadmium (dissolved)	µg/l	0.08	ISO 17025	5	0.45**			< 0.08
Chromium (dissolved)	µg/l	0.4	ISO 17025	50		4.7[&]	5*	4.3
Copper (dissolved)	µg/l	0.7	ISO 17025	2		1[$]		6.1
Lead (dissolved)	µg/l	1	ISO 17025	10	14		5	< 1.0
Mercury (dissolved)	µg/l	0.5	ISO 17025	1	0.07		0.5	< 0.5
Nickel (dissolved)	µg/l	0.3	ISO 17025	20	34			1.3
Selenium (dissolved)	µg/l	4	ISO 17025	10				< 4.0
Zinc (dissolved)	µg/l	0.4	ISO 17025	-		10.9[$]		6.5
Petroleum Hydrocarbons								
TPH - Aliphatic >C5 - $C6_{HS\_1D\_AL}$	µg/l	1	NONE					< 1.0
TPH - Aliphatic >C6 - $C8_{HS\_1D\_AL}$	µg/l	1	NONE					< 1.0
TPH - Aliphatic >C8 - $C10_{HS\_1D\_AL}$	µg/l	1	NONE					< 1.0
TPH - Aliphatic >C10 - $C12_{EH\_1D\_AL\_MS}$	µg/l	10	NONE					< 10
TPH - Aliphatic >C12 - $C16_{EH\_1D\_AL\_MS}$	µg/l	10	NONE					< 10
TPH - Aliphatic >C16 - $C21_{EH\_1D\_AL\_MS}$	µg/l	10	NONE					< 10
TPH - Aliphatic >C21 - $C35_{EH\_1D\_AL\_MS}$	µg/l	10	NONE					< 10
TPH - Aliphatic >C5 - $C35_{HS+EH\_1D\_AL\_MS}$	µg/l	10	NONE					< 10
TPH - Aromatic >EC5 - $EC7_{HS\_1D\_AR}$	µg/l	1	NONE					< 1.0
TPH - Aromatic >EC7 - $EC8_{HS\_1D\_AR}$	µg/l	1	NONE					< 1.0
TPH - Aromatic >EC8 - $EC10_{EH\_1D\_AR\_MS}$	µg/l	1	NONE					< 1.0
TPH - Aromatic >EC10 - $EC12_{EH\_1D\_AR\_MS}$	µg/l	10	NONE					< 10
TPH - Aromatic >EC12 - $EC16_{EH\_1D\_AR\_MS}$	µg/l	10	NONE					< 10
TPH - Aromatic >EC16 - $EC21_{EH\_1D\_AR\_MS}$	µg/l	10	NONE					< 10
TPH - Aromatic >EC21 - $EC35_{EH\_1D\_AR\_MS}$	µg/l	10	NONE					< 10
TPH - Aromatic >EC6 - $EC35_{HS+EH\_1D\_AR\_MS}$	µg/l	10	NONE					< 10
VOCs								
Chloromethane	µg/l	3	NONE					< 3.0

Leachability Test Results Plot 1
Project / Site name: Cardiff Peninsula

Lab Sample Number								204159
Sample Reference								RC05A
Sample Number								None Supplied
Depth (m)								1.50
Date Sampled								16/05/2024
Time Taken								None Supplied
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	**DWS**	**EQS Freshwater Priority Haz Subs (Max Allowable)**	**EQS Freshwater Specific Pollutants (Annual Average)**	**UKTAG**	Plot 1 MG
Chloroethane	µg/l	3	NONE					< 3.0
Bromomethane	µg/l	3	NONE					< 3.0
Vinyl Chloride	µg/l	3	NONE	0.5			0.25	< 3.0
1,1-dichloroethene	µg/l	3	NONE					< 3.0
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/l	3	NONE					< 3.0
Trans 1,2-dichloroethylene	µg/l	3	NONE					< 3.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	NONE					< 3.0
1,1-dichloroethane	µg/l	3	NONE					< 3.0
2,2-Dichloropropane	µg/l	3	NONE					< 3.0
Chloroform	µg/l	3	NONE				50	< 3.0
1,1,1-Trichloroethane	µg/l	3	NONE					< 3.0
1,2-dichloroethane	µg/l	3	NONE	3				< 3.0
1,1-Dichloropropene	µg/l	3	NONE					< 3.0
Cis-1,2-dichloroethene	µg/l	3	NONE					< 3.0
Benzene	µg/l	3	NONE	1	50		0.5	< 3.0
Carbontetrachloride	µg/l	3	NONE		12 (AA)		1.5	< 3.0
1,2-dichloropropane	µg/l	3	NONE					< 3.0
Trichloroethene	µg/l	3	NONE	10				< 3.0
Dibromomethane	µg/l	3	NONE					< 3.0
Bromodichloromethane	µg/l	3	NONE					< 3.0
Cis-1,3-dichloropropene	µg/l	3	NONE					< 3.0
Trans-1,3-dichloropropene	µg/l	3	NONE					< 3.0
Toluene	µg/l	3	NONE			74	350	< 3.0
1,1,2-Trichloroethane	µg/l	3	NONE					< 3.0
1,3-Dichloropropane	µg/l	3	NONE					< 3.0
Dibromochloromethane	µg/l	3	NONE					< 3.0
Tetrachloroethene	µg/l	3	NONE					< 3.0
1,2-Dibromoethane	µg/l	3	NONE					< 3.0
Chlorobenzene	µg/l	3	NONE					< 3.0
1,1,1,2-Tetrachloroethane	µg/l	3	NONE			140		< 3.0
Ethylbenzene	µg/l	3	NONE					< 3.0
p & m-xylene	µg/l	3	NONE			30		< 3.0
Styrene	µg/l	3	NONE			50		< 3.0
Bromoform	µg/l	3	NONE					< 3.0
o-xylene	µg/l	3	NONE			30		< 3.0
Isopropylbenzene	µg/l	3	NONE					< 3.0
Bromobenzene	µg/l	3	NONE					< 3.0
n-Propylbenzene	µg/l	3	NONE					< 3.0
2-Chlorotoluene	µg/l	3	NONE					< 3.0
4-Chlorotoluene	µg/l	3	NONE					< 3.0
1,3,5-Trimethylbenzene	µg/l	3	NONE					< 3.0
ter-Butylbenzene	µg/l	3	NONE					< 3.0
1,2,4-Trimethylbenzene	µg/l	3	NONE					< 3.0
sec-Butylbenzene	µg/l	3	NONE					< 3.0
1,3-dichlorobenzene	µg/l	3	NONE					< 3.0
P-Isopropyltoluene	µg/l	3	NONE					< 3.0
1,4-dichlorobenzene	µg/l	3	NONE					< 3.0
1,2-dichlorobenzene	µg/l	3	NONE					< 3.0
Butylbenzene	µg/l	3	NONE					< 3.0
1,2-Dibromo-3-chloropropane	µg/l	3	NONE					< 3.0
1,2,4-Trichlorobenzene	µg/l	3	NONE				35	< 3.0
Hexachlorobutadiene	µg/l	3	NONE		0.6		0.05	< 3.0
1,2,3-Trichlorobenzene	µg/l	3	NONE					< 3.0
Trichlorofluoromethane	µg/l	3	NONE					< 3.0

SVOCs

Aniline	µg/l	0.05	NONE					< 0.05
Phenol	µg/l	0.05	NONE					< 0.05
2-Chlorophenol	µg/l	0.05	NONE			50	150	< 0.05
Bis(2-chloroethyl)ether	µg/l	0.05	NONE					< 0.05
1,3-Dichlorobenzene	µg/l	0.05	NONE					< 0.05
1,2-Dichlorobenzene	µg/l	0.05	NONE					< 0.05
1,4-Dichlorobenzene	µg/l	0.05	NONE					< 0.05
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE					< 0.05
2-Methylphenol	µg/l	0.05	NONE					< 0.05
Hexachloroethane	µg/l	0.05	NONE					< 0.05
Nitrobenzene	µg/l	0.05	NONE					< 0.05

Leachability Test Results Plot 1
Project / Site name: Cardiff Peninsula

Lab Sample Number								204159
Sample Reference								RC05A
Sample Number								None Supplied
Depth (m)								1.50
Date Sampled								16/05/2024
Time Taken								None Supplied
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	**DWS**	**EQS Freshwater Priority Haz Subs (Max Allowable)**	**EQS Freshwater Specific Pollutants (Annual Average)**	**UKTAG**	Plot 1 MG
4-Methylphenol	µg/l	0.05	NONE					< 0.05
Isophorone	µg/l	0.05	NONE					< 0.05
2-Nitrophenol	µg/l	0.05	NONE					< 0.05
2,4-Dimethylphenol	µg/l	0.05	NONE					< 0.05
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE					< 0.05
1,2,4-Trichlorobenzene	µg/l	0.05	NONE					< 0.05
2,4-Dichlorophenol	µg/l	0.05	NONE			4.2	100	< 0.05
4-Chloroaniline	µg/l	0.05	NONE					< 0.05
Hexachlorobutadiene	µg/l	0.05	NONE		0.6		0.05	< 0.05
4-Chloro-3-methylphenol	µg/l	0.05	NONE			40	350	< 0.05
2,4,6-Trichlorophenol	µg/l	0.05	NONE					< 0.05
2,4,5-Trichlorophenol	µg/l	0.05	NONE					< 0.05
2-Methylnaphthalene	µg/l	0.05	NONE					< 0.05
2-Chloronaphthalene	µg/l	0.05	NONE					< 0.05
Dimethylphthalate	µg/l	0.05	NONE					< 0.05
2,6-Dinitrotoluene	µg/l	0.05	NONE					< 0.05
2,4-Dinitrotoluene	µg/l	0.05	NONE					< 0.05
Dibenzofuran	µg/l	0.05	NONE					< 0.05
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE					< 0.05
Diethyl phthalate	µg/l	0.05	NONE					< 0.05
4-Nitroaniline	µg/l	0.05	NONE					< 0.05
Azobenzene	µg/l	0.05	NONE					< 0.05
Bromophenyl phenyl ether	µg/l	0.05	NONE					< 0.05
Hexachlorobenzene	µg/l	0.02	NONE		0.05		0.05	< 0.02
Carbazole	µg/l	0.05	NONE					< 0.05
Dibutyl phthalate	µg/l	0.05	NONE					< 0.05
Anthraquinone	µg/l	0.05	NONE					< 0.05
Butyl benzyl phthalate	µg/l	0.05	NONE			7.5		< 0.05
PCBs by GC-MS								
PCB Congener 28	µg/l	0.05	NONE					< 0.05
PCB Congener 52	µg/l	0.05	NONE					< 0.05
PCB Congener 101	µg/l	0.05	NONE					< 0.05
PCB Congener 118	µg/l	0.05	NONE					< 0.05
PCB Congener 138	µg/l	0.05	NONE					< 0.05
PCB Congener 153	µg/l	0.05	NONE					< 0.05
PCB Congener 180	µg/l	0.05	NONE					< 0.05
Total PCBs	µg/l	0.35	NONE			25	0.25	< 0.35

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Project / Site name: Cardiff Peninsula - Plot 1

Lab Sample Number					187098	204159	204160	211151	212798	208885	208886	196841	190714	190715		
Sample Reference					RC04	RC05A	RC05A	RC05A	RC05A	RC06	RC06	TP01	WS04	WS04		
Sample Number					None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied		
Depth (m)					0.30	1.50	3.00	19.50	35.00	0.20	0.50	1.50	1.00	3.00		
Date Sampled					29/04/2024	16/05/2024	16/05/2024	23/05/2024	28/05/2024	21/05/2024	21/05/2024	08/05/2024	03/05/2024	03/05/2024		
Time Taken					None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	**GAC Resi woHP (1% SOM)**	Env	Env	Env	Geotech	Geotech	Env	Env	Env	Env	Env	Min	Max
Stone Content	%	0.1	NONE	-	65.5	< 0.1	< 0.1	< 0.1	95.4	47.3	46.5	52.9	< 0.1	< 0.1	<0.1	95.4
Moisture Content	%	0.01	NONE	-	7.1	25	17	16	4.6	6.7	7.2	12	9.9	23	4.6	25
Total mass of sample received	kg	0.1	NONE	-	0.9	1.2	1.1	0.4	0.5	0.9	0.8	0.9	1.5	1.2	0.4	1.5
Asbestos																
Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Not Detected	Not-detected	Not-detected	Not-detected			Not-detected	Not-detected	Not-detected	Not-detected	Not-detected		
Asbestos Analyst ID	N/A	N/A	N/A	-	WEM	IZJ	IZJ			EWS	EWS	SPU	MBI	MBI		
General Inorganics																
pH (L099)	pH Units	N/A	MCERTS	-	9.8	8.9	7.7	9.8	8.9	10.8	9.9	9.1	9.1	8.6	7.7	10.8
Total Cyanide	mg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	<1.0	<1.0
Total Sulphate as SO_4	mg/kg	50	MCERTS	-	1000	640	760			2900	1400	860	1000	950	640	2900
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-	560	160	100	120	110	740	370	87	310	570	87	740
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-	-	-	62.2	54.3	-	-				54.3	62.2
Water Soluble SO_4 16hr extraction (2:1)	mg/l	1.25	MCERTS	-	282	79.9	50.4			368	186	43.4	154	287	43.4	368
Sulphide	mg/kg	1	MCERTS	-	13	31	< 1.0			18	13	16	49	33	13	49
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-	-	-	-	50	5						5	50
Organic Matter (automated)	%	0.1	MCERTS	-	1.3	0.7	0.8			1.7	2.1	2.3	1.8	4.9	0.7	4.9
Water Soluble Nitrate (2:1) as N	mg/kg	2	NONE	-	-	-	-	< 2.0	< 2.0	-	-				<2.0	<2.0
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	-	-	-	-	< 2.0	< 2.0	-	-				<2.0	<2.0
Total Phenols																
Total Phenols (monohydric)	mg/kg	1	MCERTS	750	< 1.0	< 1.0	< 1.0			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs																
Naphthalene	mg/kg	0.05	MCERTS	45	0.06	< 0.05	0.18			0.17	0.12	< 0.05	1.7	< 0.05	<0.05	1.7
Acenaphthylene	mg/kg	0.05	MCERTS	2900	< 0.05	< 0.05	< 0.05			0.09	0.05	< 0.05	0.23	0.24	<0.05	0.24
Acenaphthene	mg/kg	0.05	MCERTS	3000	< 0.05	< 0.05	1.6			0.1	0.07	< 0.05	0.41	0.12	<0.05	1.6
Fluorene	mg/kg	0.05	MCERTS	2800	< 0.05	< 0.05	1.6			0.11	0.1	< 0.05	0.66	0.22	<0.05	1.6
Phenanthrene	mg/kg	0.05	MCERTS	1300	0.27	< 0.05	3			0.53	0.48	0.61	3	1.4	<0.05	3
Anthracene	mg/kg	0.05	MCERTS	31000	0.07	< 0.05	1.2			< 0.05	0.1	0.23	0.89	0.47	<0.05	1.2
Fluoranthene	mg/kg	0.05	MCERTS	1500	0.36	< 0.05	1.5			0.71	0.6	1.5	5.2	3.4	<0.05	5.2
Pyrene	mg/kg	0.05	MCERTS	3700	0.33	< 0.05	1.2			0.53	0.43	1.3	4.3	2.9	<0.05	4.3
Benzo(a)anthracene	mg/kg	0.05	MCERTS	11	0.21	< 0.05	0.42			0.31	0.27	< 0.05	2.6	< 0.05	<0.05	2.6
Chrysene	mg/kg	0.05	MCERTS	30	0.33	< 0.05	0.49			0.44	0.35	0.93	3.3	2.5	<0.05	3.3
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	3.9	0.39	< 0.05	0.6			0.49	0.37	0.98	3.2	2.7	<0.05	3.2
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	110	0.09	< 0.05	0.21			0.19	0.17	0.43	1.8	0.95	<0.05	1.8
Benzo(a)pyrene	mg/kg	0.05	MCERTS	5.3	0.24	< 0.05	0.43			0.36	0.28	0.74	2.3	1.9	<0.05	2.3
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	45	0.13	< 0.05	0.32			0.21	0.18	0.5	1.7	1.2	<0.05	1.7
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.31	< 0.05	< 0.05	0.09			0.12	0.09	< 0.05	< 0.05	0.28	<0.05	0.28
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	360	0.15	< 0.05	0.38			0.24	0.19	0.61	1.7	1.2	<0.05	1.7
Total PAH																
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	-	2.62	< 0.80	13.2			4.6	3.84	-	32.9	19.4	< 0.80	32.9

Project / Site name: Cardiff Peninsula - Plot 1

Lab Sample Number					187098	204159	204160	211151	212798	208885	208886	196841	190714	190715		
Sample Reference					RC04	RC05A	RC05A	RC05A	RC05A	RC06	RC06	TP01	WS04	WS04		
Sample Number					None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied		
Depth (m)					0.30	1.50	3.00	19.50	35.00	0.20	0.50	1.50	1.00	3.00		
Date Sampled					29/04/2024	16/05/2024	16/05/2024	23/05/2024	28/05/2024	21/05/2024	21/05/2024	08/05/2024	03/05/2024	03/05/2024		
Time Taken					None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	**GAC Resi woHP (1% SOM)**	Env	Env	Env	Geotech	Geotech	Env	Env	Env	Env	Env	Min	Max
Heavy Metals / Metalloids																
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	40	15	13	20			13	17	19	21	33	13	33
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	150	< 0.2	< 0.2	< 0.2			< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	<0.2	<0.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	910	17	35	29			22	21	57	24	33	17	57
Copper (aqua regia extractable)	mg/kg	1	MCERTS	7100	31	21	64			27	28	53	43	65	21	65
Lead (aqua regia extractable)	mg/kg	1	MCERTS	310	29	27	140			31	42	180	60	98	27	180
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	56	< 0.3	< 0.3	< 0.3			< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	180	11	25	34			15	16	24	22	30	11	34
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	430	< 1.0	< 1.0	< 1.0			< 1.0	1.9	1.2	< 1.0	< 1.0	<1.0	1.9
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	40000	64	67	120			82	82	210	110	230	64	230
Magnesium (leachate equivalent)	mg/l	2.5	NONE		-	-	-	< 2.5		-	-	-	-	-	-	-
Magnesium (water soluble)	mg/kg	5	NONE		-	-	-	< 5.0		-	-	-	-	-	-	-
Petroleum Hydrocarbons																
TPHCWG - Aliphatic >C5 - C6 HS_1D_AL	mg/kg	0.02	NONE	42	< 0.020	< 0.020	< 0.020			< 0.020	< 0.020	< 0.020	< 0.020 ^	< 0.020 ^	< 0.020	< 0.020
TPHCWG - Aliphatic >C6 - C8 HS_1D_AL	mg/kg	0.02	NONE	100	< 0.020	< 0.020	< 0.020			< 0.020	< 0.020	< 0.020	< 0.020 ^	< 0.020 ^	< 0.020	< 0.020
TPHCWG - Aliphatic >C8 - C10 HS_1D_AL	mg/kg	0.05	NONE	27	< 0.050	< 0.050	< 0.050			< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
TPHCWG - Aliphatic >C10 - C12 EH_CU_1D_AL	mg/kg	1	MCERTS	130	< 1.0	< 1.0	< 1.0			< 1.0	< 1.0	2.5	< 1.0	< 1.0	< 1.0	2.5
TPHCWG - Aliphatic >C12 - C16 EH_CU_1D_AL	mg/kg	2	MCERTS	1100	< 2.0	< 2.0	< 2.0			< 2.0	< 2.0	15	4.6	3.6	< 2.0	15
TPHCWG - Aliphatic >C16 - C21 EH_CU_1D_AL	mg/kg	8	MCERTS	65000	< 8.0	< 8.0	< 8.0			< 8.0	< 8.0	17	11	< 8.0	< 8.0	17
TPHCWG - Aliphatic >C21 - C35 EH_CU_1D_AL	mg/kg	8	MCERTS	incl above	30	< 8.0	< 8.0			30	14	44	41	25	< 8.0	44
TPHCWG - Aliphatic >C5 - C35 EH_CU+HS_1D_AL	mg/kg	10	NONE	-	30	< 10	< 10			30	14	78	56	28	< 10	78
TPHCWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.01	NONE	370	< 0.010	< 0.010	< 0.010			< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.01	NONE	860	< 0.010	< 0.010	< 0.010			< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.05	NONE	47	< 0.050	< 0.050	< 0.050			< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
TPHCWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	MCERTS	250	< 1.0	< 1.0	< 1.0			< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPHCWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	MCERTS	1800	< 2.0	< 2.0	7.8			< 2.0	< 2.0	4.9	3.8	2.3	< 2.0	7.8
TPHCWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	1900	< 10	< 10	10			< 10	< 10	< 10	< 10	< 10	< 10	10
TPHCWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	MCERTS	1900	22	< 10	21			22	< 10	15	< 10	26	< 10	26
TPHCWG - Aromatic >EC5 - EC35 EH_CU+HS_1D_AR	mg/kg	10	NONE	incl above	22	< 10	39			22	< 10	20	< 10	28	< 10	39

Project / Site name: Cardiff Peninsula - Plot 1

Lab Sample Number					187098	204159	204160	211151	212798	208885	208886	196841	190714	190715		
Sample Reference					RC04	RC05A	RC05A	RC05A	RC05A	RC06	RC06	TP01	WS04	WS04		
Sample Number					None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied		
Depth (m)					0.30	1.50	3.00	19.50	35.00	0.20	0.50	1.50	1.00	3.00		
Date Sampled					29/04/2024	16/05/2024	16/05/2024	23/05/2024	28/05/2024	21/05/2024	21/05/2024	08/05/2024	03/05/2024	03/05/2024		
Time Taken					None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	**GAC Resi woHP (1% SOM)**	Env	Env	Env	Geotech	Geotech	Env	Env	Env	Env	Env	Min	Max
VOCs																
Chloromethane	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0 #	< 5.0	< 5.0	< 5.0	< 5.0
Chloroethane	µg/kg	5	NONE		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Bromomethane	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Vinyl Chloride	µg/kg	5	NONE	0.015	< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Trichlorofluoromethane	µg/kg	5	NONE		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1-Dichloroethene	µg/kg	5	NONE		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	5	NONE		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Trans 1,2-dichloroethylene	µg/kg	5	NONE		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1-Dichloroethane	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
2,2-Dichloropropane	µg/kg	5	NONE		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chloroform	µg/kg	5	ISO 17025		< 5.0	< 5.0 ##	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1,1-Trichloroethane	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dichloroethane	µg/kg	5	ISO 17025	0.11	< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1-Dichloropropene	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Cis-1,2-dichloroethene	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Benzene	µg/kg	5	MCERTS	3.3	< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Carbontetrachloride	µg/kg	5	NONE		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dichloropropane	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Trichloroethene	µg/kg	5	ISO 17025	0.0097	< 5.0 ##	< 5.0 ##	< 5.0 ##			< 5.0	< 5.0	< 5.0 ##	< 5.0	< 5.0	< 5.0	< 5.0
Dibromomethane	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Bromodichloromethane	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Cis-1,3-dichloropropene	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Trans-1,3-dichloropropene	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Toluene	µg/kg	5	MCERTS	880	< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1,2-Trichloroethane	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,3-Dichloropropane	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Dibromochloromethane	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Tetrachloroethene	µg/kg	5	NONE	0.32	< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dibromoethane	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chlorobenzene	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1,1,2-Tetrachloroethane	µg/kg	5	ISO 17025		< 5.0	< 5.0 ##	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	83	< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
p & m-Xylene	µg/kg	5	MCERTS	79#	< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Styrene	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Bromoform	µg/kg	5	NONE		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
o-Xylene	µg/kg	5	MCERTS	79#	< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Isopropylbenzene	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1,2,2-Tetrachloroethane	µg/kg	5	NONE		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Bromobenzene	µg/kg	5	NONE		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
n-Propylbenzene	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
2-Chlorotoluene	µg/kg	5	ISO 17025		< 5.0	< 5.0 ##	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
4-Chlorotoluene	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,3,5-Trimethylbenzene	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
tert-Butylbenzene	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2,4-Trimethylbenzene	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
sec-Butylbenzene	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0

Project / Site name: Cardiff Peninsula - Plot 1

Lab Sample Number					187098	204159	204160	211151	212798	208885	208886	196841	190714	190715		
Sample Reference					RC04	RC05A	RC05A	RC05A	RC05A	RC06	RC06	TP01	WS04	WS04		
Sample Number					None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied		
Depth (m)					0.30	1.50	3.00	19.50	35.00	0.20	0.50	1.50	1.00	3.00		
Date Sampled					29/04/2024	16/05/2024	16/05/2024	23/05/2024	28/05/2024	21/05/2024	21/05/2024	08/05/2024	03/05/2024	03/05/2024		
Time Taken					None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	**GAC Resi woHP (1% SOM)**	Env	Env	Env	Geotech	Geotech	Env	Env	Env	Env	Env	Min	Max
1,3-Dichlorobenzene	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
p-Isopropyltoluene	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,4-Dichlorobenzene	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dichlorobenzene	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Butylbenzene	µg/kg	5	NONE		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dibromo-3-chloropropane	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2,4-Trichlorobenzene	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Hexachlorobutadiene	µg/kg	5	NONE		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2,3-Trichlorobenzene	µg/kg	5	ISO 17025		< 5.0	< 5.0	< 5.0			< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
SVOCs																
Aniline	mg/kg	0.1	NONE		< 0.1	< 0.1	< 0.1			0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.1
Phenol	mg/kg	0.2	ISO 17025		< 0.2	< 0.2	< 0.2			< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2-Chlorophenol	mg/kg	0.1	MCERTS		< 0.1	< 0.1	< 0.1			< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS		< 0.2	< 0.2	< 0.2			< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS		< 0.2	< 0.2 ##	< 0.2 ##			< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS		< 0.1	< 0.1	< 0.1			< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS		< 0.2	< 0.2	< 0.2			< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS		< 0.1	< 0.1	< 0.1			< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Methylphenol	mg/kg	0.3	MCERTS		< 0.3	< 0.3	< 0.3			< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Hexachloroethane	mg/kg	0.05	ISO 17025		< 0.05	< 0.05	< 0.05			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrobenzene	mg/kg	0.3	MCERTS		< 0.3	< 0.3	< 0.3			< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
4-Methylphenol	mg/kg	0.2	NONE		< 0.2	< 0.2	< 0.2			< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Isophorone	mg/kg	0.2	MCERTS		< 0.2	< 0.2	< 0.2			< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2-Nitrophenol	mg/kg	0.3	NONE		< 0.3	< 0.3	< 0.3			< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
2,4-Dimethylphenol	mg/kg	0.3	MCERTS		< 0.3	< 0.3	< 0.3			< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS		< 0.3	< 0.3	< 0.3			< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS		< 0.3	< 0.3	< 0.3			< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
2,4-Dichlorophenol	mg/kg	0.3	MCERTS		< 0.3	< 0.3	< 0.3			< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
4-Chloroaniline	mg/kg	0.1	NONE		< 0.1	< 0.1	< 0.1			< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Hexachlorobutadiene	mg/kg	0.1	MCERTS		< 0.1	< 0.1	< 0.1			< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4-Chloro-3-methylphenol	mg/kg	0.1	NONE		< 0.1	< 0.1	< 0.1			< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4,6-Trichlorophenol	mg/kg	0.1	NONE		< 0.1	< 0.1	< 0.1			< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4,5-Trichlorophenol	mg/kg	0.2	NONE		< 0.2	< 0.2	< 0.2			< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2-Methylnaphthalene	mg/kg	0.1	NONE		< 0.1	< 0.1	< 0.1			0.1	< 0.1	0.2	0.8	0.1	< 0.1	0.8
2-Chloronaphthalene	mg/kg	0.1	MCERTS		< 0.1	< 0.1	< 0.1			< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dimethylphthalate	mg/kg	0.1	MCERTS		< 0.1	< 0.1	< 0.1			< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,6-Dinitrotoluene	mg/kg	0.1	NONE		< 0.1	< 0.1	< 0.1			< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dinitrotoluene	mg/kg	0.2	NONE		< 0.2	< 0.2	< 0.2			< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Dibenzofuran	mg/kg	0.2	MCERTS		< 0.2	< 0.2	1			< 0.2	< 0.2	< 0.2	0.4	< 0.2	< 0.2	1
4-Chlorophenyl phenyl ether	mg/kg	0.3	MCERTS		< 0.3	< 0.3	< 0.3			< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Diethyl phthalate	mg/kg	0.2	MCERTS		< 0.2	< 0.2	< 0.2			< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
4-Nitroaniline	mg/kg	0.2	NONE		< 0.2	< 0.2	< 0.2			< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Azobenzene	mg/kg	0.3	NONE		< 0.3	< 0.3	< 0.3			< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS		< 0.2	< 0.2	< 0.2			< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Hexachlorobenzene	mg/kg	0.3	MCERTS		< 0.30	< 0.30	< 0.30			< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30
Carbazole	mg/kg	0.3	MCERTS		< 0.3	< 0.3	< 0.3			< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Dibutyl phthalate	mg/kg	0.2	NONE		< 0.2	< 0.2	< 0.2			< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2

Project / Site name: Cardiff Peninsula - Plot 1

Lab Sample Number					187098	204159	204160	211151	212798	208885	208886	196841	190714	190715		
Sample Reference					RC04	RC05A	RC05A	RC05A	RC05A	RC06	RC06	TP01	WS04	WS04		
Sample Number					None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied		
Depth (m)					0.30	1.50	3.00	19.50	35.00	0.20	0.50	1.50	1.00	3.00		
Date Sampled					29/04/2024	16/05/2024	16/05/2024	23/05/2024	28/05/2024	21/05/2024	21/05/2024	08/05/2024	03/05/2024	03/05/2024		
Time Taken					None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	**GAC Resi woHP (1% SOM)**	Env	Env	Env	Geotech	Geotech	Env	Env	Env	Env	Env	Min	Max
Anthraquinone	mg/kg	0.3	NONE		< 0.3	< 0.3	< 0.3			< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Butyl benzyl phthalate	mg/kg	0.3	NONE		< 0.3	< 0.3	< 0.3			< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3

Project / Site name: Cardiff Peninsula - Plot 1

Lab Sample Number					187098	204159	204160	211151	212798	208885	208886	196841	190714	190715		
Sample Reference					RC04	RC05A	RC05A	RC05A	RC05A	RC06	RC06	TP01	WS04	WS04		
Sample Number					None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied		
Depth (m)					0.30	1.50	3.00	19.50	35.00	0.20	0.50	1.50	1.00	3.00		
Date Sampled					29/04/2024	16/05/2024	16/05/2024	23/05/2024	28/05/2024	21/05/2024	21/05/2024	08/05/2024	03/05/2024	03/05/2024		
Time Taken					None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	**GAC Resi woHP (1% SOM)**	Env	Env	Env	Geotech	Geotech	Env	Env	Env	Env	Env	Min	Max
PCBs by GC-MS																
PCB Congener 28	mg/kg	0.001	MCERTS		< 0.001	< 0.001	< 0.001			< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB Congener 52	mg/kg	0.001	MCERTS		< 0.001	< 0.001	< 0.001			< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB Congener 101	mg/kg	0.001	MCERTS		< 0.001	< 0.001	< 0.001			< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB Congener 118	mg/kg	0.001	MCERTS		< 0.001	< 0.001	< 0.001			< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB Congener 138	mg/kg	0.001	MCERTS		< 0.001	< 0.001	< 0.001			< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB Congener 153	mg/kg	0.001	MCERTS		< 0.001	< 0.001	< 0.001			< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB Congener 180	mg/kg	0.001	MCERTS		< 0.001	< 0.001	< 0.001			< 0.001	< 0.001	0.002	< 0.001	< 0.001	< 0.001	0.002
Total PCBs	mg/kg	0.007	MCERTS		< 0.007	< 0.007	< 0.007			< 0.007	< 0.007	< 0.007	< 0.007	< 0.007	< 0.007	< 0.007

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Appendix D – Ground Gas Results and Calculations

Gas Assessment - Cardiff Plot 1

Monitoring Location	Response Zone (mbgl)	Target Zone	Flow (l/hr)		Carbon Dioxide (CO2) (%v/v)		CO2 Qhg l/hr	Methane (CH4) (%v/v)		CH4 Qhg l/hr
			Min	Max	Min	Max		Min	Max	
Steady Flows										
WS04		MG	0	0.1	0.5	2.1	0.0021	0.1	0.1	0.0001
RC04 (S)		MG	0	0.1	0.1	0.6	0.0006	0.1	0.1	0.0001
RC04 (D)		GFD	0	0.1	0.6	1.7	0.0017	50	54.6	0.0546
RC05		MG	0	0.1	0.4	2	0.002	0.1	0.1	0.0001
Peak Flows							0			0
RC04 (D)		GFD	0	25.2	0.6	1.7	0.4284	52.6	54.6	13.7592

Gas Assessment - Cardiff Plot 1 - Interim Assessment - Awaiting Outstanding 3rd Set of Data

Monitoring Location	Response Zone (mbgl)	Target Zone	Flow (l/hr)		Carbon Dioxide (CO2) (%v/v)		CO2 Qhg l/hr	Methane (CH4) (%v/v)		CH4 Qhg l/hr
			Min	Max	Min	Max		Min	Max	
Steady Flows										
WS04		MG	0	0.1	0.5	2.1	0.0021	0.1	0.1	0.0001
RC04 (S)		MG	0	0.1	0.2	0.6	0.0006	0.1	0.1	0.0001
RC04 (D)		GFD	0	0.1	0.6	1.7	0.0017	52.6	54.6	0.0546
RC05		MG	0	0.1	0.6	2	0.002	0.1	0.1	0.0001
Peak Flows							0			0
RC04 (D)		GFD	0	25.2	0.6	1.7	0.4284	52.6	54.6	13.7592
							0			0
							0			0
							0			0
							0			0

References

i. HMSO (1990) Environmental Protection Act 1990 (as amended).
ii. Ministry of Housing, Communities and Local Government (2021) National Planning Policy Framework.
iii. Environment Agency (2021) Land Contamination Risk Management (LCRM). Accessed through www.gov.uk.government/publications/land-contamination-risk-management-lcrm.
iv. HMSO (1990) Environmental Protection Act 1990 (as amended).
v. HMSO (2006) Contaminated Land (Wales) Regulations 2006 (as amended).
vi. HMSO (2009) The Environmental Damage (Prevention and Remediation) (Wales) Regulations 2009.
vii. Planning Wales Act 2015 and Well-being of Future Generations (Wales) Act 2015
viii. Water Environment Regulations 2017
ix. Environmental Protection Act 1990: Part 2A – Welsh Government Contaminated Land Statutory Guidance 2012 (Number WG192430).
x. Planning Policy Wales (PPW), Edition 11, 2021 and Technical Advice Notes (TANs).
xi. WLGA & NRW, Development of Land Affected by Contamination: A Guide for Developers, 2023.
xii. CIRIA (2001) CIRIA Report C552, Contaminated Land Risk Assessment: A Guide to Good Practice).
xiii. Environment Agency (2021) Land Contamination Risk Management (LCRM). Accessed through www.gov.uk.government/publications/land-contamination-risk-management-lcrm.
xiv. Environment Agency (2021) Land Contamination Risk Management (LCRM). Accessed through www.gov.uk.government/publications/land-contamination-risk-management-lcrm.
xv. Asbestos in Soil and Construction and Demolition Materials: Industry guidance. CL:AIRE, London
xvi. Arup, Ground Conditions Technical Due Diligence, Cardiff International Sports Village, prepared for Cardiff County Council. Dated 6 August 2021.
xvii. Arup Environmental Desk Study and Contamination Review Dated 17/01/12, Ref: 216460
xviii. Arup Report Geo-Environmental Generic Quantitative Risk Assessment Rev B Dated 9/1/13 Ref: REP002
xix. Ascot Design, The Cardiff Peninsula, Plot 1 – Stage 2 Report, 2024
xx. AKTII 5498 Cardiff Bay Peninsula Desk Study March 2024
xxi. AKTII 5498 Drainage & Earthworks Strategy Report April 2024
xxii. A2 Site Investigation Cardiff Bay Peninsula Phase I Desk Study, Ref: 48224-A2SI-XX-XX-RP-Y-0001-00, May 2024