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12 December 2024
Our reference: 315487 L01 (00)

Mr Steve Bickerton
Natural Resources Wales
Evidence, Policy and Permitting

Application Reference: PAN-027307
Operator: Wates Construction Limited
Facility: Channel View (Phase 1), Channel View Road, Cardiff, CF11 7HU

Dear Steve,

Thank you for the request for further information provided on 19 November 2024, following our Teams meeting. The purpose of this letter is to provide a response to the five elements you set out, where you require additional information or clarification in relation to the permit application.

Relevant Person

We have provided an updated Letter of Authority signed by Helen Bunch from Wates. A copy of this is appended to this letter.

Site Plan

A revised site plan has been provided which includes the annotation of each of the measures. Due to the base plan used, we are unable to strip out all of the background details from the proposed layout / existing layout plan. However, we have made this fainter and stripped some information out so that the proposed measures stand out more. The revised plan is provided as Appendix 7.

Sample Points

Table 1 provided within the Channel View SWMP (ref: 315486 R01 (03)) provides the easting and northing coordinates for each of the outfall locations. OF1 and OF2 are existing outfall locations with existing formed and active headwalls within the banks of the River Taff. These currently manage surface water from existing below ground infrastructure conveying surface water from the Marl, located to the north of the subject site boundary, and the existing site and surrounding residential area. OF3 is a proposed temporary outfall which may be required for the discharge of treated surface water during the construction phase. OF2 is not proposed to manage surface water discharged from the construction site. OF2 only conveys water from surface water infrastructure located beneath the Marl. Each of points OF1 and OF3 are assumed to be sampling points when water from the site is being discharged from each of these points. OF1 will convey surface water from the site and the surrounding residential area. OF3 will be temporary

and is unlikely to have a constant outfall, particularly during dryer periods. Table 1 from the surface water management plan is replicated below.

Table 1: Discharge points

		Easting	Northing
OF1	Existing outfall headwall	318126	173956
OF2	The Marl - existing outfall headwall	318126	173997
OF3	Temporary Discharge Point via pump cell	318074	173992

H1 Risk Assessment

The environmental risk assessment is based on the ground investigation data provided for the site and surrounding wider existing residential area. In addition, open source data was obtained from DataMap Wales, Magic Maps and BGS GeoIndex. A copy of the final Geotechnical and Geoenvironmental report for the site, dated June 2024 (ref: 280524-16017-02) is provided as Appendix 5. A copy of the final remediation strategy for the site, dated June 2024 (ref: 130624-16017/RS) is provided as Appendix 6.

Silt Management Plan

Your request indicates that Appendix B, C and D were missing from report 315487 R01 (C03) Surface Water Management Plan. These appendices contained the site proposed drainage layout (Appendix B), installation examples for mitigation measures (Appendix C) and an example inspection checklist (Appendix D). A copy of each of these are appended to this letter.

Yours sincerely

For RSK Environment Limited (Geosciences)

Tim Crowe

Principal Geo Environmental Consultant

Enc Appendix 1 - Revised Letter of Authority
Appendix 2 - Drainage Layout (SWMP Appendix B)
Appendix 3 - Installation examples (SWMP Appendix C)
Appendix 4 - Example inspection checklist (SWMP Appendix D)

Appendix 5 – Terra firma Geotechnical and Geoenvironmental Report

Appendix 6 – Terra firma Remediation strategy

Appendix 7 – 315486-BL-276-SS-D-C-27601-C03

APPENDIX 1
LETTER OF AUTHORITY

Ref: Channel View NRW Letter of Authority

Wates Construction Limited
Wates House
Station Approach
Leatherhead
Surrey
KT22 7SW

Henstaff Court Business Centre
Groes-Faen
Cardiff
CF72 8NG

Date: 9th December 2024

For the Attention of: Tim Crowe

On behalf of RSK Environment Limited

Dear Tim

Re: Appointment to act as consultant and agent

This letter is to authorise RSK Environment Limited (RSK Geosciences) to act as the appointed consultant and agent on behalf of Wates Construction Limited, in all matters relating to the application for a bespoke environmental discharge permit for the site known as Channel View, Cardiff.

I Trust that this letter of authority is sufficient to enable the application, all supporting information and associated information request responses, to be submitted by RSK Environment Limited on Wates Construction Limited behalf.

Yours Sincerely

DocuSigned by:
Helen Bunch
65793F76E734480...

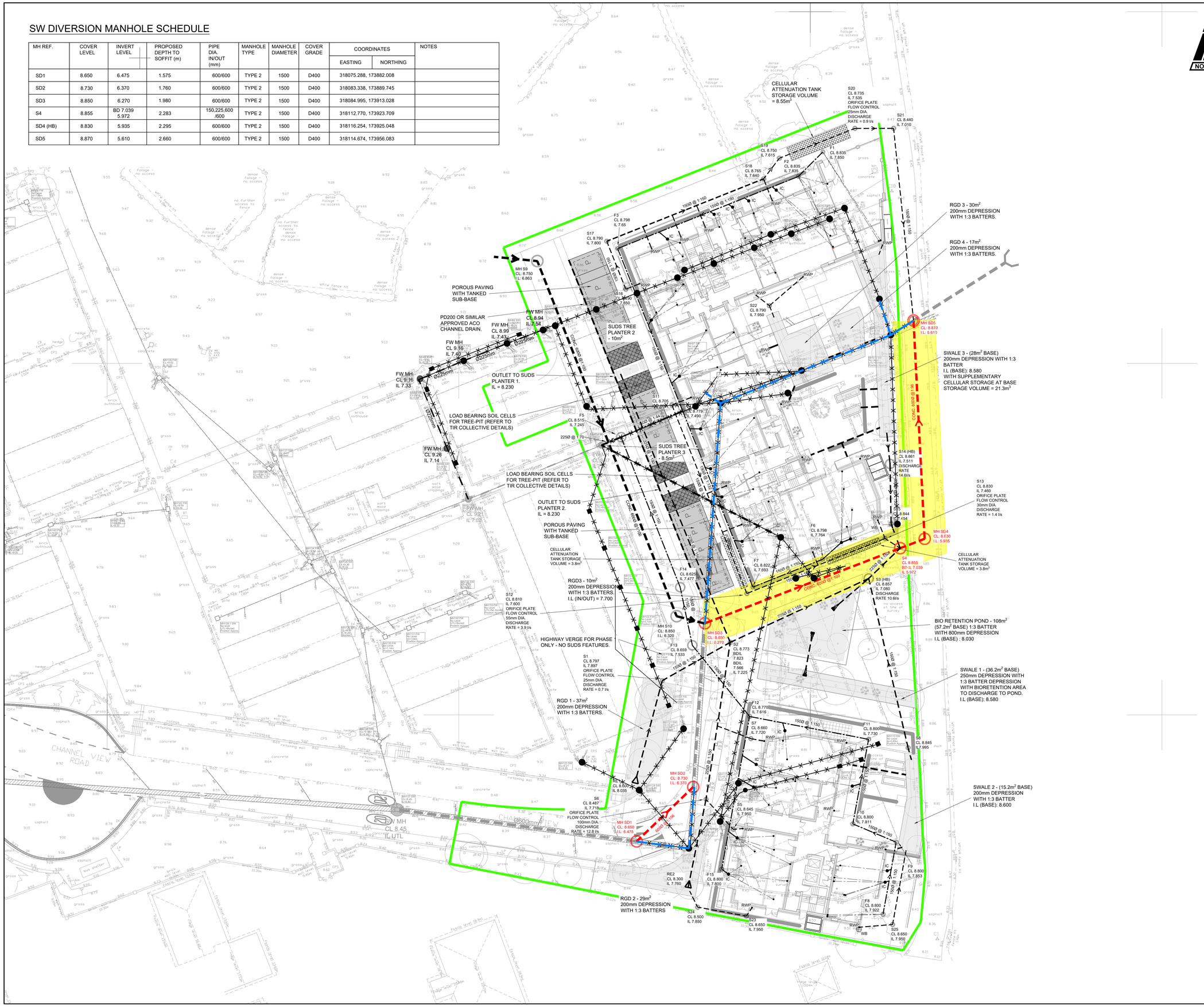
Helen Bunch

Executive Managing Director

APPENDIX 2
DRAINAGE LAYOUT (SWMP APPENDIX B)

SW DIVERSION MANHOLE SCHEDULE

MH REF.	COVER LEVEL	INVERT LEVEL	PROPOSED DEPTH TO SOFFIT (m)	PIPE DIA. IN/OUT (mm)	MANHOLE TYPE	MANHOLE DIAMETER	COVER GRADE	COORDINATES		NOTES
								EASTING	NORTHING	
SD1	8.650	6.475	1.575	600/600	TYPE 2	1500	D400	318075.288,	173882.008	
SD2	8.730	6.370	1.760	600/600	TYPE 2	1500	D400	318083.338,	173889.745	
SD3	8.850	6.270	1.980	600/600	TYPE 2	1500	D400	318084.995,	173913.028	
S4	8.855	BD 7.039 5.972	2.283	150,225,600 /600	TYPE 2	1500	D400	318112.770,	173923.709	
SD4 (HB)	8.830	5.935	2.295	600/600	TYPE 2	1500	D400	318116.254,	173925.048	
SD5	8.870	5.610	2.660	600/600	TYPE 2	1500	D400	318114.674,	173956.083	



KEY:

- EXISTING SURFACE WATER SEWER
- EXISTING COMBINED SEWER
- SW SEWER ABANDONED PHASE 1
- COMBINED SEWER ABANDONED PHASE 1
- PROPOSED SURFACE WATER SEWER DIVERSION
- PROPOSED COMBINED SEWER DIVERSION
- ABANDON FOUL WATER SEWER
- PROPOSED NEW DRAINAGE SEWER
- SITE BOUNDARY (PHASE 1)
- DCWW 6m EASEMENT

NOTES:

1. THE CONCEPT DRAINAGE STRATEGY IS SUBJECT TO APPROVAL BY THE SAB, WELSH WATER AND NRW.
2. THE STRATEGY IS SUBJECT TO FURTHER SURVEY WORKS (DRAINAGE CCTV SURVEYS).
3. S185 APPROVALS WILL BE REQUIRED FOR ALL SEWER DIVESTMENT AND DIVERSION PROPOSALS.

Rev.	Description	By	Chk	App
P08	PROPOSED DIVERSION AND RELATED ABANDONMENT SHOWN ONLY.	LW	BW	BW
		09/02/24		
P07	AMENDMENTS TO DCWW FEEDBACK.	LW	BW	BW
		05/02/24		
P06	MANHOLE SD4 HYDROBRAKE REFERENCE REMOVED. MANHOLE S4 ADDED TO S185 AGREEMENT.	DC	BW	BW
		26/01/24		
P05	AMENDMENTS TO DCWW FEEDBACK.	DC	BW	BW
		26/01/24		
P04	FOUL SEWER DIVERSION OMITTED.	PY	BW	WJ
		23/01/23		
P03	AMENDED TO SUIT REVISED SITE LAYOUT.	PY	BW	WJ
		16/09/22		
P02	ADDITIONAL LATERAL ABANDONED. ADDITIONAL STOREY ADDED. ISSUED FOR PLANNING.	AR	BW	WJ
		30/06/21		
P01	FIRST ISSUE FOR COMMENT	BW	BW	WJ
		25/02/21		

Client: CARDIFF CAERDYDD

Project:

CHANNEL VIEW, CARDIFF

Drawing Title:

PHASE 1 S185 DRAINAGE DIVERSIONS

Drawing No.

CC2083 CAM ZZ 00 SK C 52 0020

Project No. | Org. | Vol. | Level | Type | Dis. | Class | No.

Suitability Status:	Scale @A1:	Rev:
S1 PRELIMINARY	1:250	P08

CAMBRIA
Constructive Thinking

Civil & Structural Engineers
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Cardiff, CF64 1TR

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APPENDIX 3
INSTALLATION EXAMPLES (SWMP APPENDIX C)

INSTALLATION EXAMPLES

Retention of a wide vegetated buffer adjacent to a surface watercourse

Placement of stone to the front of plots to create clean forklift access

INSTALLATION EXAMPLES

Installation of silt fencing to control run-off from an unsurfaced area

Placement of silt matting to capture settled silt downgradient within a surface watercourse (image courtesy of Frog Environmental)

INSTALLATION EXAMPLES

Silt matting installed along the base of an unsurfaced swale to capture settled suspended solids prior to discharge into a surface watercourse

Dewatering bag used to treat water pumped from excavations. Dewatering bag is placed upon a pallet for ease of movement, onto clean gravel to dissipate the flow and prevent scouring, in a vegetated area for infiltration.

INSTALLATION EXAMPLES

Utilisation of flocculant treated silt matting (Floc Mat) to treat water pumped from excavations (image courtesy of Frog Environmental)

Silt Wattles utilised to separate clean and silty water within a watercourse (image courtesy of Frog Environmental)

INSTALLATION EXAMPLES

Silt Wattles utilised to intercept silt laden run-off on a road
(image courtesy of Frog Environmental)

Silt matting and Silt Wattles deployed within a surface watercourse. Silt Wattles create a check dam promoting settlement of suspended solids, which is captured by the silt matting.
(image courtesy of Frog Environmental)

INSTALLATION EXAMPLES

Coarse stone used to create periodic check dams (in conjunction with a geotextile) to reduce scouring within a swale until vegetation establishes.

Silt Wattles utilised to intercept silt laden run-off from an unsurfaced slope
(image courtesy of Frog Environmental)

INSTALLATION EXAMPLES

Silt fencing and straw bales installed across an inlet headwall within an attenuation basin, to promote settlement of silt within the concrete apron (where it can more easily be removed) prior to discharge into the attenuation basin. Coarse stone installed to dissipate flow and prevent scouring, and further promote settlement at the headwall.

INSTALLATION EXAMPLES

Silt fencing and straw bales installed across an outlet headwall within an attenuation basin, to promote settlement of silt within the basin prior to discharge into the surface watercourse

Silt fencing installed across an outfall headwall, to promote settlement of silt within the concrete apron prior to discharge into the surface watercourse (in the event of breach of other control measures)

EXAMPLE MANUFACTURERS AND PRODUCT SHEETS

Product:	Application	Manufacturer and product
Gulley Protection	Prevent silt and construction debris entering the drainage system and blocking gully pots. Proprietary products often yield superior results to straw and terram and require less maintenance.	• Forest Group – Gully Guard • Hy-Tex – Ultra drain guards
Silt Fencing	Attenuate water on site to promote settlement of silt within overland run-off.	• Frog Environmental – Silt Fence • Hy-Tex – Terrastop Silt Fence • Siltbuster – Silt Fence
Silt Matting	Capture settled silt as it naturally falls from suspension within watercourses, swales, attenuation basins to prevent its resuspension.	• Frog Environmental – Silt Mat • Hy-Tex – SediMat
Flocculant Treated Silt Matting	Capture settled silt within watercourses, swales, attenuation basins to prevent its resuspension. The addition of flocculant treatment encourages silt to settle out of suspension more readily. The Environment Agency must be consulted prior to utilisation of flocculants, and an environmental permit gained where required.	• Frog Environmental – Floc Mat
Silt Wattle	Used as check dams within watercourses / swales providing filtration and also slowing the flow of water to promote settlement of silt. Typically used in conjunction with silt matting (or flocculant coated silt matting) to capture sediment that was caused to settle. Can also be used to separate silty and clear water (i.e. within attenuation basins, or watercourses), on slopes to reduce erosion from overland run-off or to divert silty water to collection areas (i.e. on roads to divert silty run-off away from gullies).	• Frog Environmental – Silt Wattle • Hy-Tex – Ultra Erosion Guard (suitable for use as a check dam to control erosion only, due to its different construction to the Frog Environmental Silt Wattle).
Filter socks	Fitted to hose end during dewatering of excavations to collect sediment. Capable of dealing with smaller volumes and lower flow rates.	• Hy-Tex – Pro-Tex Pipe Socks • Murlac – Silt Sock • Dirtbags UK – Utility Bag
Filter bags	Fitted to hose end during dewatering of excavations to collect sediment. Capable of dealing with larger volumes and larger flow rate, typically up to a 6" pump. Note – * denotes those bags which are sized to be used within a roll on roll off skip for ease of disposal of capture silt.	• Hy-Tex – Ultra Dewatering Bag • Siltbuster – Siltstoppa Dewatering Bag* • Murlac – Silt Bag • Dirtbags UK – Dirtbag / Titan Dirtbag*
Settlement Tanks	Settlement and capture of suspended solids during dewatering / over pumping works of a larger volume than suitable for a dewatering bag, or during extended periods of dewatering / over pumping. The unit required is dependent on the grain size of suspended particles, how quickly these settle from suspension, and the required flow rate. Liaison with the supplier is best undertaken to ensure a suitable product is selected. Can be used in conjunction with flocculants and coagulants to promote settlement, however the Environment Agency must be consulted prior to their utilisation, and an environmental permit gained where required.	• Siltbuster – wide range of settlement units available • Andrew Sykes Group – settlement tanks / Silt Away. • Dirtbags UK – Dirtbox

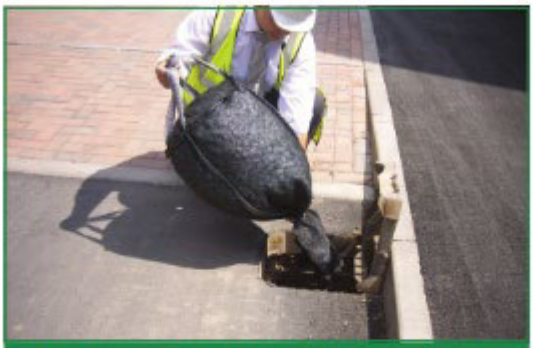
EXAMPLE MANUFACTURERS AND PRODUCT SHEETS

GULLEY PROTECTION

The Gully Guard

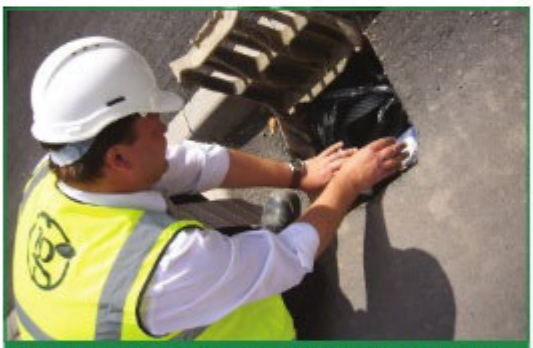
Installation guide

1. Lever open gully grid. Gully Guard is designed to fit all size gullies.



2. Hold handles at top of the Gully Guard, work beads to top and insert base into water filled gully pot.

3. Lower the Gully Guard into the pot. The beads will fall freely into the void within the pot.



4. Tuck the holding handles to the side of the Gully Guard.

5. Close gully grid.

Forest Drainage Products Ltd
Stardens Works, Tewkesbury Road,
Newent, Gloucestershire GL18 1LG
Tel: 01531 828960 Fax: 01531 828969
Email: info@forestgroupuk.co.uk
www.forestgroupuk.co.uk

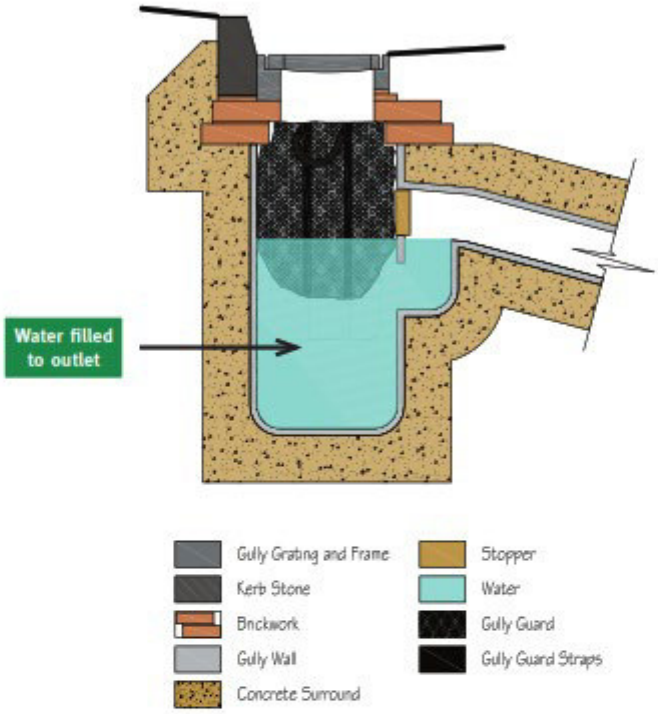
Patent no. 2472690

The Forest Group
High performance, versatile solutions

EXAMPLE MANUFACTURERS AND PRODUCT SHEETS

The Gully Guard

Installation diagram



Maintenance

The Company (Forest Drainage Products) would recommend that an inspection procedure be put in place for the product by the organisation on a 3–4 months basis depending on site conditions.

Maintenance would simply involve the removal of the Product and power hose off in a bund to contain and manage silt and any contaminants prior to reinsertion back into the gully pot.

Without prior knowledge of the type and concentration of the contaminants that each Gully Guard has been subjected to, the Company cannot advise on appropriate disposal. The Company advises that an environmental risk assessment is conducted on an individual case-by-case basis to fully evaluate the nature of contaminants. In order to determine the appropriate method of disposal the Company would recommend that you follow your organisation's environmental waste disposal policy.

Forest Drainage Products Limited (the "Company")

Forest Drainage Products Ltd, Stardens Works,
Tewkesbury Road, Newent, Gloucestershire GL18 1LG
Tel: 01531 828960 Email: info@forestgroupuk.co.uk
www.forestgroupuk.co.uk

The Forest Group
High performance, versatile solutions

2019 / 69145

EXAMPLE MANUFACTURERS AND PRODUCT SHEETS

wildlife | specialist | biodegradables | **geotextiles** | agrotextiles | accessories

Hy-Tex **Ultra Drain Guard** for Drainage Gully Sediment Control

Ultra Drain Guards are designed to remove oil and sediment pollution from surface water running into gully drains from surrounding construction sites, farms, industrial estates, or other areas prone to storm water pollution or cleaning operations.

Ultra Drain Guards are made from a high permeability non-woven polypropylene geotextile that trap solids and oils but allow water to drain through and also incorporate bypass ports to further maintain flow into the drain.

They are designed to be easily placed directly into the drain gully pot to filter out materials as they flow into the drain without compromising drainage, and the Oil and Sediment model absorbs up to 3.29 litres of hydrocarbons as well as up to 18 kg of sediment, sand or debris.

Installation:

1. Remove catch basin grating
2. Clean dirt and debris from grating ledge
3. Insert Drain Guard.
4. Reinstall grate. To insure maximum effectiveness, Drain Guard skirt should be secured (pinched) between grating and ledge.
5. Cut the excess fabric off with a blade or knife if desired.

Maintenance and disposal:

6. The Ultra-Drain Guard filters are designed to be used for 3 to 6 months under normal conditions.
7. Where heavy contamination is present the unit will have a reduced life expectancy. When the unit has collected about 6 inches of sediment it is recommended that it be replaced. The unit should also be replaced if free oil can be seen floating and is not being absorbed. The Ultra-Drain Guards should be inspected on a regular basis.
8. Dispose of unit in accordance with applicable environmental laws and regulations. The user is solely responsible for compliance with maintenance and disposal laws and regulations. The manufacturer or seller assumes no responsibility for proper or improper maintenance or disposal.

Model	Code	Oil Capture	Sediment Capture	Collection Area	Flow Rate	Size
Oil & Sediment	9217	3.29 l (.87 gal)	18 kg (40 lbs)	25.4 x 45.7cm (10" x 18")	1893 l/min (500 gpm)	121.9 x 91.4 x 45.7cm (48" x 36" x 18")

All of this was removed from 50 Ultra Drain Guards after just two weeks in storm drains

Property	ASTM Test	Value
Material		Non-woven polypropylene geotextile
Grab Tensile Strength	D 4632	979 N (220 lb)
Elongation	D 4632	50%
Trapezoid Tear	D 4533	423 N (95 lb)
Puncture Resistance	D 4833	600 N (135 lbs)
Mullen Burst	D 3786	2,896 kpa (420 psi)
Permittivity	D 4491	1.4 sec^{-1}
Pore Size	D 4751	180 micron (80 US sieve no)
UV Stability	D 4355	70% strength retained after 500hr
Weight	D 5261	272 g/m^2 (8 oz/yd^2)
Flow Rate - Fabric	D 4491	3,660 $l/min/m^2$ (90 $gal/min/ft^2$)
Flow Rate - Bypass Ports	D 4491	2,914 l/min

Aldington Mill, Mill Lane,
Aldington, ASHFORD, Kent TN25 7AJ
sales@hy-tex.co.uk www.hy-tex.co.uk

Tel: 01233 720097
Fax: 01233 720098

Hy-Tex (UK) Limited
Committed to Quality, Value & Service

EXAMPLE MANUFACTURERS AND PRODUCT SHEETS

SILT FENCING

frog environmental

product information sheet

Silt Fence

temporary silt control barrier

frog environmental supply Silt Fence and quarter cut 1.2 metre posts, ideal for providing support

Silt Fence is inexpensive to buy and install, but it must be correctly positioned and maintained for it to be an effective pollution control measure.

Each line of Silt Fence should be inspected on a regular basis, especially after rainfall.

If stakes are broken or gaps appear between the fence and the ground, then the fence should be re-trenched. Accumulated silt must be removed regularly from Silt Fence, typically when it reaches a third of the way up the fence.

Multiple smaller runs of silt fence are usually more effective at controlling pollution than longer lines.

Applications

- Silt Fence is deployed on construction sites to help prevent silt pollution in water bodies or from impacting public highways.
- Silt Fence provides a 'ponding' function; it allows silt laden water to collect behind it and for silt to drop out of suspension while the water slowly drains away or evaporates.
- Silt Fence is usually deployed in conjunction with other silt pollution control measures, especially on sites with clayey soils.

frog environmental Silt Fence is made from high specification geo-textile material and has medium porosity, making it suitable for use on most construction sites.

Poorly installed Silt Fence can cause erosion underneath or around the edges of fencing. This can lead to an increased silt pollution risk.

EXAMPLE MANUFACTURERS AND PRODUCT SHEETS

Technical information — Silt Fence

Dimensions: 100 metres x 0.9 metres (single roll)

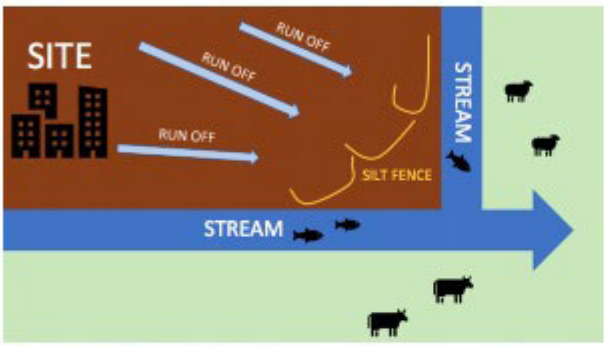
Dry Weight p/m: 110 g/m2 (9.9 kg single roll)

Permeability: 7 (l/m2 /sec)

Material used: tear resistant polypropylene geotextile, PFSC timber stakes (cable ties or staples/ nails to fix)

Function: creates a temporary fence to provide a pooling function that allows silt to drop from suspension

Disposal: all materials fully reusable or recyclable



Shorter J shaped runs of silt fence typically provide more effective pollution control than longer runs

Silt Fence can be used as a temporary measure to prevent muddy water escaping from construction sites

10 TIPS for successful Silt Fence deployments:

- Fence posts should be spaced a maximum of 1.5m apart
- Silt Fence should be trenched a minimum of 20cm into the ground and compacted
- Shorter 'J shaped' installations of Silt Fence act like mini-retention areas and are typically more effective than longer runs (as shown in the diagram above)
- Longer runs of silt fence will concentrate water in the lowest point, where the fence can become weakened and water can undercut or overflow the fence avoid these where possible
- Water flowing around the edges of silt fence can cause erosion and add to the pollution loading from site
- The lower part of the end of each run of silt fence should ideally be above the top of the middle section of the run
- Removal of accumulated silt and regular inspection are key maintenance activity for silt fence. A named individual should be responsible for this action on site
- Silt fences are not designed to handle continuous high volume flows and will not be an effective stand-alone control in these circumstances
- Factors such as soil type, slope angle and slope length are key factors in determining how much silt fence is needed on site
- If ground conditions are clayey Silt Fence alone is unlikely to be an effective pollution control

for technical support and sales of Silt Fence contact frog environmental

0345 057 4040

info@frogenvironmental.co.uk

www.frogenvironmental.co.uk

@frogenv

Wales: Llanwrda, Dyfed SA19 8NA

Midlands: The Byre, Blakenhall Park, Barton Under Needwood, Staffordshire, DE13 8AJ

EXAMPLE MANUFACTURERS AND PRODUCT SHEETS

SILT MATTING

frog environmental

product information sheet
SiltMat
silt capture mat

SiltMat is a fully biodegradable mat that captures and prevents sediment resuspension.

The mats can be placed in natural or artificial channels, ditches or directly on land to trap suspended sediments.

SiltMat can be orientated sideways or lengthways and fits into all channel types.

SiltMats are used to manage sediment release to watercourses from construction sites and for capturing silts suspended by in channel or works on river banks.

Applications

- Silt control from construction sites
- Silt control from river or bank works
- Deployed in rivers, streams and ditches
- Deployed in Silt Capture Channels
- Used in forestry and agricultural applications

SiltMat is proven in the field to reduce downstream levels of suspended solids

EXAMPLE MANUFACTURERS AND PRODUCT SHEETS

Technical information — SiltMat

Dimensions: 2 x 1 x 0.12 metres

Dry Weight: 12kg per mat

Material used: coir (80%) jute (20%)

Function: Captures and prevents resuspension of silt

Performance: Single mat captures up to 40kg of silt

Disposal: Fully biodegradable, with correct permissions used mats can be disposed ofland.

four step guide to using SiltMats

Use our reference table (below) to judge optimal placement. As a rule of thumb, SiltMat is best placed in areas where stream energy is reduced and natural deposition takes place.

SiltMat is unfolded and orientated to cover the width of the channel. The edges of silt mat can be overlaid without gaps. Mats are staked in place or weighted with local material.

SiltMat will trap large amounts of sediment. Stakes or weights are removed and the mats rolled up ready for disposal.

With correct permission SiltMat can be seeded and left on site, creating an environmental enhancement and avoiding disposal costs.

Reference table showing the distance that different particle sizes travel at differing water velocities

Particle Size	Water Speed (m/s)				
	0.2	0.4	0.6	0.8	1
Fine Gravel	20 cm	40 cm	60 cm	80 cm	1 m
Sand	70 cm	1.4 m	2.1 m	2.8 m	3.5 m
Fine Sand	8 m	17 m	25 m	33 m	40 m
Silt	228 m	456 m	683 m	911 m	1139 m

for technical support and sales of
Silt Wattle contact frog environmental
0345 057 4040
info@frogenvironmental.co.uk
www.frogenvironmental.co.uk
@frogenv

Wales: Llanwrda, Dyfed SA19 8NA
Midlands: The Byre, Blakenhall Park, Barton Under Needwood, Staffordshire, DE13 8AJ

EXAMPLE MANUFACTURERS AND PRODUCT SHEETS

FLOCCULANT TREATED SILT MATTING

frog environmental

product information sheet

Floc Mat™

water treatment mat

Floc Mat™ is a versatile silt control device

A mat created to treat and capture fine silts and suspended particles in construction site run off.

The main function of the mat is to flocculate very fine particles, making them easier to separate from water.

Floc Mats can be laid flat out in dispersion fields, used with Silt Wattles or silt fence and deployed in the frog environmental Silt Capture Channel as part of a versatile water treatment process to remove silt from construction site run off.

Applications

- In a Silt Capture Channel
- With Silt Wattles and SiltMats
- In site ditches and low flow channels
- In combination with silt fence
- On natural dispersion fields
- In combination with dewatering bags and silt socks

- **Floc Mat™ is a fully biodegradable water treatment and silt capture mat that treats muddy water and helps prevent silt pollution**
- **They are a cost effective way of treating water in ditches and channels, without the need for pumps – saving energy and CO_2**

EXAMPLE MANUFACTURERS AND PRODUCT SHEETS

Technical information — FlocMat™

Dimensions: 2x1 x 0.10m

Variants: FM1 (30g/m2), FM2 (100g/m2) FM0(untreated)

Active ingredient: Water Lynx™

Dry Weight: 12 kg per mat

Material used: coir fibres, coir netting, coir rope, anionic flocculant, water

Function: Water treatment – aids solid water separation. Can be used to segregate low flow channel to in bankside works.

Performance: Single mat captures up to 50kg of silt in live test

Disposal: Fully biodegradable, suitable for re-use on site (with correct permit).

Waste classification and disposal legislation must be followed at all times. Always liaise with the regulator before deploying a product containing flocculant. If in doubt contact frog environmental on 0345 0574040 for further information and advice.

Close up FlocMat showing accretion of silt

Deployed in Silt Capture Channels with Silt Wattles

100% sustainably sourced natural fibres are used to create Floc Mat, this ensures the mats are biodegradable and suitable for use as backfill material once used, reducing waste disposal costs. Floc Mat is available in treated and untreated forms.

The fibres of the treated version of Floc Mat are coated with Water Lynx™, a non-hazardous, non-toxic, synthetic anionic polymer which contains no coagulants, cations or metals such as Al and Fe that are ecotoxic.

When deployed in a Silt Capture Channel the Floc Mat provides a safe, low carbon and easy solution to support the removal of suspended solids and associated pollutants from construction site run off.

Deployed to treat muddy excavation water

for technical support and sales of
Silt Wattle contact frog environmental
0345 057 4040
info@frogenvironmental.co.uk
www.frogenvironmental.co.uk
@frogenv

Wales: Llanwrda, Dyfed SA19 8NA
Midlands: The Byre, Blakenhall Park, Barton Under Needwood, Staffordshire, DE13 8AJ

EXAMPLE MANUFACTURERS AND PRODUCT SHEETS

SILT WATTLE

frog environmental

product information sheet

Silt Wattle

silt control sausage

Silt Wattles are a versatile silt control device.

They are deployed on building sites to control movement of suspended silt and in ditches, channels and streams to slow the flow and naturally capture silt.

Silt Wattles are often deployed with frog environmental SiltMats and FlocMats as part of a silt pollution prevention strategy.

Applications

- Silt Wattles can be used to reduce silt release into watercourses from construction sites and deployed directly in channel to reduce movement of suspended silts.
- The tough exterior netting means they can be left for months on site with out degradation, whilst the biodegradable treated wood fibre continues to slow the flow and trap silt particles.
- Silt Wattles mould to the shape of the river bed or ground and can be joined end on end or pyramided to help clean dirty water.
- Wattles are highly versatile and can be weighted or staked in position depending on bed/ground conditions and flows.
- Silt Wattles can be joined end of end to create temp low flow channel and protect rivers from pollution arising from bank works.

Silt Wattles are a versatile product suitable for use in a wide range of silt control applications on construction sites and in river works

EXAMPLE MANUFACTURERS AND PRODUCT SHEETS

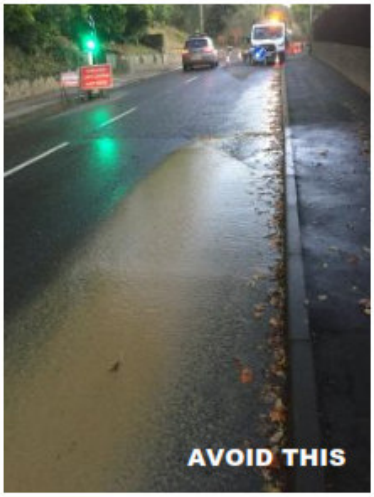
FILTER SOCKS

wildlife | specialist | biodegradables | **geotextiles** | agrotextiles | accessories

Hy-Tex **Pro-Tex Dewatering Socks** for Pumped Sediment Control

☑ **Ideal for small dewatering jobs.**

☑ **Traps sediment and oil.**



OIL DETECTION INDICATOR

A light blue paper oil detection strip is attached to each bag

If strip turns **DARK BLUE**
OIL PRESENT
Stop pumping
Contact your Environmental Manager

Pro-Tex Dewatering Socks control pollution caused when pumping dirty water from excavations, and offers an economical alternative to traditional dewatering bags or filtration products.

These easy to use and popular sediment filters bags are ideal for projects with small budgets and minor pollution problems to control of sediment and oil sheen from pumped water.

Designed to attach directly to the discharge pipe, they quickly filter water to help prevent unwanted sediment, silt, debris or pollutants leaving the site in run-off.

The socks have been designed to control pollution caused by pumping dirty water from excavations, trenches, lift shafts, bunds and the like, by filtering out sediment from contaminated water down to 90 micron, while the fabric the socks are constructed from has an inherent ability to absorbs hydrocarbons too.

Advantages

The main advantage of using an Oil & Sediment filter is that it removes hydrocarbons and sediment from pumping activities.

It provides an alternative solution that delivers a considerable cost saving and is user friendly. Furthermore it reduces site time over existing methods such as hiring a vacuum tanker. If you wish to carry out street works with a minimal disruption to the public, this is the ideal solution.

Other benefits include:

- Simple set-up with built in tie
- Hydrocarbon detection strip to identify oil pollution
- Lightweight and compact
- Very easy to empty

Product: Pro-Tex Dewatering Sediment Bag. Premium Pipe Sock.
Application: Oil and Sediment Filter
Effective Pore Size: 90 micron
Sediment Capacity: Approx 18kg
Permeability: 72 litres/m²/sec
Tensile Strength: 19 kN/m
CBR Puncture Strength: 2,900N
Material: UV stabilised. continuous filament, non-woven, needle punched polypropylene fabric.
Bag Size: Approx 1.00 x 0.30m lay flat
Additional Features: Tying cord and hydrocarbon detection strip

Aldington Mill, Mill Lane,
Aldington, ASHFORD, Kent TN25 7AJ
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Tel: 01233 720097
Fax: 01233 720098

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EXAMPLE MANUFACTURERS AND PRODUCT SHEETS

FILTER BAGS

wildlife | specialist | biodegradables | **geotextiles** | agrotextiles | accessories

Hy-Tex **Ultra Dewatering Bags** for Pumped Sediment Control

Hy-Tex Ultra Dewatering Bags provide an effective way to collect harmful sediments from dirty water pumped out of excavation works (such as foundations, pipe line construction, water, sewer and utility trenches, waterways and lakes) that would otherwise pollute the surrounding environment.

It is a legal requirement to prevent silty water from leaving site untreated, and a finable offence if you do not take appropriate pollution control measures. The Environment Agency Pollution Prevention Guidelines PPG6 (See side panel), in summary, require that the majority of suspended solids (gravel, sand, and silt) must be removed from site water before it is discharged into a drain, sewer or watercourse.

Traditionally settlement methods (such as straw bale structures or settlement ponds/tanks) are often ineffective, rely on slow water movement, long settlement times, expensive and time consuming tank maintenance and large works areas.

Ultra Dewatering Bags are an efficient, practical, quick, simple and cost effective alternative solution to manage this ongoing environmental problem of removing suspended solid pollutants from pumped water on construction sites.

Sediment-laden water is simply pumped into the high quality filter bags, which trap the solids inside and allow filtered water to flow freely out through the geotextile fabric to disperse into the surrounding ground or another collection point.

Ultra Dewatering Bags can also be used for gravity feed applications such as outfall pipes from site drainage or lagoons.

The silt filter bags provide a passive non-mechanical solution, without the use of excessive or specialist machinery (other than possible lifting equipment when full), and do not require a large work area.

The sediment bags are also light, compact and easy to store, with minimal cleaning up required - when full just dispose of the bag and replace with another bag.

The Ultra Dewatering Bags detain both oil and sediment, offering a combination of benefits not available in alternative products. They can also be used to contain contaminated sediment whilst treatments are applied (such as flocculants or absorbents).

The standard 1.80 x 1.80m Ultra Dewatering bags has the capacity to trap near 1 tonne of silt and cope with flow rates up to 2,730 l/min, while the larger 3.05 x 4.55m bags can trap over 4 tonnes of silt and cope with flow rates up to 6,818 l/min.

The Environment Agency

"Working at construction and demolition sites: PPG6 Pollution Prevention Guidelines"

"Poor management of silt and silty water is a major cause of serious pollution incidents from construction sites. Silt for these purposes is a fine inert sediment derived from soil and rocks.

Silt pollution can: damage and kill aquatic life by smothering and suffocating; reduce water quality; cause flooding by blocking culverts and channels..."

"You must not discharge any silty water to a drain or watercourse without prior treatment to settle or remove suspended solids. If you've identified that you will be generating silty water, identify suitable means to treat the water before discharge; examples include: lagoons, settlement tanks, silt traps grassy areas that slow water and allow solids to settle..."

"You must have prior permission from the local sewerage provider if you intend to discharge settled water to the foul sewer because this will be regarded as a trade effluent.

You must have prior permission from [the Environment Agency] if you need to discharge anything to a watercourse. In Scotland if you comply with certain conditions, a discharge will be covered by a General Binding Rule and you will not need to contact SEPA."

Property	ASTM Test	Value
Material		Non-woven polypropylene geotextile
Grab Tensile Strength	D 4632	912 N (205 lb)
Elongation	D 4632	50%
Trapezoid Tear	D 4533	378 N (85 lb)
Puncture Resistance	D 4833	578 N (130 lbs)
Mullen Burst	D 3786	2,758 kpa (400 psi)
Permittivity	D 4491	1.4 sec^{-1}
Pore Size	D 4751	180 micron (80 US sieve no)
UV Stability	D 4355	70% strength retained after 500hr
Weight	D 5261	272 g/m^2 (8 oz/yd^2)
Flow Rate	D 4491	3,660 $l/min/m^2$ (90 $gal/min/ft^2$)

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EXAMPLE MANUFACTURERS AND PRODUCT SHEETS

wildlife | specialist | biodegradables | **geotextiles** | agrotextiles | accessories

Hy-Tex **Ultra Dewatering Bags** for Pumped Sediment Control

Usage Guidelines

Ideally position the Ultra Dewatering Bag on a slope, so incoming water flows downhill through the bag, and, as a precaution, install Terrastop Premium silt fence down slope of the bags to control any potential run-off pollution.

The bag is fitted with a collar which fits around delivery hoses or connectors. Strap the neck of the Ultra Dewatering Bag tightly to the discharge hose using the attached tying cord.

To increase filtration efficiency place the bag on an aggregate, or a layer of Hy-Pave tiles, to maximize water flow through the under surface of the bag.

Plan ahead for removal, if the filled bags are to be lifted for disposal then place suitable lifting straps under bag prior to pumping, alternatively you can roll the bags into a digger bucket.

Regularly check the bags. The Ultra Dewatering Bag is full when it no longer can efficiently filter sediment or pass water at a reasonable rate.

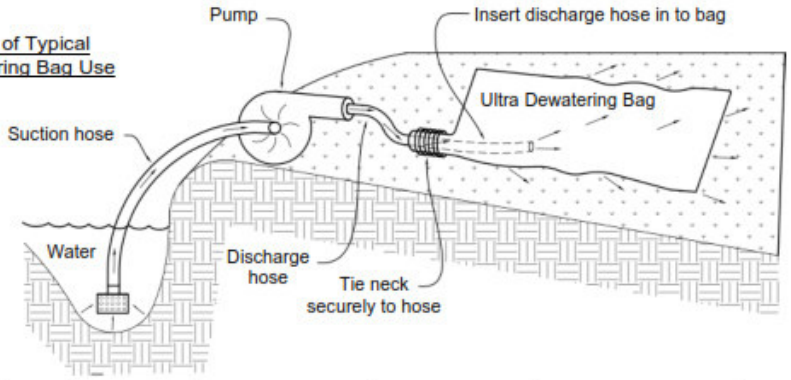
Flow rates will vary depending on the size of the Ultra Dewatering Bag, the type and amount of sediment discharged into the bag, the type of ground, rock or other substance under the bag and the degree of the slope on which the bag lies.

Under most circumstances Ultra Dewatering Bags will accommodate flow rates of up to 2,730 l/min for the 1.80 x 1.80m bags and 6,816 l/min for the 3.05 x 4.55m bags.

Use of excessive flow rates, or overfilling Ultra Dewatering Bags with sediment, may cause ruptures of the bags or failure of the hose attachment straps.

Dispose of the Ultra Dewatering Bag as directed by the site engineer. Normally allow the bags to dry in place then either cut open, spread and landscape on site or remove and dispose of the filled bags (Heavy lifting machinery may be required).

Illustration of Typical Ultra Dewatering Bag Use



Size	Code	Surface Area	Max Flow Rate	Max Pump Size	Sediment Capacity	Oil Capacity
1.80 x 1.80 m (6 x 6 ft)	9724	6.68 m² (72 ft²)	2,730 l/min (500 gal/min)	10 cm (4 inch)	0.51 m³ / 980 kg (18 ft³ / 2,160 lbs)	14 l (3.7 gal)
3.05 x 4.55 m (10 x 15 ft)	9725	27.87 m² (300 ft²)	6,818 l/min (1,500 gal/min)	15 cm (6 inch)	4.20 m³ / 4,082 kg (150 ft³ / 9,000 lbs)	57 l (15.1 gal)

Notes:

Flow/Dewatering rates will vary according to soil type (Sand typically dewaters at the fastest rate, while clay dewaters at the slowest). Clay may also blind over the fabric in some instances, significantly reducing flow.

Max flow rate is a cautious figure based on a significantly de-rating of the clean fabric flow rate of approx 3,660 l/min/m² (90 gal/min/ft²) to allow for pump pressure build up due to silt accumulation.

Sediment capacity is calculated using wet sand weight of approx 1,920kg/m³ (120 lbs/ft³) and a bag fill height of approx 150mm

Oil capacity is estimated at low flow conditions with approx 2.09 l/m² (0.5 gal/yd²) absorption capacity

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EXAMPLE MANUFACTURERS AND PRODUCT SHEETS

Siltbuster®

Siltbuster Siltstoppa Bags

Siltstoppa Bags provide a low cost solution for the dewatering of sludges and slurry.

Pre-conditioned (flocculated) slurry is pumped into the Siltstoppa Bag and allowed to dewater. The water released from the sludge bleeds through the geotextile fabric whilst the trapped solids remain in the bag.

Siltstoppa De-watering Bags are available individually, to sit on a suitable slab or drainage area or can be supplied as a complete treatment solution including as required sludge conditioning unit, and roll-on/roll-off (RORO) container.

When the bag is full and the trapped solids have dewatered, the Siltstoppa bag can either be split open on-site and the dewatered solids removed by means of an excavator (or similar equipment), or the full RORO container can be transported for off-site disposal.

Siltbuster Siltstoppa Bags Specs

Separation Method	Geotextile Membrane
Height	Expands until full
Length	5.5m
Width	2.1m
Dry Weight	Size Dependant
Materials	Sludges and Slurries
Material Colour	Black
Bag Capacity	6m³
Operating Range	Material Dependant

Siltbuster Siltstoppa Skip

Siltstoppa De-Watering Bags have been conviently sized to fit an industry standard roll on roll off (RORO) Siltstoppa skip. The RORO dewatering skip provides a secure and environmentally acceptable means of bunding a Siltbuster Siltstoppa Dewatering Bag.

When the skip is full with either single or multiple bags (stacked up on top of each other), the skip and its contents can be transported to a Waste Management Facility for disposal of the dewatered sludge/slurry contained within the Siltstoppa Bags.

The Siltstoppa Skip comes complete with an integral sump, allowing easy removal of the water which escapes from the dewatering sludge/slurry.

Siltbuster Siltstoppa Skip Specs

Separation Method	Geotextile Membrane
Height	1.2m
Length	6.1m
Width	2.6m
Dry Weight	2.0 tonne
Material	Flocculated Particles
Operating Capacity	1 Bag
Lifting Method	RORO Hooklift
Operating Range	Material Dependant

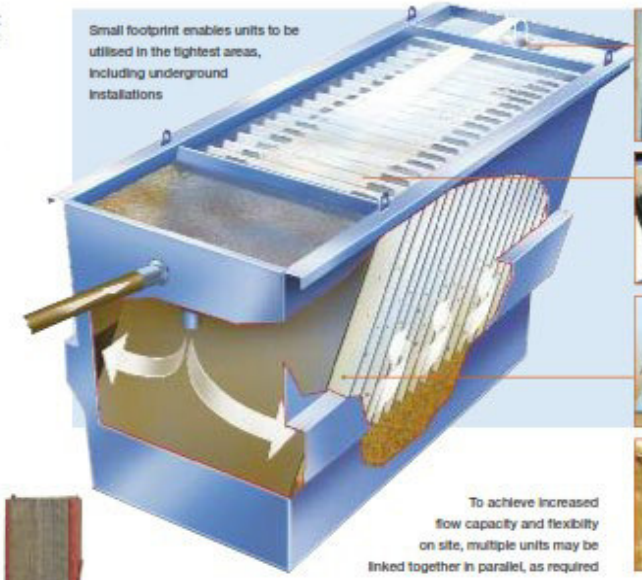
SETTLEMENT TANKS

Siltbuster®

Gravity Settlement ▸ Siltbuster Settlement Units & Water Clarifiers

Siltbuster is the UK's leading provider of mobile settlement units and Lamella Clarifiers. Each unit in the extensive range is specifically designed to remove suspended solids and settleable matter from silt and solids laden surface run-off and groundwater.

Effective gravity based solid/liquid separation requires the largest possible settlement area and optimum hydraulic flow. Siltbuster Clarifiers utilise lamella plate technology to maintain ideal settlement conditions within each unit, thereby, ensuring maximum particle settlement and minimum unit footprint.

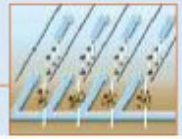


Small footprint enables units to be utilised in the tightest areas, including underground installations

To achieve increased flow capacity and flexibility on site, multiple units may be linked together in parallel, as required

Innovative outlet design maintains flow even when the unit is not exactly level

Plate technology and configuration hugely increases settlement area. Plates are designed for easy handling



Flow distribution has been designed to meet the rigours of the modern construction site

Emptying can be achieved by a range of methods, e.g. via drain ports & valves, vacuum tanker or by manual or mechanical means

Siltbuster mobile clarifiers are robust; skid-mounted; compact and lightweight, making them simple to transport, install and operate. They are ideal for sites with limited access, restricted spaces and temporary projects.
Hopper bottomed units can be fitted (on request) with an automatic sludge removal system making their operation virtually maintenance-free.

Typical applications

Construction

- Pumping & de-watering
- Groundwater treatment
- Site run-off treatment
- Drilling, piling & coffer dams
- In-river & near-river works
- De-silting & dredging
- Roads, pipelines & other linear projects
- Plant, vehicle & wheel washing
- Site water management

Silt Management

www.siltbuster.com

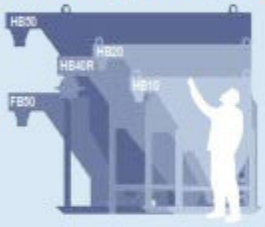
RSK GEOSCIENCES

Silt Management

The Siltbuster Mobile Range

Siltbuster offers a range of various sized units to provide customers with flexibility and the opportunity to hire or purchase a tailored, yet off the shelf, solution.

The Mobile Range, Size Comparison



FB50	HB10	HB20	HB40R	HB50
Flat-bottomed, skid-mounted unit. The Construction Industry's favourite	Hopper-bottomed, skid-mounted unit	Enlarged version of HB10. Increased flow rate and sludge storage. Batch or continuous sludge draw-off	Hopper-bottomed, skid-mounted unit	Performance of the FB50 but with twin hoppers for larger capacity, primary thickening applications and batch or continuous sludge draw-off
Height: 1.9m	Height: 2.1m	Height: 2.6m	Height: 3.1m	Height: 3.1m
Length: 3.7m	Length: 1.9m	Length: 2.5m	Length: 3m	Length: 3.7m
Width: 1.45m	Width: 0.9m	Width: 1.2m	Width: 2.2m	Width: 1.7m
Effective Settlement Area: 50m²	Effective Settlement Area: 10m²	Effective Settlement Area: 20m²	Effective Settlement Area: 40m²	Effective Settlement Area: 50m²
Dry Weight: 1,960kg	Dry Weight: 510kg	Dry Weight: 1,120kg	Dry Weight: 2,480kg	Dry Weight: 2,370kg
Inlet: 4" bauer	Inlet: 2" bauer	Inlet: 3" bauer	Inlet: 4" bauer	Inlet: 4" bauer
Outlet: 6" bauer	Outlet: 3" bauer	Outlet: 4" bauer	Outlet: 6" bauer	Outlet: 6" bauer
Typical Operating Capacity: 1-50m³/hr	Typical Operating Capacity: 1-10m³/hr	Typical Operating Capacity: 1-20m³/hr	Typical Operating Capacity: 1-40m³/hr	Typical Operating Capacity: 1-50m³/hr

The benefits

- Readily transportable, fast and simple to setup, easy to operate.
- Small footprint units with large settlement area
- Unique design enables rapid particle settlement and water clarification
- Up to 20 times more efficient than conventional settlement tanks and lagoons of the same plan area
- Choice of unit sizes and capabilities to suit most applications
- Units can be used individually or linked to accommodate a wide range of flows, pump sizes and particle charcteristics

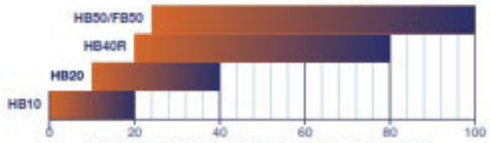
Options & Process Add-ons

Total Water Treatment Solutions

Siltbuster Clarifiers can be configured as single or mulitiple units for basic gravity separation and discharge-to-sewer applications. Thay can also be supplied as part of a complete, tailored, packaged treatment solution – including ancillary equipment, such as:

- Lids, covers, walkways & access platforms
- Flow splitter valves, flow meters & flanged ports
- Automatic, flow proportional, single or multi-stage chemical pre-treatment
- Fully containerised dosing systems
- Flash mixers
- Pipe flocculators or mixing/aging tanks
- Automatic desludging systems
- Sludge pumps & sludge storage tanks
- De-watering systems

Siltbuster Mobile Clarifier Operating Range



For hire, sales or more details call Siltbuster on 01600 772256

RSK GEOSCIENCES

Process Add-ons

Chemical Dosing, Pre-treatment & Reaction Systems

Siltbuster believes that, wherever possible, the use of chemicals to treat excess site water should be avoided. However, there are some types of waste water, contaminants and effluent which still require the use of chemicals to increase the particle settlement rate, so as to enable their removal. This can be due to either the presence of very fine particles; clay; colloidal matter; colour or simply the soil's own interparticle electrical bonds which need to be interupted in order for settlement to occur.

In such cases, chemical dosing is unavoidable. Consequently, Siltbuster has developed an extensive range of chemical dosing systems to compliment it's award-winning settlement units.

Treatment Systems

Flocculant Blocks
Basically, a flocculant in a solid form. When immersed in water the solid dissolves, releasing the chemicals, causing a reaction.

Single-Stage & Multi-Stage Dosing Systems
Siltbuster's Single-Stage dosing systems range from a single dosing pump linked to a drum of coagulant or acid/alkali for pH adjustment, through to an IBC based flocculant batch makeup system and associated pumped dosing. The dosing rate is fully controllable and can be linked to flow rate and chemicals can be added to mixing/reaction tanks, in-line or via pipeflocculators. For more complex dosing regimes requiring similar levels of accuracy, Siltbuster offers Multi-stage dosing systems, including staged coagulant and flocculant dosing, often with an intermediate stage for pH adjustment.

Chemical Reaction Systems

The reaction rate of treatment chemicals, dictates the system required.

Mixing Tanks
Siltbuster can supply mixing tanks, ranging from 1m³ to 30m³ capacity.

Pipeflocculators
For faster reacting chemicals, various pipeflocculators are available.

Containerised Integrated Dosing Units

Siltbuster can provide secure, self-contained, in-line dosing units which enable the controlled, flow-proportional, multi-stage addition of treatment chemicals. For flows up to 150 m³/hr, the 'plug & play' systems come pre-installed in a 10ft (3m), 20ft (6m) or 40ft (12m) shipping container, as required.

Options include:

- Bunded chemical storage
- Flow-proportional dosing systems
- Reaction/aging tanks and pipeflocculators
- Control panels and datalogging
- Insulation, lighting and heating
- Integrated Lamella or DAF Units (subject to model and size).
- Automatic monitoring of feed and discharge water

Full Treatment Packages

Siltbuster's in-house laboratory can test a wide range of chemicals to identify the treatment regime most suited to your needs. A sample of the untreated water, your flowrate and the required discharge limits are all that is needed.

Silt Management

www.siltbuster.com

APPENDIX 4
EXAMPLE INSPECTION CHECKLIST (SWMP APPENDIX D)

GULLEY INSPECTION CHECKLIST
SITE:

Date	Gully no	Fit for purpose (yes/no)	(if no: action required, clean / replace?)	Comment	Signature

SITE INSPECTION CHECKLIST
SITE: Garlick's Arch, Burntcommon, Surrey

Name of person undertaking inspection: .....
Date: .....
Current weather conditions: .....

Description	Comments	Action	Initial
1) What is the current condition of the gully protection measures within the active areas of the site? *Note any gullies requiring maintenance measures*			
2) Are site roads clean and relatively free of mud? Is the frequency of visits by the road sweeper adequate? *Consider whether additional visits should be scheduled.*			
3) Are there currently unsurfaced areas being trafficked which may be causing silt to enter the site drainage? *Note if additional measures are required to reduce the run-off from these unsurfaced areas.*			
5) Are control measures in place to prevent silt run-off from unsurfaced areas and soil stockpiles? *Note if the control measures are adequate and whether the increased runoff requires an increase in the frequency of inspection of any control measures.*			

6) What is the current condition of water within the two on-site surface watercourses? *Note any discolouration of the water or obvious sign of sediment within the water.*			
7) What is the current water condition of the attenuation basin and swale? *Note any discolouration of the water or obvious sign of sediment within the water.*			
8) Is any off-site run-off occurring? *Note whether any run-off is occurring – considered most likely to occur at the southern and western boundaries.* *Note any control measures in place.*			
9) Is there any dewatering of excavations taking place on site? *Note what activities are taking part and their location.* *Note any control measures in place.*			

Notes and actions to be taken:

Completed by	Name	Signature	Date
Site Manager			

MONITORING POINT INSPECTION RECORD
SITE: Garlick's Arch, Burntcommon, Surrey

Name of person undertaking inspection: .....

Date: .....

Current weather conditions: .....

Monitoring Location	Monitoring Location Rationale	Inspection Record	Action required	Initial
Monitoring of the following primary monitoring locations (as shown on Figure 3 – depicted by purple monitoring symbols) on a **daily basis during periods of rainfall**, and at a suitable frequency during periods of dry weather				
Monitoring Location MP1:	Monitor the water quality and sediment-contamination of the drainage (retention) basins.			
Monitoring Location MP2:	Monitor the water quality and sediment-contamination of the surface watercourse.			
Monitoring Location MP3:	Monitor surface water and sediment run-off / deposition across the site's infrastructure (roads, drainage, gulleys etc).			

Completed by	Name	Signature	Date
Site Manager			

APPENDIX 5
GEOTECHNICAL AND GEOENVIRONMENTAL REPORT

terra firma

Geotechnical & Geoenvironmental Specialists

Geotechnical and Geoenvironmental Report

Site: Proposed Phase 1 Residential Development, Channel View, Cardiff

Prepared For: Cardiff City Council

Issue Date: June 2024

Job No: 16017

info@terrafirmawales.co.uk

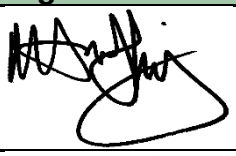
www.terrafirmawales.co.uk

V3

REPORT TITLE	:	**Geotechnical and Geoenvironmental Report: Proposed Phase 1 Residential Development, Channel View, Cardiff**
JOB NUMBER	:	**16017**
ISSUE DATE	:	**June 2024**
REPORT REFERENCE	:	**280524-16017-02**

Document Revision Record

Issue Number	Date	Revision Details
01	29th April 2024	First Issue
02	28th May 2024	Completion of gas and groundwater monitoring
03	13th June 2024	Removal of reference to proposed basement

	Name	Signature
Prepared	**Michael Watkins** MEng FGS Tech IOSH	
Checked	**David Emanuel** BSc (Hons), MSc, FGS, Dip.Chem, M Phil, CGeol	
Approved	**Gwyn Lake** BSc (Hons). PhD, CGeol, FGS	

Executive Summary

Site Location and Proposed Development	*Cardiff City Council (the Client) is proposing the redevelopment of residential areas on Channel View Road in the Grangetown area of Cardiff. Phase 1 of the proposed development lies at the south of the broader area of redevelopment and comprises two 8-12 storey tower blocks providing accommodation for 79 elderly-persons, with communal gardens, community café, access road and car parking.*
Site History	*Land reclamation has taken place at the site since 1812. Prior to this the site lay seaward of the coastline. Since this time further infilling has taken place beneath and around the site, including a landfill known as 'The Marl'. The site became occupied by housing sometime between 1974 and 1989. These houses were demolished in 2023.*
Geology	*The site is underlain by approximately 4-5m of made ground above Tidal Flat Deposits, giving way to Glaciofluvial Sheet Deposits at approximately 13-14m. Mudstones of the Mercia Mudstone Group are recorded at around 18-22m.*
Radon	*A radon report procured from BGS states that no radon protection measures are required for new buildings at the site.*
Ground Conditions	

Depth (m)			***Thickness (m)***	***Stratum***
0.00	-	*5.8*	*5.8*	*Dark brown mottled black and grey very sandy angular fine to coarse **GRAVEL** of brick and concrete fragments, metal, ceramics, plastic, and mudstone. Sand is fine to coarse (**Made Ground**).*
5.8	-	*12.9/17.5*	*7.1/11.7*	*Very soft to soft grey silty **CLAY** and clayey **SILT** with lenses of slightly sandy slightly gravely **CLAY** and fibrous organic matter (**Tidal Flat Deposits**)*
12.9/17.5	-	*19.5/20.5*	*3.0/6.6*	*Orangish brown variably sandy sub angular to sub rounded fine to coarse **GRAVEL** of mudstone with medium cobble content. **(Glaciofluvial Sheet Deposits)***
19.5/20.5	-	*26.5/27.5*	*Unconfirmed*	*Extremely weak to weak narrowly bedded light reddish brown mottled light bluish grey **MUDSTONE** with some lenses of very stiff light reddish brown gravelly **CLAY** (**Mercia Mudstone Group**).*

Contamination of Concern	*Soil – Lead, dibenzo(ah)anthracene, and asbestos* *Groundwater – Nickel and zinc*
Ground Gas Risk Assessment	*The site is classified as 'Gas Characteristic Situation 1' (CS1). in line with recommendations provided in BS8485:2015+A1:2019.*
Foundation Solution	*The proposed development comprises a mixture of 8 to 12 storey residential buildings. Due to the high loads and inappropriate founding strata at shallow depth, piled foundations set within the underlying Mercia Mudstone Group bedrock are recommended. Given the density of the glaciofluvial sheet deposits above the Mercia Mudstone bedrock, likelihood for buried obstructions and proximity to existing developments, roads and services continuous flight auger (CFA) piles are recommended.* *Floor slabs should be designed as suspended.*

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SECTION 1 Introduction and Proposed Development

1.1 Introduction

Cardiff City Council (the Client) is proposing the redevelopment of residential areas on Channel View Road in the Grangetown area of Cardiff. Phase 1 of the proposed development lies at the south of the broader area of redevelopment and comprises two 8-12 storey tower blocks providing accommodation for 79 elderly-persons, with communal gardens, community café, access road and car parking.

TFW Group Limited (hereafter referred to as Terra Firma) has been commissioned by the Client to undertake a second phase of geoenvironmental assessment and geotechnical investigation of the Phase 1 area.

Terra Firma has previously carried out a site investigation on a larger parcel of land that encompasses the site. This report should be read in conjunction with the following report.

- Geotechnical and Geo-Environmental Report: Proposed Residential Development at Channel View Cardiff, dated December 2021 (Job No: 16017).

The main objectives of the geoenvironmental assessment programme are:

- Investigate the potential human health and environmental liabilities at the site associated with any contamination.
- Provide a summary of the human health and environmental conditions at the site, together with any necessary further intrusive works and / or remediation works to render the site fit for its intended use.

The main objectives of the geotechnical site investigation are:

- Investigated the type, strength and bearing characteristics of the shallow superficial and underlying solid geology.
- Investigate the risk, if any, from historical shallow underground mining features
- Provide engineering foundation and floor slab recommendations for the proposed development.
- Provide infiltration rates and stormwater drainage viability.
- Provide recommendations regarding any other geotechnical aspects pertaining to the development.

In order to achieve the above objectives, Terra Firma carried out an assessment programme including a site walkover, a review of existing data, followed by a field investigation to collect geotechnical and geoenvironmental data from selected locations.

1.2 Limitations and Exceptions of Investigation

The Client has requested that a Geoenvironmental Site Assessment (GSA) and Geotechnical Investigation (GI) be performed to enable the outlined main objectives.

The GSA and GI were conducted, and this report has been prepared for the sole internal reliance of the Client and their design and construction team. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Terra Firma. If an unauthorised third party comes into possession of this report, they rely on it at their peril and the authors owe them no duty of care and skill. The report represents the findings and opinions of experienced geoenvironmental and geotechnical consultants. Terra Firma does not provide legal advice and the advice of lawyers may be required.

The subsurface geological profiles, any contamination and other plots are generalised by necessity and have been based on the information found at the locations of the exploratory holes and depths sampled and tested.

It was beyond the scope of this report to provide an updated desk study for the Phase 1 development area.

1.3 Quality Assurance

The quality and environmental aspects of the assessment comply with Terra Firma business management system which is UKAS Accredited to ISO 9001:2015 and ISO 14001:2015 standards.

SECTION 2 Review of Existing Data

2.1 Physical Setting and Current Site Use

The development site is irregular in shape and locates to the east of Channel View Road in the Grangetown area of Cardiff, CF11 7HZ. The site centres on an approximate National Grid Reference of 318090, 173930, occupying a plan area of approximately 0.56 Hectares.

The site is currently unoccupied following the demolition of two-storey dwellings with gardens. The site is currently surrounded by security fencing. A gate allows access from Channel View Road at the southwest.

Site boundaries are defined by housing to the south and west, playing fields to the north, and the Taff Trail (cycle path) to the east.

Immediately to the east of the Taff Trail is the banks of the River Taff. To the north are playing fields known as The Marl, and to the south and west is housing.

The site is generally flat and has an elevation of approximately 8m AOD. The site stands approximately 4m above the adjacent River Taff.

The Phase 1 site location is indicated in blue on **Figure 2.1** at the south of the broader area of proposed redevelopment in red.

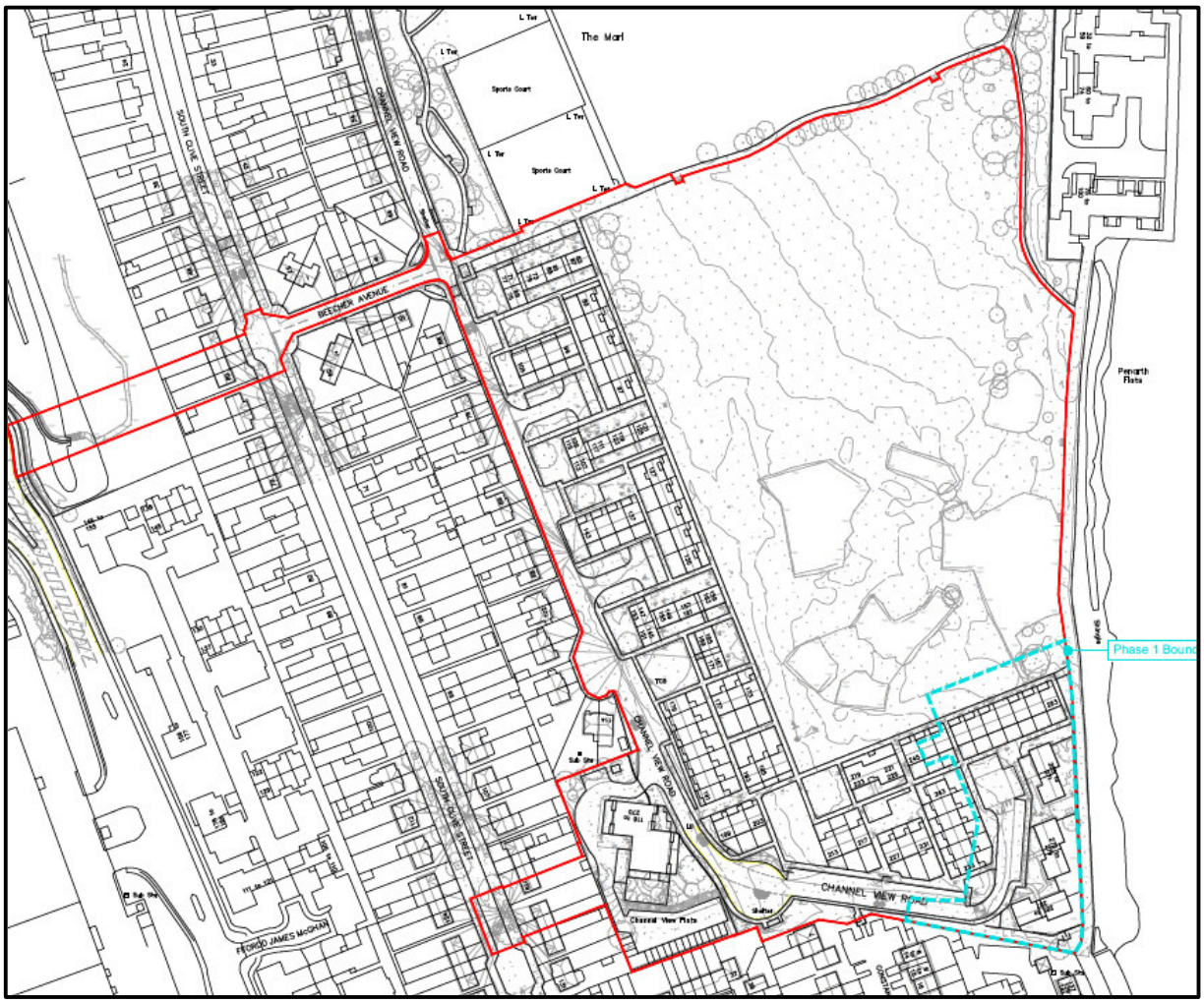


Figure 2.1 Site Location

2.2 Summary of Historical Review

A summary of the historical review, targeted specifically at the Phase 1 development site is presented below. The data has been drawn from the Terra Firma site investigation report dated December 2021, which stretches further to the north and west. The most relevant editions are summarised in **Table 2.1**. Distances, where quoted are approximate, and any changes in-between map editions may not be recorded.

Table 2.1 Historical Development from Map Information

Map Edition & Scale	Key Features on Site	Key Features off Site
1880 1:2,500	The site is an area of salt marshland and rough pasture. An east to west orientated stream flows through the site.	The site is surrounded by marshland. The Taff Vale Railway lies 100m to the west and River Taff lies 175m to the east.
1901 1:10,560	Saltings occupy the west and mud banks occupy the west of the site.	Changes in site levels appears to have taken place to the west of the site. A sewerage tank lies 290m to the north and a gas works lies approximately 640m to the northwest.
1920 1:2,500	No significant changes.	No significant changes to the surrounding area.
1941 1:10,560	No significant change.	Houses have been built approximately 120m to the west.
1947-1951 1:10,560	The site has been subject to filling with an embankment along the south and east boundaries. The saltings and mud banks are no longer recorded as being on site.	No significant changes.
1965 1:10,560	The site and area to the north are located upon 'The Marl' playing fields at approximately 25 feet (8m) above Ordnance Datum.	The River Taff's High-Water Mark of Medium Tides is located approximately 10m to the east.
1969-74 1:1,250	No significant changes.	A transport depot lies to the immediate south of the site. A residential tower lies approximately 140m to the west. The sewage works are no longer recorded and has been replaced by a sand and gravel yard.
1989 1:1,250	An access road and houses occupy most of the site. The far north of the site is occupied by 'The Marl' playing fields.	Houses lie to the immediate west of the site.
2000 Aerial Image	No significant change.	The depot to the south has been replaced by houses.
2006 1:10,000	The site remains unchanged.	The surrounding area remains unchanged.
2023	The houses on site have been demolished.	The surrounding area remains unchanged.

2.3 Geological Setting

2.3.1 Geology

The 1:50,000 scale British Geological Map of the area (Sheet 263) and the publication 'Urban Geology of Cardiff Centre and the Bay Region' were consulted for geology underlying the site.

The site is shown to be underlain by rocks of the Mercia Mudstone Group. Above the bedrock is Glaciofluvial Deposits, beneath Alluvium. Made ground is likely to cover the site.

Detailed stratigraphical information is provided in **Table 2.2**.

Table 2.2 Detailed Stratigraphical Information

Age	Name	Description
Modern	Made Ground	Dock construction involved the coastline being extended southwards for about a kilometre. Since the docks were built the tidal flats of the Ely, Taff and Rhymney have been tipped on to reclaim land for industrial use. Reclamation took place in this area of Cardiff by 1810 and any fill materials are likely to be highly variable.
Quaternary	Tidal Flat Deposits	Including mud flat and sand flat deposits form extensive nearly horizontal marshy land in the intertidal zone that is alternately covered and uncovered by the rise and fall of the tide. They consist of unconsolidated sediment, mainly mud, silt and/or sand. They may form the top surface of a deltaic deposit.
Pleistocene	Glaciofluvial Sheet Deposits	Sand and gravel, locally with lenses of silt, clay or organic material; characteristic 'sandur' (sheet) and valley train form; of glaciofluvial origin.
Mid to Late Triassic	Mercia Mudstone Group	Dominantly red, less commonly green-grey, mudstones and subordinate siltstones with thick halite-bearing units in some basinal areas. Thin beds of gypsum/anhydrite are widespread; thin sandstones are also present.

No dip readings are recorded in the local area.

Made ground to a depth of approximately 5m is anticipated at the site based on previous borehole data on site and in the surrounding area.

2.3.2 BGS Data

One BGS borehole is recorded on site and a further two boreholes are recorded approximately 60m and 80m to the west. Data from these boreholes is presented in **Table 2.3**.

Table 2.3 Detailed Stratigraphical Information

BGS Reference	Exploratory Hole Type	Location	Strata Summary	Depth (m)	
ST17SE178	Borehole	On site	MADE GROUND	0.00	4.72
			Soft grey and brown silty CLAY	4.72	13.41
			Dense GRAVEL	13.41	18.29
			Stiff Red clayey MARL	18.29	>20.57
ST17SE452	Trial Pit	60m northwest	Topsoil	0.00	0.25
			MADE GROUND	0.25	>4.00
ST17SE68	Borehole	80m west	MADE GROUND	0.00	3.81
			Soft CLAY	3.81	15.84
			SAND and GRAVEL	15.84	19.81
			Stiff red CLAY	19.81	20.73
			Mercia Mudstone	20.73	>25.76

British Geological Survey's (BGS) Geoindex website allow subsurface geological cross-sections to be derived from 3D geological models in some cities of the UK. Cardiff is one of these cities. Two indicative cross-sections have therefore been created through the site from north to south and are presented in **Figure 2.2**.

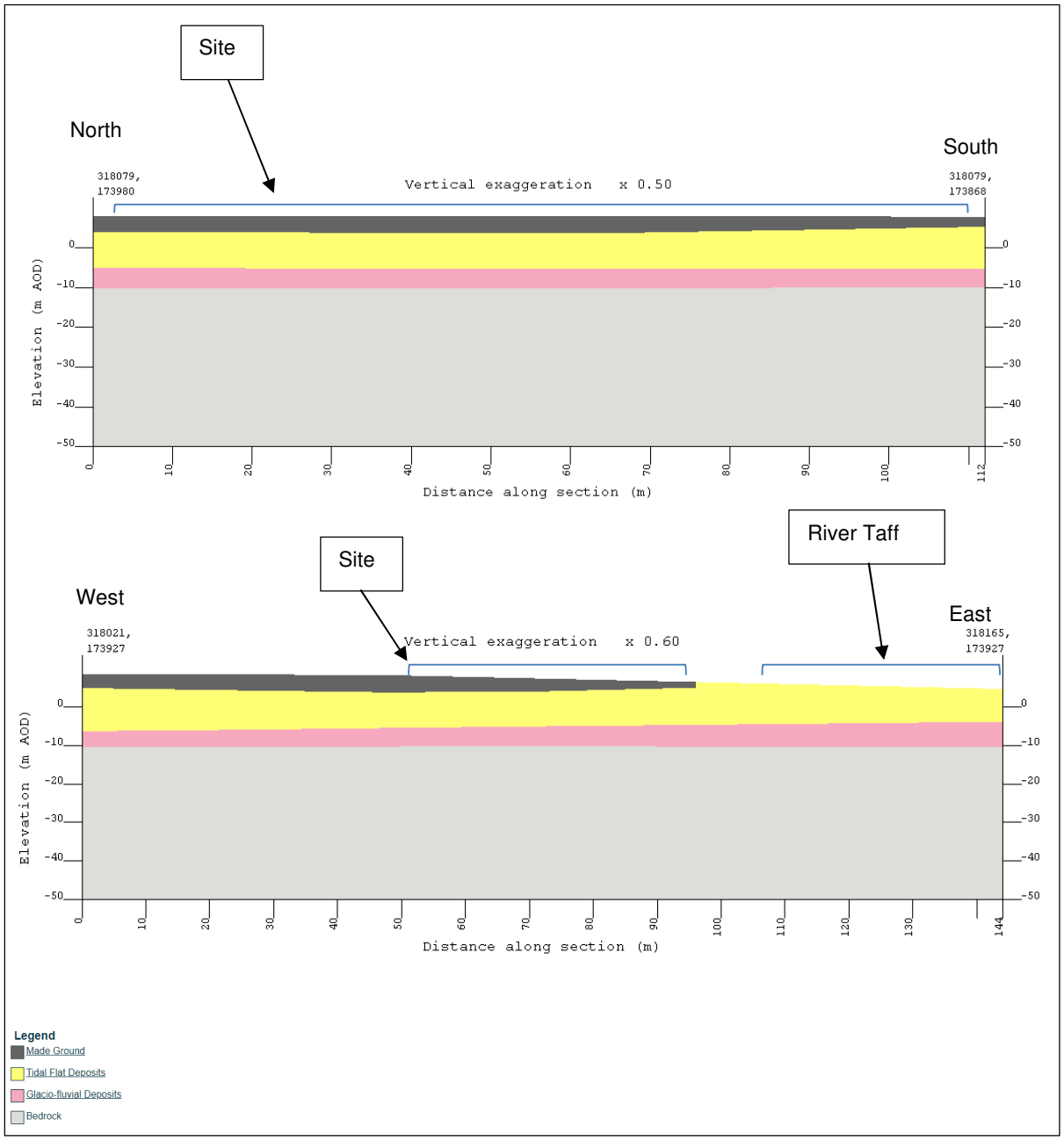


Figure 2.2 BGS Cross-Sections through Site

2.3.3 Cardiff Borehole Information

The 1812 coastline is located to the north of the site, indicating the site ground levels have been raised since this time.

There are buried channels within the Mercia Mudstone beneath Cardiff. The buried channels were cut during a period or periods of low sea-level, when during the Devensian glacial maximum, the whole of the Bristol Channel area was dry land. As the glaciers retreated northwards into the Coalfields soon after the Devensian glacial maximum, sands and gravels spread out in a fan, filling the deep channels.

The Cardiff Borehole Contour Map shows the axes of a buried channel running along the south boundary of this site from northwest to southeast. Based on the contours, bedrock is anticipated at approximately 12m to 14m below Ordnance Datum (approximately 20-22m depth below ground level).

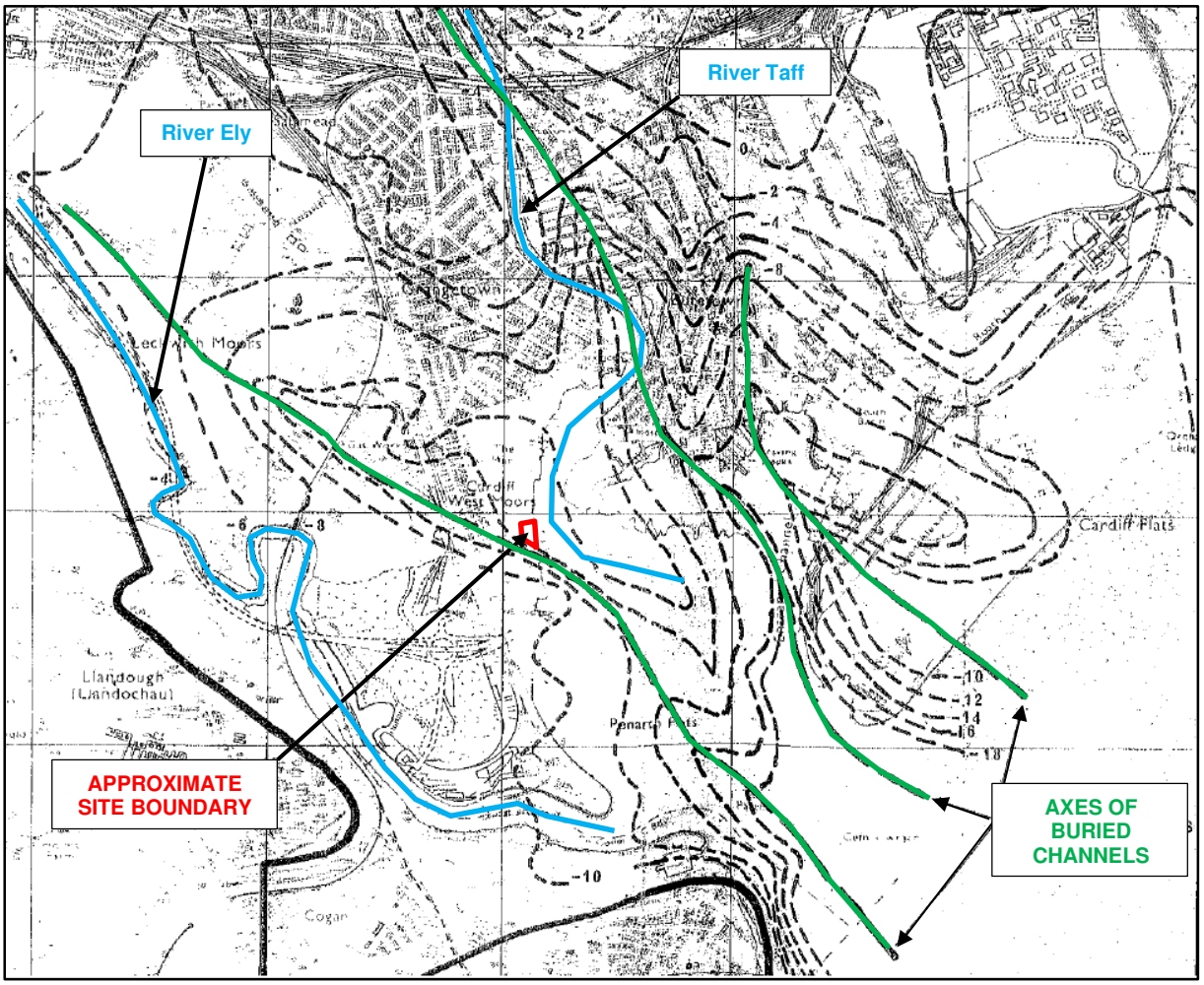


Figure 2.3 Map of Cardiff Showing Location of Buried Channels

The buried channel in proximity of the site is taken to be the former course of River Ely. The British Geological Survey Memoir for Cardiff and District states that the greatest known depth of the buried channel is 12.5m, near the outlet of the modern river to the sea.

2.3.4 Radon

A Radon Report from British Geological Survey details that no radon protective measures are required for new developments on the investigation site. A copy of the radon report is presented in **Annex A**.

Additional consideration will need to be given to the requirement of radon protection within basements or other occupied spaces below ground level.

Further guidance on reducing the concentration of radon in new buildings, extensions, conversions and refurbishment projects, in order to reduce the risk to occupants, is provided in BR:211:2023.

2.3.5 Mining

The site situates outside the South Wales Coal Field.

There are no BGS mineral sites recorded within 250m of the site.

2.3.6 Natural Hazards

A summary of the geotechnical risks that have been identified at the site is presented in **Table 2.4**.

Table 2.4 Summary of Geotechnical Risks

Hazard	Hazard Potential	Details
Variable depth to bedrock	Medium	The Mercia Mudstone Group in Cardiff is known to contain buried channels. A buried channel is recorded within proximity of the site orientated from northwest to southeast. Variable depth to bedrock may lead to unexpectedly high pile lengths, leading to unforeseen construction costs.
Weathered zones	Medium	The Mercia Mudstone Group often contains weaker lenses below stronger horizons rather than the more typical weathering progression where the weakest material occurs at the surface and becomes and stronger at depth. This can lead to piles 'breaking through' the more competent layers and into weathered horizons causing higher pile lengths and unforeseen construction costs.
Ground Dissolution	Medium	The Mercia Mudstone Group contains evaporite minerals, mainly halite (sodium chloride) and gypsum (hydrous calcium sulphate). These lithologies can cause significant problems for construction due to dissolution.
Sulphate attack on buried concrete	Medium	The Mercia Mudstone Group contain significant amounts of gypsum, leading to potential for buried concrete attack. Made ground containing material such as slag and Tidal Flat Deposits may also host pyrite, which presents a significant risk to buried concrete.
Compressible Ground	Medium	Tidal Flat Deposits are expected beneath a significant thickness of made ground. Both strata could cause unacceptable settlement and damage of foundations if founded upon.
Shrinking and Swelling Clays	Very low	Some parts of the Mercia Mudstone may be subject to shrinking and swelling with changes in moisture content to a sufficient degree that structural damage to buildings or disruption in some types of construction works is caused.

2.4 Environmental Setting

The following sections have been compiled using the Landmark Information Group Envirocheck datasheet and maps.

2.4.1 Hydrogeology

Superficial deposits beneath the site have an aquifer designation of secondary aquifer – Undifferentiated.

The bedrock deposits beneath the site have an aquifer designation of secondary aquifer –B.

Deeper groundwater flow within the underlying bedrock will be controlled by the strata dip and any fractures or bedding planes within the rock units.

The hydraulic gradient will be at its steepest during periods of heavy rainfall and aquifer recharge.

It is anticipated that the groundwater is in hydrological continuity with the River Taff.

The site does not locate within a groundwater source protection zone.

The nearest groundwater abstraction point is located 283m southeast of the site, operated by Cardiff Council.

2.4.2 Hydrology

The nearest surface water feature locates 13m to the east and comprises the River Taff.

The topography of the site is generally flat and lies at approximately 8m above Ordnance Datum.

2.4.3 Flooding

The site's east boundary falls into an area at risk from flooding from rivers or sea. This area does however benefit from flood defence.

The site lies in an area classified as having potential for groundwater flooding of property situated below ground level.

2.4.4 Waste

Recorded landfill sites within 250m of the site are summarised in **Table 2.5**.

Table 2.5 Landfill Sites Summary

Landfill Name	Distance/ Direction from site	Operation Dates	Deposited Wastes
The Marl	On site	1936-1945	Inert, Industrial, Commercial, Household and Special Waste.
Lower Ferry Road	120m south	Up to 1993	Building Wastes, Inert Demolition Waste, Soil, Subsoil
South Of Hamadryad Hospital Phase 2	153 northeast	Up to 1992	Local Civil Engineering Waste
Butetown Link Landfill South of Hamadryad Hospital	175m east	1992	Landfills Taking Other Wastes (Construction, Demolition, Dredgings).
Hamadryadd No.2	200m east	1994-1996	Inert, Industrial and Household Waste.

2.4.5 Pollution

No pollution incidents are recorded to have occurred within proximity of the site.

2.4.6 Sensitive Land Use

The site is not located within a sensitive land use area.

2.4.7 Measured Urban Soil Chemistry

The BGS have published measured urban soil chemistry concentrations locally to the site for a number of common contaminants, i.e. arsenic, cadmium, chromium, lead and nickel. All of the given determinants have anticipated concentrations that are below the recognised trigger

levels for a residential with plant uptake scenario apart from lead which are measured at between 150 and 300mg/kg, compared to a trigger level of 200mg/kg.

2.4.8 Industrial Land Use

No relevant contemporary trade directory entries are recorded within proximity of the site.

2.4.9 Infilled Land

Potentially infilled land features within 250m of the site are summarised in **Table 2.6**.

Table 2.6 Potentially Infilled Land

Feature	Distance/Direction from site	Date of Mapping
Potentially Infilled Land (Water). *Probably to raise ground levels to claim land from the estuary.*	On site	1901
Potentially Infilled Land (Water). *Probably infilled drain.*	100m west	1885
Potentially Infilled Land (Water). *Probably to raise ground levels to claim land from the estuary.*	75m to south	1965
Potentially Infilled Land (Water). *Probably to raise ground levels to claim land from the estuary.*	150m to south	1885

2.5 Historical Site Investigation Data

2.5.1 Proposed Residential Development at Channel View, Cardiff – December 2021

As stated in **Section 1**, a site investigation was carried out at land encompassing the current study site. The site investigation comprised the drilling of 3No. cable percussive boreholes (two of which with rotary follow-on) and 4No. windowless sampler boreholes. All three cable percussive boreholes and 1No. windowless sampler boreholes were drilled on The Marl playing fields. The remaining 3No. windowless sampler boreholes were drilled within the existing housing estate.

The exploratory holes drilled within the playing fields are also within the extent of The Marl historic landfill site. The composition of the exploratory holes within the landfill, and outside the landfill were broadly consistent. All made ground was typically loose grey to black sandy gravel or gravelly sand with little to no biodegradable material. Anthropogenic material generally comprised brick, glass, ash, concrete, coal and to a lesser extent slag, metal. This is typical of many sites in south Cardiff where ground levels have been raised by soil of this nature.

The made ground was recorded to a depth of between 4.3m and 5.3m in the three cable percussive boreholes and was underlain by Tidal Flat Deposits comprising very soft to soft silty clay to depths of between 11.3m and 11.8m. Beneath the Tidal Flat Deposits are medium dense to very dense variably clayey sandy gravel with cobbles and boulders (Glaciofluvial Sheet Deposits) to depths of 18.0m to 19.6m, giving way to bedrock of the Mercia Mudstone Group. No core samples were obtained as part of the investigation.

The made ground soils contained several contaminants above their threshold values. These include PAHs, TPH, arsenic, beryllium, lead, and cyanide. Asbestos was also detected in one

of the soil samples. The chemical test results show no discernible difference between the made ground soils and the soils within the landfill.

Of the 7No. exploratory holes from the previous investigation, only CP03 falls within/on the boundary of the site. CP03 lies at the far north of the current study site. Soil laboratory testing identified arsenic, beryllium, lead and dibenz(a,h)anthracene above target concentrations. Copper, zinc and chromium were recorded above target concentrations from leachate testing, and copper and chromium were identified slightly above target concentration from the groundwater testing.

Gas monitoring results recorded in the made ground give a Gas Characteristic Situation 1 scenario. The only results that recorded elevated concentrations from the previous phase of gas monitoring were in wells with response zones located within the tidal flat deposits with lenses of peat. The response zones were installed primarily for groundwater monitoring rather than for ground gas.

2.5.2 Jim Driscoll Way, Cardiff – October 2020

Contamination reports were carried out at two plots of land located approximately 140m (Site A) and 340m (Site B) to the north of the site in October 2000 by Earth Science Partnership. The sites lay to the immediate east of The Marl landfill, and to the immediate west of the River Taff.

Ground conditions at the site are expected to be very similar to those encountered at Site A and Site B due to the similar geological depositional environments and recent histories. At site A, made ground was recorded to depths of 2.9m to 3.75m and on occasions contained buried concrete slabs. Tidal Flat Deposits were recorded to maximum excavation depths of 4.5m.

A total of 16No. soil samples from the made ground were tested across the two sites. Several contaminants were recorded above current threshold levels for a residential development with plant uptake including arsenic, nickel, lead, and PAHs.

Gas monitoring was carried out in 8No. wells with response zones within the made ground across both sites. Carbon dioxide concentrations were recorded up to 4.5% with minimum oxygen concentrations of 10.2%. Flows of up to 0.9m/s were recorded. No methane was recorded in any of the wells.

2.6 Unexploded Ordnance Risk (UXO)

Based on the historical setting of the site and Zetica UXO Risk Maps military activity has been recorded within the area. Therefore, a Detailed Unexploded Ordnance Risk Assessment was produced by MACC International Limited.

The report and UXO risk maps are presented in **Annex B**, with a summary of findings outlined below:

A medium risk rating has been determined for drilling, sampling, bulk excavations or piling in post war un-worked ground.

Additional mitigation requirements for the medium risk activities within post-war unworked ground:

- Drilling, Sampling & Bulk Excavations: These should be checked for UXO by an EOD Engineer equipped with specialist magnetometers ahead of the drilling/sampling bits. A UXO safety ‘watching brief’ should be in place during excavations.
- Piling: All positions should be tested using a specialist ‘Mag Cone’ and be UXO safety certified prior to the commencement of piling.

SECTION 3 Preliminary Human Health and Environmental Risk Assessment

3.1 General

The preliminary human health and environmental risk assessment is a qualitative evaluation of unacceptable risks to human health or the environment from potential 'contaminated land', based on reviewed information in preceding sections of this report.

For 'contaminated land' to exist as defined in Part 2A of the Environmental Protection Act (EPA) 1990, a Pollutant Linkage needs to be identified. Pollutant linkages are defined by having a valid 'source – pathway – receptor' as established in the preliminary conceptual site model.

For our definitions of pollution linkage and how we define risk please refer to **Annex C** which includes our classifications of consequence and probability, and risk assessment matrix.

3.2 Potential Sources of Contamination

Potential or known sources of contamination associated the sites current and historical land use are summarised in **Table 3.1**.

Table 3.1 Contamination Sources

ID	Source	Contaminant
S1	Made Ground/Infilled Land	Metals, metalloids, PAHs, Asbestos, TPH, CH_4, CO_2, CO, H_2S, Sulphate
S2	Landfill	Metals, metalloids, PAHs, Asbestos, TPH, CH_4, CO_2, CO, H_2S, Sulphate
S3	Bedrock	Radon, Sulphate
S4	Tidal Flat Deposits	Sulphate

No other significant potential on-site or off-site sources of contamination have been identified during the desk study.

3.3 Potential Pollution Pathways

Potential contaminant pathways associated with a residential with home grown produce land use are as follows.

P1 – Direct soil and dust ingestion
P2 – Consumption of home grown produce
P3 – Dermal contact
P4 – Inhalation of dust and vapours
P5 – Vertical migration of leachates (unsaturated zone)
P6 – Horizontal and vertical migration of contaminants (saturated zone)
P7 – Artificial contaminant pathway (borehole, pile, excavation etc)
P8 – Surface run-off
P9 – Plant uptake
P10 – Horizontal and vertical migration of ground gasses and vapours
P11 – Direct contact with construction materials
P12 – Inhalation of asbestos fibres

3.4 Potential Receptors

There are human and hydrological receptors to any contamination that may be present on site. Potential receptors include.

R1 – Construction and maintenance workers

R2 – Future site users (residents)
R3 – Passers-by or neighbouring site users
R4 – Groundwater (aquifer)
R5 – Surface waters (river/lake)
R6 – Area of public open space
R7 – Construction materials (concrete/potable water pipes)

3.5 Preliminary Conceptual Site Model

The preliminary conceptual site model establishes potential pollutant linkages between contaminants (source), pathways and receptors, realised during the preparation of the desk study report. Where a potential pollutant linkage is identified an assessment of risk is subsequently undertaken. The preliminary conceptual site model is tabulated in **Table 3.2**.

An illustrative preliminary conceptual site model, which also includes geotechnical risks to the proposed development is presented in **Annex D.**

Outcomes of the preliminary conceptual site model are used as a basis for the design and implementation of the site investigation, whereby areas of potential contamination can be targeted as well as investigating the wider site.

Findings of the site investigation can in turn be used to develop and refine the conceptual site model.

Table 3.2 Preliminary Conceptual Site Model

Source	Pathway	Receptor	Preliminary Risk Assessment		
			Consequence	Probability	Risk & Justification
Human Health					
Soils S1	Direct soil and dust ingestion P1 Dermal contact P3 Inhalation of dust and vapours P4 Inhalation of asbestos fibres P11	Construction and maintenance workers R1	**Medium**	**Low Likelihood**	**Medium Risk:** COSHH assessment and good level of PPE/ hygiene by site workers/ staff; dust suppression measures to be adopted, if required.
		Passers-by or neighbouring site users R3	**Medium**	**Unlikely**	**Low Risk**: Dust suppression measures may be adopted to mitigate this risk, if required.
		Future site users (residents) R2	**Medium**	**High Likelihood**	**High Risk:** Made ground soils of unknown origin and composition, likely to contain elevated metals/metalloids, and PAHs.
Radon Gas S3	Horizontal and vertical migration of ground gasses and vapours P9	Future site users (residents) R2	**Medium**	**Unlikely**	**Low Risk**: Up to date radon report required.
Landfill Gas S2		Future site users (residents) R2, Construction and maintenance workers R1	**Severe**	**Likely**	**High Risk:** Landfill encroaches onto site from the north, and other landfills located within 250m in surrounding area.
Ground Gas S1			**Severe**	**Low Likelihood**	**Medium Risk:** Infilled land used to reclaim land from the estuary is likely to be mostly inert.
Impacted Groundwaters S1	Horizontal and vertical migration of contaminants (saturated zone) P6 Dermal contact P3	Construction and maintenance workers R1	**Medium**	**Unlikely**	**Low Risk** Pathway between source and receptor is unlikely to exist due to the depth of groundwater
Soils S1	Plant uptake & consumption of home grown produce P2	Future site users (residents) R2	**Medium**	**Likely**	**Medium Risk:** Made ground soils of unknown origin and composition, likely to contain elevated metals/metalloids, and PAHs.
Soils S1	Direct Contact P10	Construction materials (water pipes) R7	**Mild**	**Low Likelihood**	**Low Risk:** An appropriate water supply pipe material should be chosen after the potable water supplier has completed an assessment in accordance with UK Water Industry Research guidance; Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites, UKWIR Report Ref: 10/WM/03/21.
Aggressive ground conditions – Sulphates S1,S2, S3, S4		Construction materials (concrete) R7	**Medium**	**Low Likelihood**	**Low Risk:** Chemical analysis of the soils should be undertaken and the appropriate classification of concrete should be specified as per BRE Special Digest 1: Concrete in Aggressive Ground.

Aquatic Environment					
Soils (leachate) S1	Surface run-off P8	Surface waters (river/lake) R5	**Mild**	**Low Likelihood**	**Medium Risk:** Leachate from made ground soils of unknown origin and composition, likely to contain elevated metals and PAHs. Site is located adjacent to river.
Soil (leachate) S1	Vertical migration of leachates/liquid contaminants (unsaturated zone) P5	Groundwater (aquifer) R4	**Mild**	**Low Likelihood**	**Low Risk:** Leachate unlikely to migrate through the cohesive alluvium soils between the made ground and fluvioglacial gravels at depth. Free product is not anticipated due to lack of possible source. Piles are likely to be used for foundations. Precautions should be taken to ensure they do not act as preferential pathway between shallow soils and aquifer at depth.
Soils (leachate) S1	Horizontal and vertical migration of contaminants (saturated zone) P6	Surface waters (river/lake) R5	**Mild**	**Low Likelihood**	**Medium Risk:** Leachate from made ground soils of unknown origin and composition, likely to contain elevated metals and PAHs. Site is located adjacent to river.
		Groundwater (aquifer) R4	**Mild**	**Low Likelihood**	**Low Risk:** Groundwater located in fluvioglacial gravel is unlikely to be affected by contamination at shallow depth. Free product from site is not anticipated due to lack of possible source. Piles are likely to be used for foundations. Precautions should be taken to ensure they do not act as preferential pathway between shallow soils and aquifer at depth.

SECTION 4 Field Investigation

4.1 Site Works

A geotechnical and geoenvironmental site investigation comprising 3No. cable percussive boreholes with rotary core follow-on, windowless sampling and trial pitting was undertaken between the 7th December 2023 and 6th February 2024.

The fieldwork was supervised by Terra Firma, who logged the exploratory holes to the requirements of BS 5930:2015+A1:2020. The proposed locations of the exploratory holes were determined by Terra Firma in general accordance with BS 10175:2011+A2:2017 in order to assess the findings of the preliminary conceptual site model.

Exploratory hole logs are presented in **Annex E.**

Boreholes reference BH01 to BH03 were formed using a light cable tool (shell and auger) drilling rig. Boreholes were advanced from surface using 150mm tools and casing with the occasional use of a heavy chisel to assist boring.

On refusal to cable percussive techniques the boreholes were continued by rotary core drilling methods utilising water flush. Boreholes reference BH101a, BH102 and BH103 were continued using a track mounted rotary drilling rig.

All core samples were retained in sequence in labelled core boxes.

The boreholes referenced WS101 to WS106, were formed using a Terrier 2000 rig. Dynamic sampling techniques were employed from surface to produce a continuous disturbed sample.

Standard penetration tests (SPT) were carried out at regular intervals in general accordance with BS1377: Part 9:1990:3.3. SPT results summarised as N values are presented on the borehole log.

On completion BH01A, BH102, and BH103, WS101 to WS103 were installed with slotted standpipes consisting of a 50mm ID HDPE slotted tube set in a granular filer zone and sealed above with a bentonite plug. Installations were protected at surface with an upstanding/flush cover. Full installation details are recorded on the relevant logs.

The installations were tested for carbon dioxide, methane, oxygen, hydrogen sulphide and carbon monoxide using a gas analyser GA2000/5000. Atmospheric pressure and gas flow were also recorded. Subsequent monitoring readings are presented in **Annex F**.

BH101, and WS104 to WS106 were backfilled with bentonite pellets and the surface reinstated.

Representative disturbed samples were taken and retained in airtight containers for environmental and geotechnical testing.

Boreholes were monitored for groundwater ingress as drilling proceeded.

Trial pits referenced TP01 to TP06, were formed using a JCB 3CX excavator with a 0.60m wide bucket.

Representative disturbed samples were taken and retained in airtight containers for environmental and geotechnical testing.

On completion all trial pits were backfilled, and the ground surface was left proud to accommodate future settlement of backfilled materials.

Exploratory hole locations are shown on **Drawing 01**.

4.2 Ground Conditions

The ground conditions encountered by the exploratory holes can in general be summarised as shown in **Table 4.1**.

Table 4.1 Summary of Typical Ground Conditions

Depth (m)			Thickness (m)	Stratum
0.00	-	5.8	5.8	Dark brown mottled black and grey very sandy angular fine to coarse **GRAVEL** of brick and concrete fragments, metal, ceramics, plastic, and mudstone. Sand is fine to coarse (**Made Ground**).
5.8	-	12.9/17.5	7.1/11.7	Very soft to soft grey silty **CLAY** and clayey SILT with lenses of slightly sandy slightly gravely **CLAY** and fibrous organic matter (**Tidal Flat Deposits**)
12.9/17.5	-	19.5/20.5	3.0/6.6	Orangish brown variably sandy sub angular to sub rounded fine to coarse **GRAVEL** of mudstone with medium cobble content. **(Glaciofluvial Sheet Deposits)**
19.5/20.5	-	26.5/27.5	Unconfirmed	Extremely weak to weak narrowly bedded light reddish brown mottled light bluish grey MUDSTONE with some lenses of very stiff light reddish brown gravelly **CLAY** (**Mercia Mudstone Group**).

Bedrock of the Mercia Mudstone (MMG) was first recorded at 19.5m to 20.5m depth, however due to the quality of the bedrock, the first 1.0m to 1.4m could not be recovered by the rotary coring. The variable strength and weathering grade was typical of that expected in the first 5.0m to 7.0m. As was anticipated prior to the fieldworks, alternating horizons of typically very weak MMG and very stiff clays were recorded.

No significant variation to the depth of bedrock was recorded, however there was a significant increase in depth of tidal flat deposits in BH02 (17.5m), compared to BH01 and BH03 (13.3m and 12.9m respectively). The cross-section presented in **Figure 4.1** appears to show rockhead at its deepest through the middle of the site compared to the north and south. Greatest filling by fluvioglacial deposits was also found in this area. The boreholes suggest that a significant variation in the depth to bedrock is not anticipated, however there is likely to be greater variation in the depth of the overlying dense glaciofluvial deposits. These deposits are often dense and contain large cobbles and boulders. Allowances should be made by piling contractors for difficulty piling through these ground conditions and reduced daily meterage.

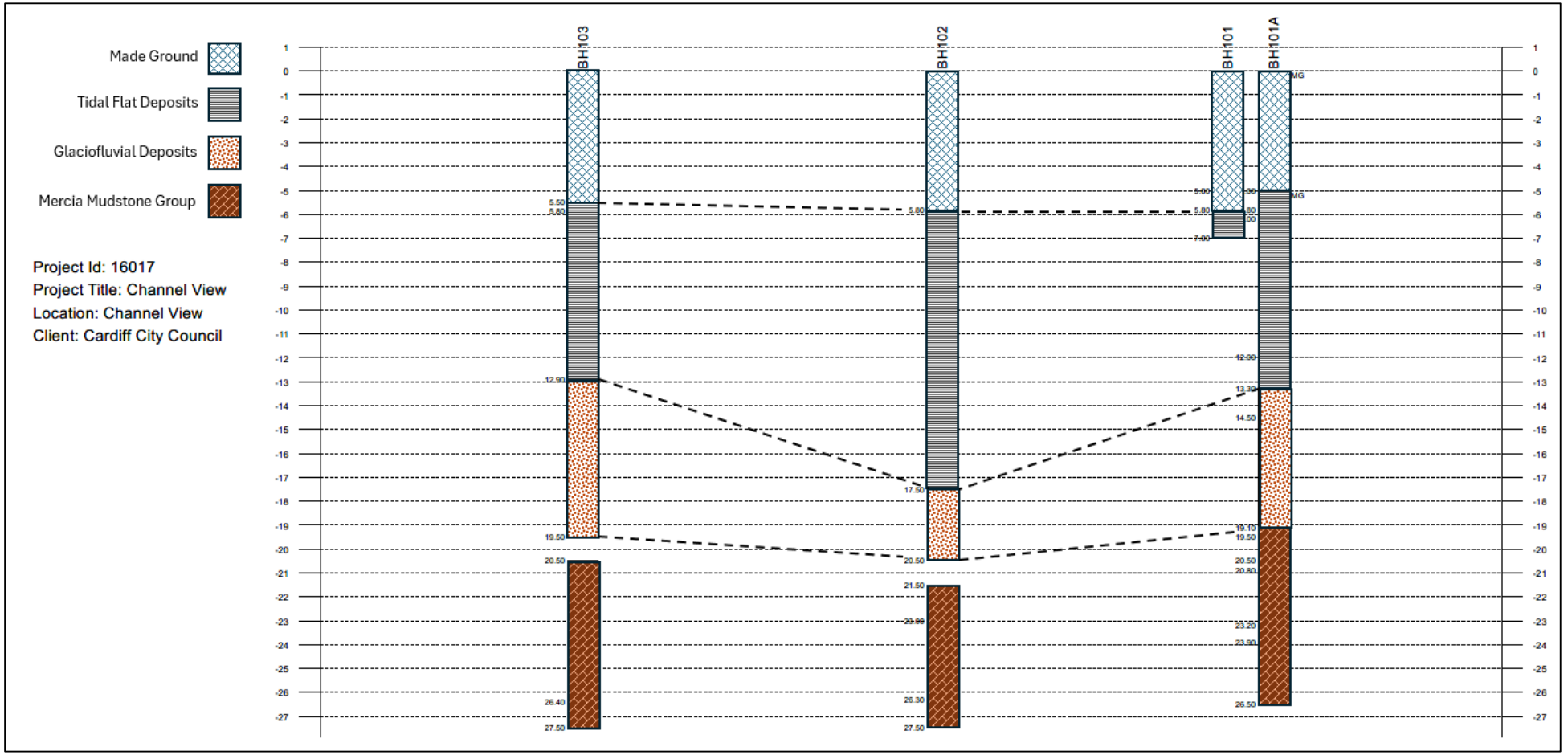


Figure 4.1 Borehole Cross-Section

4.2.1 Miscellaneous Ground Conditions

Concrete obstructions were recorded by the driller in BH101A and BH103 at 5.5m to 5.8m depth respectively.

4.3 Groundwater

Groundwater information recorded during the site investigation is summarised in **Table 4.2**.

Table 4.2 Groundwater Summary

Location	Depth (m)	Details
BH101A	13.5	Rose to 10.4m after 20 minutes
BH102	12.7	Rose to 10.0m after 20 minutes
BH103	12.9	Rose to 7.9m after 20 minutes

4.4 Stability and Obstructions

Trial pits remained stable and vertical during excavation.

Advancement of BH101 was obstructed at 7.0m due to a suspected concrete obstruction and a signal detected by the UXO engineer.

4.5 Installation Well Construction

Groundwater and gas well locations were selected on a non-targeted basis to characterise the groundwater and gas contamination status of the site. A triangular pattern was adopted.

Groundwater and gas installation well construction details are summarised in **Table 4.3**.

Table 4.3 Installation Well Summary

Location	Response Zone		Stratum
	From (m)	To (m)	
BH101A	13.0	18.0	Tidal Flat Deposits and Glaciofluvial Sheet Deposits
BH102	18.0	20.0	Tidal Flat Deposits and Glaciofluvial Sheet Deposits
BH103	13.0	21.0	Glaciofluvial Sheet Deposits
WS101	1.0	2.5	Made Ground
WS102	1.0	3.0	Made Ground
WS103	1.0	3.0	Made Ground

4.6 Laboratory Chemical Testing

4.6.1 Sampling Strategy

Soil and groundwater sampling locations were selected on a mixture of targeted and non-targeted. Targeted samples of made ground were taken from specific depths in areas for soil waste classification where excavations are proposed.

Non-targeted samples were taken to characterise the contamination status of the site. A herringbone sampling pattern was adopted for the non-targeted samples.

Sample locations, depths and suspected/known contamination source targets are summarised in **Table 4.4**:

Table 4.4 Sample Locations, Depths and Targets

Location	Depth (m)	Contamination Targets	Targeted/Non-targeted
TP101	1.3	S1	Targeted
TP102	2.6	S1	Targeted
TP103	1.5	S1	Targeted
TP104	2.7	S1	Targeted
TP105	1.4	S1	Targeted
TP106	2.8	S1	Targeted
WS101	0.5	S1	Non-targeted
WS102	0.8	S1	Non-targeted
WS103	0.3	S1	Non-targeted
WS104	0.3	S1	Non-targeted
WS105	0.5	S1	Non-targeted
WS106	0.7	S1	Non-targeted

4.6.2 Soil Laboratory Analysis

During the site investigation works soil samples were taken and despatched to the accredited laboratories of Eurofins Chemtest for laboratory chemical testing. Soil samples were tested for the determinants listed in **Table 4.5**.

Table 4.5 Soil Laboratory Analysis

Metals & Metalloids	In-Organics	Organics	Others
Arsenic	Cyanide	Phenols	pH (acidity)
Cadmium	Sulphate	PAH	Asbestos
Chromium III		Petroleum Hydrocarbons	
Chromium VI		TOC	
Copper		DOC	
Lead			
Mercury			
Nickel			
Selenium			
Zinc			

The results are discussed in detail in **SECTION 6** and the laboratory test results certificates may be found in **Annex H**.

4.6.3 Groundwater Laboratory Analysis

Upon completion of site investigation works groundwater samples were collected from installation wells and submitted to the laboratories of Eurofins Chemtest. Samples were tested for the determinants listed in **Table 4.6**.

Table 4.6 Groundwater Laboratory Analysis

Metals & Metalloids	In-Organics	Organics	Others
Arsenic	Cyanide	Phenols	pH (acidity)
Cadmium	Sulphate	Petroleum Hydrocarbons	Hardness
Chromium III	Sulphide	PAH	Electrical Conductivity
Chromium VI			Oxygen Demands
Chromium			
Copper			
Lead			
Mercury			

Nickel			
Selenium			

The results are discussed in detail in **SECTION 6** and the laboratory test results certificates may be found in **Annex I**.

4.7 Soil Property Testing

4.7.1 Laboratory Geotechnical Testing

A schedule of laboratory tests was prepared by Terra Firma and samples were despatched to the accredited laboratories of Apex Testing Solutions. A summary of the testing carried out is presented in **Table 4.7**.

Table 4.7 Summary of Geotechnical Testing

Geotechnical Test	Standard (BS1377:1990)	No. Tested
Point Load Testing	ISRM:Standard	14
Uniaxial Compressive Strength Testing	ISRM Standard	3

The test results are presented in **Annex J** and discussed in **SECTION 7** of this report.

4.8 Soil Waste Classification

Samples taken from areas of the site where soil is to be excavated to depths of approximately 3m have been classified for disposal. A copy of the Soil Waste Classification Letter Report is presented in **Annex K.**

SECTION 5 Evaluation of Geoenvironmental Analytical Results

5.1 Assessment Methodology

Comparison of the analytical results has been made with the 2015 Suitable 4 Use Levels (S4UL) provided by Land Quality Management (LQM) Limited and the Chartered Institute of Environmental Health (CIEH) or provisional Category 4 Screening Levels (pC4SL).

Groundwater analytical results have been compared with available published guidelines in the Water Framework Direction (Standards and Classification) Directions (England and Wales) 2015 and Drinking Water Directive (98/83/EC).

Sulphate results have been compared to guidelines presented in British Research Establishment (BRE SD1:2015). Sulphate levels need only be considered for buried concrete risk assessment and are not human health related.

5.2 Soil Test Results

A summary of the chemical test results which include the regulatory soil guideline values used in a residential setting with plant uptake are given in the following tables. The complete results can be found in **Annex F**.

5.2.1 Inorganics & Miscellaneous

Twelve samples were tested for a standard suite of inorganics, pH and organic matter. The summarised results are in **Table 5.1**.

Table 5.1 Summary of Soil Chemical Test Results – Inorganics & Miscellaneous

Substance	Threshold Value (mg/kg)	Source	Measured Concentrations (mg/kg)		Number of Exceedances
			Minimum	Maximum	
Arsenic	37	LQM/CIEH	7.2	37	0
Cadmium	11	LQM/CIEH	0.51	2.5	0
Chromium III	910	LQM/CIEH	13	44	0
Chromium VI	6	LQM/CIEH	<0.5	<0.5	0
Copper	2400	LQM/CIEH	11	1600	0
Lead	200	pC4SL	25	410	7
Mercury (inorganic)	40	LQM/CIEH	0.06	1.7	0
Nickel	180	LQM/CIEH	14	80	0
Selenium	250	LQM/CIEH	0.57	1.3	0
Zinc	3700	LQM/CIEH	54	1800	0
Total Cyanide	-	-	<0.5	4.4	-
Free Cyanide	-	-	<0.5	<0.5	
Boron	290	LQM/CIEH	<0.4	1.8	0
Sulphate (%)	0.24	BRE	0.052	0.18	0
Organic Matter (%)	-	-	0.3	3.4	-
pH	-	-	7.5	9.1	-

Notes:
- No available guideline

5.2.2 Organics

Twelve samples were tested for speciated polycyclic aromatic hydrocarbons. The summarised results are in **Table 5.2**.

Table 5.2 Summary of Soil Chemical Test Results – Speciated Polycyclic Aromatic Hydrocarbons

Substance	Threshold Value (mg/kg)	Source	Measured Concentrations (mg/kg)		Number of Exceedances
			Minimum	Maximum	
Naphthalene	2.3	LQM/CIEH	<0.1	1.2	0
Acenaphthylene	170	LQM/CIEH	<0.1	0.14	0
Acenaphthene	210	LQM/CIEH	<0.1	1.2	0
Fluorene	170	LQM/CIEH	<0.1	0.55	0
Phenanthrene	95	LQM/CIEH	<0.1	2.4	0
Anthracene	2400	LQM/CIEH	<0.1	0.49	0
Fluoranthene	280	LQM/CIEH	<0.1	5.3	0
Pyrene	620	LQM/CIEH	<0.1	4.9	0
Benzo(a)anthracene	7.2	LQM/CIEH	<0.1	3.2	0
Chrysene	15	LQM/CIEH	<0.1	3.8	0
Benzo(b)fluoranthene	2.6	LQM/CIEH	<0.1	4.4	2
Benzo(k)fluoranthene	77	LQM/CIEH	<0.1	1.7	0
Benzo(a)pyrene	2.2	LQM/CIEH	<0.1	3.2	1
Indeno(123cd)pyrene	27	LQM/CIEH	<0.1	2.4	0
Dibenzo(ah)anthracene	0.24	LQM/CIEH	<0.1	0.93	8
Benzo(ghi)perylene	320	LQM/CIEH	<0.1	2.2	0
Total PAH	-	-	<2.0	35	-

Notes:
Thresholds based on 1.0% soil organic matter
- No available guidelines

Twelve samples were tested for petroleum hydrocarbon. The summarised results are shown in **Table 5.3**.

Table 5.3 Summary of Soil Chemical Test Results – Petroleum Hydrocarbons

Substance	Threshold Value (mg/kg)	Source	Measured Concentrations (mg/kg)		Number of Exceedances
			Minimum	Maximum	
Aliphatic					
PH C5 – C6 Ali	42	LQM/CIEH	<0.05	<0.05	0
PH C6 – C8 Ali	100	LQM/CIEH	<0.1	<0.1	0
PH C8 – C10 Ali	27	LQM/CIEH	<0.05	<0.05	0
PH C10 – C12 Ali	130	LQM/CIEH	<2.0	3.9	0
PH C12 – C16 Ali	1100	LQM/CIEH	<1.0	6.2	0
PH C16 – C21 Ali	65000*	LQM/CIEH	<2.0	7.4	0
PH C21 – C35 Ali	65000*	LQM/CIEH	<3.0	14	0
PH C35 – C44 Ali	65000	LQM/CIEH	<10	12	0
Aromatic					
PH C5 – C7 Arom	70	LQM/CIEH	<0.05	<0.05	0
PH C7 – C8 Arom	130	LQM/CIEH	<0.05	<0.05	0
PH C8 – C10 Arom	34	LQM/CIEH	<0.05	<0.05	0

PH C10 – C12 Arom	74	LQM/CIEH	<1.0	<1.0	0
PH C12 – C16 Arom	140	LQM/CIEH	<1.0	<1.0	0
PH C16 – C21 Arom	260	LQM/CIEH	2.2	71	0
PH C21 – C35 Arom	1100	LQM/CIEH	<2.0	470	0
PH C35 – C44 Arom	1100	LQM/CIEH	<1.0	74	0

Notes:
PH – Petroleum Hydrocarbon
Ali – Aliphatic
Arom – Aromatic
Thresholds based on 1.0% soil organic matter
* – Ali C16-21 and C21-C35 based on criteria for Ali EC >16-35

Twelve samples were tested for Phenols. The summarised results are in **Table 5.4**.

Table 5.4 Summary of Soil Chemical Test Results – Phenols

Substance	Threshold Value (mg/kg)	Source	Measured Concentrations (mg/kg)		Number of Exceedances
			Minimum	Maximum	
Phenols	120	LQM/CIEH	<0.10	<0.10	0

Notes:
- No available guideline

5.2.3 Asbestos Testing

All made ground soil samples were scheduled for asbestos screening. Asbestos was detected in 1No. sample. Samples testing positive for asbestos were further scheduled for gravimetric quantification of ACM and fibres in soil/fibre quantification in soils. The results are summarised in **Table 5.5**.

Table 5.5 Summary of Soil Chemical Test Results – Asbestos Quantification

Sample	Depth (m)	Comment	Result (mass %)
WS101	0.5	Chrysotile in Cement	0.019

5.3 Groundwater Test Results

Three groundwater samples were collected during two monitoring visits from boreholes BH101A, BH102, and BH103. The samples were tested for a suite of inorganic and organic determinants. The results are summarised in **Table 5.6** to **5.8**.

The groundwater test results in their entirety are presented in **Annex F**.

Table 5.6 Summary of Groundwater Chemical Test Results – Inorganics & Miscellaneous

Substance	Threshold Value (µg/l)	Source	Measured Concentrations (µg/l)		Number of Exceedances
			Minimum	Maximum	
Arsenic	50	WFD2	<0.2	2.2	0
Cadmium	0.08	WFD1	<0.08	<0.11	0
Chromium	3.4*	WFD2	<0.5	0.74	0
Copper	1.0	WFD2	<0.5	3.4	2
Lead	1.2	WFD1	<0.5	<0.5	0
Mercury	0.07	WFD3	<0.01	<0.05	0
Nickel	4	WFD1	1.8	4.8	2

Selenium	10	DWD	<0.5	1.7	0
Zinc	10.9	WFD2	17	140	6
Cyanide, Total	1.0	WFD2	<50	<50	BLDL
Sulphide	-	-	<50	52	BLDL
Sulphate (mg/l)	400	BRE	0.051	0.18	0
pH	-	-	6.8	8.2	-
BOD (mg/l)	-	-	<4.0	26	-
COD (mg/l)	-	-	11	100	-
Electrical Conductivity (uS/cm)	-	-	750	1200	-
Hardness (mg/l)	-	-	260	650	-

Notes:
WFD1 - Water Framework Directive – Inland Surface Waters (AA)
WFD2 - Water Framework Directive – Freshwater (Long Term Mean)
WFD3 - Water Framework Directive – Inland Surface Waters (MAC)
DWD – Drinking Water Directive
BRE – British Research Establishment
- No available guideline
* Conservative threshold for Chromium VI used
BLDL - Below laboratory detection limit
ALDL - Above laboratory detection limit

Table 5.7 Summary of Groundwater Chemical Test Results – Organics

Substance	Threshold Value (µg/l)	Source	Measured Concentrations(µg/l)		Number of Exceedances
			Minimum	Maximum	
Naphthalene	2	WFD1	<0.1	<0.1	0
Acenaphthylene	-	-	<0.1	<0.1	BLDL
Acenaphthene	-	-	<0.1	<0.1	BLDL
Fluorene	-	-	<0.1	<0.1	BLDL
Phenanthrene	-	-	<0.1	<0.1	BLDL
Anthracene	0.1	WFD1	<0.1	<0.1	0
Fluoranthene	0.0063	WFD1	<0.1	<0.1	BLDL
Pyrene	-	-	<0.1	<0.1	BLDL
Benzo(a)anthracene	-	-	<0.1	<0.1	BLDL
Chrysene	-	-	<0.1	<0.1	BLDL
Benzo(b)fluoranthene	0.017	WFD3	<0.1	<0.1	0
Benzo(k)fluoranthene	0.017	WFD3	<0.1	<0.1	0
Benzo(a)pyrene	0.00017	WFD1	<0.1	<0.1	BLDL
Indeno(123cd)pyrene	-	-	<0.1	<0.1	BLDL
Dibenzo(ah)anthracene	-	-	<0.1	<0.1	BLDL
Benzo(ghi)perylene	0.0082	WFD3	<0.1	<0.1	BLDL
TPH (C6-C40)	-	-	<10	<10	BLDL
Phenols	7.7	WFD2	<30	<30	0

Notes:
WFD1 - Water Framework Directive – Inland Surface Waters (AA)
WFD2 - Water Framework Directive – Freshwater (Long Term Mean)
WFD3 - Water Framework Directive – Inland Surface Waters (MAC)
- No available guideline
ALDL - Above laboratory detection limit
BLDL - Below laboratory detection limit

Table 5.8 Summary of Groundwater Chemical Test Results – Petroleum Hydrocarbons

Substance	Threshold Value (ug/l)	Source	Measured Concentrations (ug/l)		Number of Exceedances
			Minimum	Maximum	
Aliphatic					
TPH >C5 – C6 Ali	15000	WHO	<0.1	<0.1	0
TPH C6 – C8 Ali	15000	WHO	<0.1	<0.1	0
TPH C8 – C10 Ali	300	WHO	<0.1	<0.1	0
TPH C10 – C12 Ali	300	WHO	<0.1	<0.1	0
TPH C12 – C16 Ali	300	WHO	<0.1	<0.1	0
TPH C16 – C21 Ali	-	-	<0.1	<0.1	-
TPH C21 – C35 Ali	-	-	<0.1	<0.1	-
TPH C35 – C44 Ali	-	-	<0.1	<0.1	-
Aromatic					
TPH C5 – C7 Arom	10	WHO	<0.1	<0.1	0
TPH C7 – C8 Arom	700	WHO	<0.1	<0.1	0
TPH C8 – C10 Arom	300	WHO	<0.1	<0.1	0
TPH C10 – C12 Arom	90	WHO	<0.1	<0.1	0
TPH C12 – C16 Arom	90	WHO	<0.1	<0.1	0
TPH C16 – C21 Arom	90	WHO	<0.1	<0.1	0
TPH C21 – C35 Arom	90	WHO	<0.1	<0.1	0
TPH C35 – C44 Arom	-	-	<0.1	<0.1	-

Notes:
PH – Petroleum Hydrocarbon
Ali – Aliphatic
Arom – Aromatic
WHO, 2008 – Drinking Water Standards

SECTION 6 Geotechnical Testing Results

Geotechnical testing results are summarised in the following sections and presented in their entirety in **Annex H**.

6.1 Uniaxial Compressive Strength and Point Load Index Testing

Selected sections of rock cores were submitted to Apex Testing Services and scheduled for uniaxial compressive strength (UCS) testing and point-load index testing.

Due to sample quality of cores only a limited number of UCS tests were able to be performed. The samples were described as 'incredibly weak' by the laboratory manager, and due to the large number of fractures, some of the samples fell apart in their hands as they tried to pick them up.

The UCS is related to the Point Load Index (Is_{50}) by a conversion factor, K, as follows;

$UCS = (K)\ Is_{50}$

Published K values for sedimentary rock typically range from 16 to 24 (Rusnak, J., Mark, C. *Using the Point Load Test to Determine the Uniaxial Compressive Strength of Coal Measure Rock. 2000).* Terra Firma have typically found the K value to sit in the region of K=20 locally. This value has subsequently been employed to estimate UCS values where point load testing was undertaken. UCS values derived from point load testing results are summarised in **Table 6.1**.

Table 6.1 Summary of Point Load Index Test Results

Borehole	Depth (m)	Test Type (see test results certificates)	Geological Group	Point Load Index (Is_{50})	Uniaxial Compressive Strength (MPa)	UCS corrected for a Factor of Safety of 3 (MPa)
	Point Load Index Tests *(UCS derived from Is_{50} and K=20)*					
BH101A	20.80*	-	Mercia Mudstone	-	-	-
BH101A	24.50	D		0.03	0.6	0.20
BH101A	24.50	A		0.06	1.2	0.40
BH102	22.90	D		0.02	0.4	0.13
BH102	22.90	A		0.04	0.8	0.26
BH102	25.80	D		0.02	0.4	0.13
BH102	25.80	A		0.05	1.0	0.33
BH102	25.00	D		0.03	0.6	0.20
BH102	25.00	A		0.06	1.2	0.40
BH103	26.60	D		0.02	0.4	0.13
BH103	26.60	A		0.05	1.0	0.33
BH103	26.20	D		0.02	0.4	0.13
BH103	26.20	A		0.05	1.0	0.33
BH103	27.30	D		0.02	0.4	0.13
BH103	27.30	A		0.03	0.6	0.20
	UCS Test Results					
Borehole	**Depth (m)**			**Mode of Failure**	**UCS (MPa)**	
BH101A	23.90-24.00		Mercia Mudstone	AC	0.6	
BH101A	25.60-25.72			AC	0.7	
BH103	27.00-27.10			F	0.1	

Table Notes:

- * Crumbled in hand
- d - Diametral loading
- a - Axial loading
- i - Irregular lump
- AC – Axial Cleavage

- F - Fragmented

6.2 BRE SD1 Testing

Ten samples were subject to BRE SD1 testing for concrete classification. The results are summarised in **Table 6.2**.

Table 6.2 BRE SD1 Testing Summary

Location	Depth (m)	2:1 Water/Soil Extract		Total Sulphur (%)	Total Potential Sulphate (%)	Acid Soluble Sulphates (%)	Oxidisable Sulphides (%)	pH
		SO_4 (mg/l)	Mg (mg/l)					
BH101*	1.0	140	-	0.32	0.96	0.29	0.67	9.3
BH101A#	7.0	<10	-	0.19	0.57	0.15	0.42	8.6
BH102*	2.0	240	-	0.24	0.72	0.14	0.58	8.5
BH102#	10.0	<10	-	0.19	0.57	0.14	0.43	8.7
BH102^	17.0	<10	-	0.031	0.093	<0.01	0.083	9.2
BH102~	21.0	260	-	0.021	0.063	0.054	0.09	9.4
BH103*	1.5	<20	-	0.075	0.225	0.20	0.025	8.8
BH103#	9.0	93	-	0.36	1.08	0.19	0.89	8.9
BH103~	19.5	<10	-	<0.010	<0.03	0.01	<0.02	9.7
BH103~	23.0	<10	-	0.038	0.114	0.091	0.023	9.3

Notes
* - Made ground
# - Tidal Flat Deposits
^ - Glaciofluvial Deposits
~ - Mercia Mudstone Group

Based on the ten results obtained, the classification for each soil/rock type has been presented in **Table 6.3**.

Table 6.3 BRE SD1 Testing For Soil Types

Location	Characteristic Values			Design Sulphate Class	ACEC Class
	SO4 (mg/kg)	Total Potential Sulphate (%)	pH		
Made ground	240	0.96	8.5	DS-3	AC-3
Tidal Flat Deposits	93	1.08	8.6	DS-3	AC-3
Glaciofluvial Deposits	<10	-	9.2	DS-1	AC-1
Mercia Mudstone Group	260	-	9.3	DS-1	AC-1

SECTION 7 Ground Gas Risk Assessment

7.1 Gas Risk Characterisation

7.1.1 Gas Source

Recorded landfills are located beneath the far north of the site, continuing northwards beneath The Marl playing fields. Four other landfills are located within 250m of the site. All five landfills present a potential risk to the site from landfill gas. It should however be noted that the landfill and infilled land on and to the north of the site comprises typically of non-biodegradable material such as ash, clinker, brick, concrete, mudstone and ceramic.

To better understand the amount of biodegradable material of the soil, 9No. samples from the cable percussive boreholes were taken of the made ground at regular intervals. The samples were tested for total organic carbon (TOC) and dissolved organic carbon (DOC). The test results are summarised in **Table 7.1** and are presented in their entirety in **Annex F**.

Table 7.1 Measured Gas Concentration Summary

Location	Depth	TOC (%)	DOC (mg/kg)
BH101A	0.5	6.1	50
BH101A	1.2	7.8	<50
BH101A	2.0	3.6	50
BH102	1.2	35	<50
BH102	2.0	28	<50
BH102	3.0	41	<50
BH103	1.2	18	<50
BH102	2.0	33	<50
BH103	3.0	22	<50

Reference has been made to guidance set out in CL:AIRE RB17 November 2012. A Pragmatic Approach to Ground Gas Risk Assessment.

Very high TOC concentrations have been recorded in the made ground. An assessment based on the TOC alone would lead to a potential characteristic situation of CS3. However, much of the TOC is likely to be derived from coal, clinker, ash or carbonaceous mudstone. None of which is biodegradable. DOC is a far more accurate indicator of biodegradable material.

Out of the 9No. samples tested for DOC, 7No. fell below laboratory detection limits of 50mg/kg, with 2No. recorded at 50m/kg.

The maximum TOC based on ‘Table 1 Limiting values of organic content’ would equate to 0.05kg/tonne x 1.33 = 0.0665% (2 d.p). This falls well below the 1.0% limiting value for the CS1 threshold.

The exploratory hole logs, which record very little biodegradable material such as textiles, or buried vegetation, and the DOC results demonstrate that the made ground beneath the site is not a significant source of ground gas.

7.1.2 Gas Migration Pathways

Landfill gas is able to migrate through permeable soils. Low permeability and saturated soils are unlikely to provide a suitable pathway for the migration of landfill gas. Landfill gas is also more likely to take the route of least resistance, which would be most likely upwards through the highly permeable made ground soils. The River Taff will also provide a barrier to migration from the landfills to the east.

7.1.3 Potential Receptors

R1 – Construction and maintenance workers
R2 – Future site users (residents)

7.1.4 Driving Forces

The rise of fluctuating groundwater will push the landfill gas upwards towards the surface. Low barometric pressures are also more likely to drag the landfill gas out from the landfill to the surface. Due to the age of the landfills and infilled land, the likelihood of significant quantities of biodegradable material being broken down and producing a positive flow of carbon dioxide and methane is considered very low.

7.2 Volatile Gasses

No volatile gas source has been identified by the investigation.

7.3 Gas Screening Value

Three ground gas monitoring wells were installed in WS101, WS102, and WS103. Installation details are shown on the relevant log.

Six rounds of gas monitoring have been carried out. The installations were tested for carbon dioxide, methane, oxygen, carbon monoxide and hydrogen sulphide using a Gas Analyser GA2000/5000.

Recorded gas concentrations are summarised in **Table 7.2**.

Table 7.2 Measured Gas Concentration Summary

Gas	Minimum (% V/V)	Maximum (% V/V)
Methane	0.0	0.2
Carbon Dioxide	0.1	2.8
Oxygen	17.4	21.4

Methane levels peaked at 0.2% V/V. Carbon dioxide levels varied between 0.1% and 2.8% V/V. Oxygen concentrations varied between 17.4% and 21.4% V/V.

The gas flow rate from the boreholes was also assessed, a maximum flow rate of 0.7 l/hr was recorded.

Based on a flow rate of 0.7 l/hr and the highest recorded carbon dioxide concentration of 2.8%, a gas screening value of 0.0196 l/hr is calculated, as follows:

(2.8/100) x 0.7 = 0.0196 l/hr

The results to date are presented in **Annex E**.

7.4 Conclusion

When this monitoring result is compared with Table 8.5 of CIRIA report C665, the site is classified as ‘Gas Characteristic Situation 1’ (CS1). in line with recommendations provided in BS8485:2015+A1:2019.

These results are broadly consistent with previous monitoring undertaken in the made ground for the broader site area in 2021. The only results that were elevated from the previous phase of gas monitoring were in wells with response zones located with the tidal flat deposits with

lenses of peat. The response zones were installed primarily for groundwater monitoring rather than for ground gas.

The response zone installed within the Tidal Flat Deposits has created an artificial mechanism by which gas can enter the headspace of the well. The saturated cohesive deposits would naturally act as a barrier to this gas. Due to the depth at which these layers are located, there is no realistic pathway for the ground gas to migrate to the surface.

Alluvial soils and buried peat can quite often give high concentrations of methane and carbon dioxide in monitoring wells, often methane concentrations can reach up to 90%. This is because the gas has been generated historically and is trapped in the pores due to limited transport (at low diffusion rates). The methane accumulates at increasing depth in peat columns, but this does not indicate high rates of production (Clymo and Bryant, 2008; Fritz et al., 2011). There is no, or very little, current gas generation and the carbon dioxide has dissolved out of the gas trapped in the soil pores which causes a higher percentage of methane to be recorded.

Natural soils that are known to contain methane, e.g. Alluvium, Peat, etc, providing pockets of trapped gas cannot be released quickly following changes in groundwater level (which is rare and not likely on most sites).

SECTION 8 Quantitative Risk Assessment

8.1 Contaminants of Concern

Contaminants identified as part of the investigation are summarised in **Table 8.1**, along with an interpretation of the likely contamination source. Where applicable, the contaminant, source relationship is based on the inferences made in the preliminary conceptual site model.

Table 8.1 Contaminants of Concern

Location	Depth	Contaminant	Source
TP01	1.3	Lead, dibenzo(ah)anthracene	S1 (Made ground)
TP02	2.6	Lead, dibenzo(ah)anthracene	S1 (Made ground)
TP03	1.5	Lead, dibenzo(ah)anthracene	S1 (Made ground)
TP04	2.7	Lead, dibenzo(ah)anthracene	S1 (Made ground)
TP06	2.8	Dibenzo(ah)anthracene	S1 (Made ground)
WS101	0.5	Dibenzo(ah)anthracene Chrysotile (asbestos)	S1 (Made ground)
WS102	0.8	Lead, dibenzo(ah)anthracene	S1 (Made ground)
WS103	0.3	Lead, dibenzo(ah)anthracene	S1 (Made ground)
WS104	0.3	Lead	S1 (Made ground)
BH101A	-	Nickel, Zinc	S1 (Made ground leachate)
BH102	-	Nickel, Zinc	S1 (Made ground leachate)
BH103	-	Zinc	S1 (Made ground leachate)

8.2 Pollutant Linkages

Based on the findings of the intrusive site investigation and identified contaminants, the preliminary conceptual site model has been revised. Significant pollutant linkages are tabulated in the refined conceptual site model **Table 8.2**. Identified pollutant linkages will require detailed risk assessment, appropriate mitigation or remedial measures.

Table 8.2 Refined Conceptual Site Model

Source	Pathway	Receptor
S1 (Made ground/infilled land)	P1 – Direct soil and dust ingestion P2 – Consumption of home grown produce P3 – Dermal contact P4 – Inhalation of dust and vapours	R1 – Construction and maintenance workers R2 – Future site users (residents) R3 – Passers-by or neighbouring site users

8.3 Mitigation and Remedial Measures

The following sections summarise the likely mitigation and remedial measures suitable for the identified contamination and proposed development. Detailed methodology to achieve the measures should be prescribed in a Remediation Strategy Report and the results presented in a Validation Report upon completion of the development.

8.3.1 Human Health

8.3.1.1 Contaminated Soils

The advice of an asbestos specialist will be required and as a minimum the following precautions should be employed:

- Dust suppression and measures to dampen the material.
- Suitable PPE for site workers.
- Air monitoring on the site boundary.
- Personal air monitors (for a time to determine actual personnel / fibre interaction).

In addition to the above it is best practise to clean down plant and change air filters on any plant used in the works with asbestos contaminated material.

To protect future site users from the identified contamination the site will need to be capped. The capping should consist of the proposed buildings and hard standings. In garden and soft landscaped areas, the capping should consist of 600mm of suitable inert topsoil, and subsoil underlain by a double no-dig barrier comprising a geogrid and a high visibility geotextile membrane.

Due to the thickness of contaminated made ground soils beneath the site, source removal is not a realistic option for remediation.

The soils should also be physically suitable and contain no 'sharps' as defined in BS8332:2015 Specification for Topsoil and BS8601:2013 Specification for Subsoil and Requirements for Use.

As good practice, construction workers should adhere to good site management, COSHH, good standards of hygiene and appropriate health & safety on site, with personal protection equipment (PPE) and dust suppression where appropriate.

All imported soils should be validated as clean and suitable for use in accordance with 'Requirements for the Chemical Testing of Imported Soils for Various End Uses and Validation Cover Systems'.

For proposed new supply water pipes, the UK Water Industry Research publication 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites (Report 10/WM/03/21)' should be consulted.

In accordance with EC Regulation 1272/2008 and Environment Agency Guidance WM3 soils destined for off-site disposal should be classified on the basis of their hazard phrases prior to disposal. Soils are classified as a mirror entry waste and should be classified on the basis of their specific chemical properties.

If during earthworks ground conditions are encountered that are markedly different to those found during the investigation then the ground should be subject to additional sampling and testing and any necessary remedial measures designed and implemented before continuing with the works.

8.3.2 Aquatic Environment

Nickel and Zinc have been found above respective guideline values as described above. Defra guidance (Environmental Protection Act 1990: Part 2A) "seeks to identify and deal with significant pollution (rather than lesser levels of pollution), the local authority should seek to focus on pollution which: (i) may be harmful to human health or the quality of aquatic ecosystems or terrestrial ecosystems directly depending on aquatic ecosystems; (ii) which may result in damage to material property; or (iii) which may impair or interfere with amenities and other legitimate uses of the environment."

Part 2A also defines that the following types of pollution (Points 1 to 4) should be considered to constitute significant pollution of controlled waters:

1. Pollution equivalent to “environmental damage” to surface water or groundwater as defined by The Environmental Damage (Prevention and Remediation) Regulations 2009, but which cannot be dealt with under those Regulations.

The contamination identified in the waters on the site are highly unlikely to equate to environmental damage. Envirocheck data indicates that no Sensitive Land Uses are present near the site. The closest sensitive land use is the Cardiff Bay Wetlands and Hamadryad Park, a local nature reserve, located 163m northeast, on the east bank of the River Taff. In addition, the Cardiff Bay Wetlands and Hamadryad Park is located up stream of the site. Due to the distance from the site of this location there is unlikely to be any imminent threat of damage to protected species, habitats, surface/ground water and land.

2. Inputs resulting in deterioration of the quality of water abstracted, or intended to be used in the future, for human consumption such that additional treatment would be required to enable that use.

There are no groundwater abstraction points within 250m of the site. Given that the groundwater beneath the site has an aquifer designation of Secondary B and Secondary Undifferentiated it is considered that future abstractions would be very unlikely.

3. A breach of a statutory surface water Environment Quality Standard, either directly or via a groundwater pathway.

The guideline values for waters are very low and in reality, are difficult to achieve. It is highly unlikely that impacted waters on the site would produce exceedances in the adjacent surface water bodies as given the concentrations encountered on site are moderate and inconsistent across the site. The impact of any contamination would be rendered insignificant given the massive dilution upon reaching the River Taff.

4. Input of a substance into groundwater resulting in a significant and sustained upward trend in concentration of contaminants (as defined in Article 2(3) of the Groundwater Daughter Directive (2006/118/EC)5).

The contaminants of concern within the water are nickel and zinc. These have most likely leached out the made ground beneath the site and to the north from the Marl landfill. Envirocheck data states the last input at the landfill to be 31st December 1945. As activity relating to the source of the contamination has ceased for a considerable amount of time, there should not be a sustained upward trend in the concentration of contamination in the groundwater.

For the above reasons it is considered that the site falls into the lesser level of pollution and that the risk to the aquatic environment from waters and soils under the site is low.

It is recommended that a pile risk assessment is carried out prior to construction works taking place at the site.

In accordance with EC Regulation 1272/2008 and Environment Agency Guidance WM3 soils destined for off-site disposal should be classified on the basis of their hazard phrases prior to disposal. Soils are classified as a mirror entry waste and should be classified on the basis of their specific chemical properties.

During the remediation works, there is a risk to the environment/adjacent sites from de-watering, digging foundations, moving contaminated soil, drainage misconnections, discharges to local surface waters or the ground, runoff from construction materials and/or exposed ground, wheel washings and oil or chemical spills.

The risk is considered to be negligible as any adverse effects will be easily preventable by due diligence to good construction practise and housekeeping in preventing surface runoff and the spillage of materials.

The basic measures that should be taken are as follows:

- Prepare a drainage plan and mark the manholes to prevent pollutants accidently reaching the surface water sewers;
- Carry out any activities that could cause pollution in a designated, bunded area, away from rivers or boreholes. Where possible it should drain to the foul sewer;
- Use settlement ponds to remove silty water;
- Store all oils and chemicals in a fully bunded area to prevent leaks or spills;
- Get advice on whether you need an environmental permit and apply in good time

SECTION 9 Engineering Recommendations

9.1 Preparation of Site

Areas of vegetation including all roots should be stripped and removed from beneath the proposed development site.

All hard standing should be removed from beneath the proposed buildings and areas of hard standing. Any buried obstructions should also be excavated and removed. All deleterious materials should then be removed by licensed contractors to a suitable landfill facility.

Allowances should be made for any temporary/permanent support works to any existing adjacent structure necessary as a result of the proposed works.

Contingencies should be made for the protection/diversion of any underground/overhead services present beneath/above the site brought about as a result of the proposed works.

Any reduced levels should be brought up to the required levels with suitable inert mainly granular materials. Department of Transport (DTp) type 2 sub-base or similar should be used and compacted in layers to the requirements of the Specification for Highway Works.

Allowances should also be made for the excavation of any soft spots/areas and their replacement with well compacted imported granular materials.

In accordance with EC Regulation 1272/2008 and Environment Agency Guidance WM3 soils and other materials destined for off-site disposal should be classified on the basis of their hazard phrases prior to disposal. Soils are classified as a mirror entry waste and should be classified on the basis of their specific chemical properties. Terra Firma offer this service if required.

9.2 Foundation and Floor Slab Solution

The proposed development comprises a mixture of 8 to 12 storey residential buildings. Due to the high loads and inappropriate founding strata at shallow depth, piled foundations set within the underlying Mercia Mudstone Group bedrock are recommended. Given the density of the glaciofluvial sheet deposits above the Mercia Mudstone bedrock, likelihood for buried obstructions and proximity to existing developments, roads and services continuous flight auger (CFA) piles are recommended.

Based on experience and back analysis in the Mercia Mudstone, Chandler and Davis (Ref. 1) have published bearing pressure at failures for test piles in weathered (Zone II), hard (Zone I) and weathered (Zone II/III). The Mercia Mudstone encountered was predominantly Zone II/III and based upon the above research an Ultimate End Bearing Pressure of 3.0MN/m^2 has been taken. For a 750mm diameter bored pile this would give an Ultimate End Bearing Resistance of 1155kN.

Chandler and Davis (Ref 1) have also published data for values of ultimate skin friction on pile shaft for Zone I to Zone III Mercia Mudstone. As the mudstone is predominately Zone II/III a figure of 225kN/m2 has been taken for design purposes. Therefore, for a 26m long, 750mm diameter bored pile with an embedment length of 8m in the Mercia Mudstone an ultimate skin friction value of 4242.8kN has been calculated.

Ref 1 *CHANDLER, R.J. and DAVIS, A.G. Further work on the engineering properties of Keuper Marl (Mercia Mudstone) Construction Industry Research and Information Association, Research Report No 47, London 1973*

Allowances should be made for the removal of any 'soft spots' and their replacement with well-compacted granular materials. Department of Transport (DoT) Type 2 materials or similar could be used and should be compacted in layers to the specification for Highway Works.

Combining skin friction and end bearing and allowing a factor of safety of 2.5 would give an allowable working load for a 26m long 0.75m diameter pile of 2159kN.

The above estimated working loads do not take into account any beneficial skin friction resistance that may be gained from the superficial deposits.

It should also be noted that if a 'soft' band of mudstone is encountered at termination depth then the depth of pile should be increased until a competent layer is reached.

The above estimated working loads, type and length of piles are provided for guidance only and should be confirmed by a specialist piling contractor. It may also be prudent to install a number of test piles at selected locations.

Due to the presence of the buried channel in the south of the site pile lengths quoted may vary within and adjacent to the channel.

Due to the risk from buried structures encountered allowances should be made re-boring piles. Allowances should also be made by the piling contractor for dealing with large cobbles and boulders, and dense gravels in the fluvioglacial deposits.

The floor slabs should be designed as suspended.

All foundation formations should be inspected by a suitably qualified Engineer before being concreted.

9.3 Excavations and Formations

Most of the shallow excavations will be possible with normal soil excavating machinery.

Shallow perched water and groundwater flows were not encountered during the investigation. Any water inflows together with rainwater infiltration should be dealt with by conventional pumping techniques. However, it should be noted that during times of heavy rainfall a higher water table will be encountered.

The sides of any excavations deeper than 1.20m, or shallower if unstable, should be supported by planking and strutting or other proprietary means.

The sub-formations/formations are likely to be susceptible to loosening, softening and deterioration by exposure to weather (rain, frost and drying conditions), the action of water (flood water or removal of groundwater) and site traffic.

Formations should never be left unprotected and continuously exposed to rain causing degradation, or left exposed/uncovered overnight, unless permitted by a qualified engineer.

Construction plant and other vehicular traffic should not be operated on unprotected formations.

As a minimum the formation/excavation surfaces must be protected by blinding concrete immediately after exposure.

Allowances should be made for the removal of soft spots/areas and their replacement with well compacted granular materials.

Allowances should also be made for special precautions to prevent formation deterioration in addition to the above.

9.4 Protection of Buried Concrete

When the results are compared with Table C2 of BRE Digest 1:2005, it indicates that buried concrete should generally conform to Design Sulphate Class DS-3, ACEC Class AC-3.

9.5 Access Roads and Car Parking Areas

For car parking and road areas, formations within the in-situ natural soils a CBR value of 1% is likely to be suitable for design purposes. It is recommended that CBR tests are carried out to verify the performance of the shallow soils.

Allowances should be made for the removal of any 'soft spots/areas' and their replacement with well-compacted granular materials as previously described.

Please note that the Local Council / Highways Authority may require in-situ CBR testing to be undertaken before a road is adopted. In-situ CBR Testing should be performed following earthworks to verify the performance of the engineered fill.

9.6 Retaining Walls

Retaining walls may be required as part of the proposed development.

The existing steepness of any embankments should not be increased. Any cuts should be undertaken in small sections and in such a way so as not to induce any instability to the ground.

Effective shear parameters for retaining wall design are presented in **Table 9.1**.

Table 9.1 Effective Shear Stress Parameters

Stratum Description	Bulk Unit Weight (γ) kN/m^3	Effective Cohesion (c′) kN/m^2	Effective Angle of Shearing Resistance (ϕ') degrees
Made Ground	18	0	18
Soft to firm cohesive soils	18	0	28
Firm to stiff cohesive soils	18		28
Well compacted, granular materials compacted as per Specification for Highway Works and other relevant guidance such as British Standards (BS) 6031: 1981. Code of Practise for Earthworks.	19-20	0	35-40

The parameters are based on experience in similar ground conditions.

The materials to be in-filled behind the retaining wall should be placed at or close to its optimum moisture content/maximum dry density and compacted in layers as per the requirements of the Specification for Highway Works. During the earthworks suitable in-situ testing should be carried out to ensure that the compaction process is achieving the required maximum dry density to achieve at least 95% compaction.

The acceptability of the filling works should be verified by appropriate on site testing. A certification report should also be prepared on the earthworks by a suitably qualified Geotechnical Engineer.

Appropriate drainage should be incorporated in the design to prevent the build-up of hydrostatic pressure.
Appropriate cutting and benching of the existing slope should be conducted prior to the replacement of any imported fill to minimise the risk of any slip surfaces forming on the interface between the existing imported materials.

ANNEX A
BGS Radon Report

GeoReports

British Geological Survey

MICHAEL WATKINS
T F W GROUP LTD
UNIT 5
DERYN COURT
WHARFEDALE ROAD
CAERDYDD
CF23 7HA

Radon Report

Advisory report on the requirement for radon protective measures in new buildings, conversions and extensions to existing buildings. The report also indicates whether a site is located within a radon Affected Area

Report Id: ***BGS_337606/53074***

Client reference: 16017-MW

Search location

Contains OS data © Crown Copyright and database right 2024. OS OpenMap Local: Scale: 1:5 000 (1cm = 50 m)
Search location indicated in red

This report describes a site located at National Grid Reference 318090, 173930. Note that for sites of irregular shape, this point may lie outside the site boundary. Where the client has submitted a site plan the assessment will be based on the area given.

Radon Report: UK

When extensions are made to existing buildings in high radon areas, or new buildings are constructed in these areas, the Building Regulations for England, Wales, Scotland and Northern Ireland require that protective measures are taken against radon entering the building.

This report provides information on whether radon protective measures are required. Depending on the probability of buildings having high radon levels, the Regulations may require either:

1. No protective measures
2. Basic protective measures
3. Full protective measures

This is an advisory report on the requirement for radon protective measures in new buildings, conversions and extensions. The report also indicates whether a site is located within a radon Affected Area

Requirement for radon protective measures

The determination below follows advice in *BR211 Radon: Guidance on protective measures for new buildings (2023 edition), which also provides guidance on what to do if the* result *indicates that protective measures are required.*

Is the property in an area where radon protective measures are required for new buildings or extensions to existing ones as described in publication BR211 (2023 edition) Radon: Guidance on protective measures for new buildings?

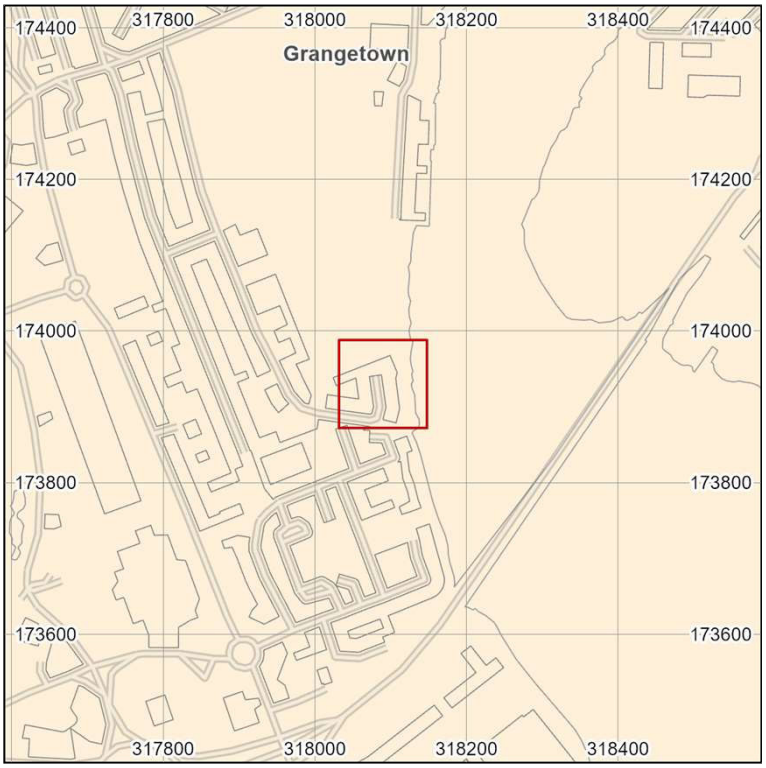
NO RADON PROTECTIVE MEASURES ARE REQUIRED FOR THE REPORT AREA.

More details of the protective measures required are available in *BR211 Radon: Guidance on protective measures for new buildings (2023 Edition)*.

Whether or not the radon level in a building is above or below the radon Action Level can only be established by having the building tested. The UKHSA provides a radon testing service which can be accessed at www.ukradon.org or by telephone (01235 822622).

If you require further information or guidance, you should contact your local authority building control officer or approved inspector.

Radon Affected Area



	% Homes estimated to be at or above the action level
	0-1%
	1-3%
	3-5%
	5-10%
	10-30%
	30-100%

Contains OS data © Crown Copyright and database right 2024
Scale: 1:10 000 (1cm = 100 m)
Search area indicated in red

Is the property in a radon Affected Area as defined by the UK Health Security Agency (UKHSA) and if so what percentage of homes are estimated to be at or above the Action Level? NO

Additional Information

THE PROPERTY IS IN AN AREA WHERE LESS THAN 1% OF HOMES ARE ESTIMATED TO BE AT OR ABOVE THE ACTION LEVEL. THE PROPERTY IS NOT IN A RADON AFFECTED AREA.

The UKHSA recommends a radon 'Action Level' of 200 Becquerels per cubic metre of air (Bq m^{-3}) for the annual average of the radon gas concentration in a home. Where 1% or more of homes are estimated to be at or above the Action Level the area should be regarded as a radon Affected Area.

This report informs you whether the property is in a radon Affected Area and the percentage of homes that are estimated to be at or above the radon Action Level at this location. Being in an Affected Area does not necessarily mean there is a high radon level within the property; the only way to determine the radon level is to carry out a radon measurement.

The UKHSA advises that radon gas should be measured in all properties within radon Affected Areas and that homes with radon levels at or above the Action Level (200 Bq m^{-3}) should be remediated. Householders with levels between the Target Level (100 Bq m^{-3}) and Action Level should seriously consider reducing their radon level, especially if they are at greater risk, such as if they are current or ex smokers. Whether or not a home is in fact above or below the Action Level or Target Level can only be established by having the building tested. The UKHSA provides a validated radon testing service which can be accessed at www.ukradon.org.

The information in this report provides an answer to one of the standard legal enquiries on house purchase in England and Wales, known as Law Society CON29 Enquiries of the Local Authority (2016); 3.14 Radon Gas: Do records indicate that the property is in a “Radon Affected Area” as identified by the UKHSA. The data can also be used to advise house buyers and sellers in Scotland and Northern Ireland.

If you are buying a new build property in a Radon Affected Area, you should ask the builder whether radon protective measures were incorporated in the construction of the property.

If you are buying a currently occupied property in a radon Affected Area, you should ask the present owner whether radon levels have been measured in the property. If they have, ask whether the results were at or above the radon Action Level and if so, whether remedial measures were installed, radon levels were re-tested, and if the results of re-testing confirmed the effectiveness of the measures.

Further information on radon is available from the UKHSA at www.ukradon.org.

What is radon?

Radon is a naturally occurring radioactive gas, which is produced by the radioactive decay of radium which, in turn, is derived from the radioactive decay of uranium. Uranium is found in small quantities in all soils and rocks, although the amount varies from place to place. Radon released from rocks and soils is quickly diluted in the atmosphere. Concentrations in the open air are normally very low and do not present a hazard. Radon that enters enclosed spaces such as some buildings (particularly basements), caves, mines, and tunnels may reach high concentrations in some circumstances. The construction method and degree of ventilation will influence radon levels in individual buildings. A person's exposure to radon will also vary according to how particular buildings and spaces are used.

Inhalation of the radioactive decay products of radon gas increases the chance of developing lung cancer. If individuals are exposed to high concentrations for significant periods of time, there may be cause for concern. In order to limit the risk to individuals, the Government has adopted an Action Level for radon in homes of 200 becquerels per cubic metre (Bq m^{-3}). The Government advises householders that, where the radon level is at or above the Action Level, measures should be taken to reduce the concentration.

Radon in workplaces

The Ionising Radiation Regulations 2017 require employers to take action when radon is present above a defined level in the workplace. Advice may be obtained from your local Health and Safety Executive Area Office or the Environmental Health Department of your local authority. The BRE publishes a guide (BR293)**: Radon in the workplace.** BRE publications may be obtained from the BRE Bookshop, Tel: 01923 664262, email: bookshop@bre.co.uk website: www.brebookshop.com

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Important notes about this Report

- The data, information and related records supplied in this Report by BGS can only be indicative and should not be taken as a substitute for specialist interpretations, professional advice and/or detailed site investigations. You must seek professional advice before making technical interpretations on the basis of the materials provided.
- Geological observations and interpretations are made according to the prevailing understanding of the subject at the time. The quality of such observations and interpretations may be affected by the availability of new data, by subsequent advances in knowledge, improved methods of interpretation, and better access to sampling locations.
- Raw data may have been transcribed from analogue to digital format, or may have been acquired by means of automated measuring techniques. Although such processes are subjected to quality control to ensure reliability where possible, some raw data may have been processed without human intervention and may in consequence contain undetected errors.
- Detail, which is clearly defined and accurately depicted on large-scale maps, may be lost when small-scale maps are derived from them.
- Although samples and records are maintained with all reasonable care, there may be some deterioration in the long term.
- The most appropriate techniques for copying original records are used, but there may be some loss of detail and dimensional distortion when such records are copied.
- Data may be compiled from the disparate sources of information at BGS's disposal, including material donated to BGS by third parties, and may not originally have been subject to any verification or other quality control process.
- Data, information and related records, which have been donated to BGS, have been produced for a specific purpose, and that may affect the type and completeness of the data recorded and any interpretation. The nature and purpose of data collection, and the age of the resultant material may render it unsuitable for certain applications/uses. You must verify the suitability of the material for your intended usage.
- If a report or other output is produced for you on the basis of data you have provided to BGS, or your own data input into a BGS system, please do not rely on it as a source of information about other areas or geological features, as the report may omit important details.
- The topography shown on any map extracts is based on the latest OS mapping and is not necessarily the same as that used in the original compilation of the BGS geological map, and to which the geological linework available at that time was fitted.
- Note that for some sites, the latest available records may be historical in nature, and while every effort is made to place the analysis in a modern geological context, it is possible in some cases that the detailed geology at a site may differ from that described.

Report issued by
BGS Enquiry Service

ANNEX B
Detailed UXO Risk Assessment and Online UXO Maps

DETAILED UNEXPLODED ORDNANCE RISK ASSESSMENT

Phase 1, Channel View
Cardiff, CF11 7HZ

Prepared for: TFW Group Ltd

Project Number: 8668

Version: 1.0

Dated: 16/11/2023

DISTRIBUTION

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Dated: 16/11/2023

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CONTENTS

REFERENCES

Publications

Sources of information used in the compilation of this study included:

German Air Raids on Britain 1914-18. Morris 1925

Unexploded Ordnance (UXO) – A guide for the Construction Industry. CIRIA C681

Dangerous Energy. Cocroft 2000

The Blitz Then and Now Volumes 1 to 3. Ramsey 1987

Advanced German Weapons WW2. Ford 2000

Dealing with Munitions in Marine Aggregates. UMA 2008

United Nations International Mine Action Standards (IMAS). UN 2010

Military Engineering Volume XII. War Office 1956

German Bomb Fuzes. USN 1945

Fields of Deception & Anti Aircraft Command. Dobinson 1988

Target Reconnaissance Photography. Luftwaffe 1939-44

Battle Stations Volume 3 DJ Smith 1980

National & Local Archive Reports, Accounts and Bomb Census Maps (where available)

Internet Information

Additional information was provided through the following credible internet sites, their assistance is credited where appropriate:

Army EOD Incidents

RAF EOD Incidents & Air Situation Reports 1939-45

Luftwaffe Strategy & Tactics

Luftwaffe Bomber Specifications

WO Defence Arrangements 1939-45

News Reports Witness Accounts 1939-45

Latest News Reports

Project Information

Site and project information was provided by TFW Group Ltd.

TERMS AND DEFINITIONS

Anti Aircraft Ammunition (AAA)
High Explosive shells ranging from 30mm to 155mm used by air defence batteries to attack or deter enemy air attack.

Air Dropped Munition
A bomb or container dropped from an aircraft which is designed to detonate at a pre determined altitude, on impact or using a delay mechanism; after impact.

Air Dropped Sub-Munitions (Bomblet)
Small sub-munitions dispensed from a larger carrier which may be fixed to the aircraft or dropped as a single container munition which was designed to open above the target spreading its contents over a large area. Some designs are extremely dangerous and fitted with anti-handling devices.

Area Clearance
This is the term used for the systematic clearance of explosive ordnance from land, including military property, firing and bombing ranges, airfields and training areas. When the land is a former wartime battle ground, the term used is Battle Area Clearance (BAC)

Blast Zone
This term refers to the area around an explosive detonation where the explosive overpressure (Blast) can cause damage, injury or death.

Explosive Ordnance (EO)
All manufactured or improvised items designed to contain explosive, propellant, pyrotechnic and fissionable material or biological or chemical agents or pre-cursers which when coupled with an initiation or dispersal system are designed to cause damage, injury or death.

Explosive Ordnance Disposal (EOD)
A series of recognised procedures and protocols which are used by specialists in the detection, identification, evaluation, risk assessment, render safe, recovery and disposal of any item of explosive ordnance or improvised explosive device.

Fragmentation Zone
This is the term which refers to the danger area in which a piece of an item of explosive ordnance will travel on detonation. This zone is normally greater than the blast zone.

Geophysical Survey
The use of magnetometers, ground penetrating radar or other geophysical data gathering systems, which is then used for evaluation, risk assessment and to quantify further mitigation requirements.

High Explosive (HE)
High explosives react/detonate at a rate of around 9,000 metres per second, to all intents and purposes, instantaneously.

Imperial War Museum (IWM)
Wartime records source based in Lambeth Road London.

Incendiary Bomb (IB)

Incendiary bombs ranged from 1kg in size to 500kg the larger sizes were designated as Oil Bombs. Fills range from Thermite mixtures, Phosphorus, Kerosene or other pyrotechnic mixtures.

Intrusive Search

This term refers to the process of introducing a specialist magnetometer by pushing or drilling the sensor in to the ground to a pre determined depth, thus allowing construction activities such as: piling, soil testing and deep intrusive ground works to be conducted safety.

Land Service Ammunition (LSA)

LSA is a term that refers to all items containing explosives, pyrotechnic or noxious compounds which are placed, thrown or projected during land battles.

Local Records Office (LRO)

Wartime records source charged with maintaining the records for the Region, County, Borough or City.

National Archive (NA)

Wartime records source housed in Kew Gardens London.

Oil Bomb (OB)

Large airdropped bomb or modified ordnance container containing flammable material and accelerant, these weapons normally range in weight from 250 – 500kg.

Parachute Mine (PM)

Air-dropped mine designed to detonate at a pre set altitude above the ground. Essentially a large blast bomb with an explosive content of 1600 kg commonly fitted with anti-handling or anti-removal fuzes.

Unexploded Bomb (UXB)

Any air dropped bomb that has failed to function as designed.

Unexploded Ordnance (UXO)

Explosive ordnance that has been primed, fused, armed or otherwise prepared for use or used. It may have been fired, dropped, launched or projected yet remains unexploded either through malfunction or design or for any other cause.

War Office (WO)

This was the United Kingdom Government department responsible for defence of the realm, forerunner of the Ministry of Defence (MoD).

White Phosphorus (WP)

Munitions filled with WP_4 are designed for signalling, screening and incendiary purposes. They achieve their effect by dispersing WP, which burns on contact with the air.

World War One or Two (WWI or WW2)

Period of multi-national conflict, specifically: WW1; 1914-1918 or WWII; 1939-1945.

1 INTRODUCTION

1.1 Instruction & Scope

MACC International Ltd was commissioned by TFW Group Ltd to conduct a Detailed Unexploded Ordnance (UXO) Risk Assessment for Phase 1, Channel View, Cardiff, CF11 7HZ (See Annex 'A-1'). The scope of the assessment is to determine the likelihood of an encounter with UXO within the context of the execution of ground investigations and subsequent development works.

1.2 Methodology & Purpose

The methodology used in the assessment complies with the United Nations (IMAS) standards for UXO/Mine Level 1 Survey (Desk Top Study), the CIRIA C681 "Unexploded Ordnance (UXO) – A guide for the Construction Industry" and the recognised best practice advocated by the Health and Safety Executive (HSE). The quality and environmental aspects of the assessment comply with UKAS Accredited ISO 9001:2015 and ISO 14001:2015 standards. The purpose of the assessment is that of evaluation and to provide an aid in decision making by our client.

2 DETERMINING THE LIKELIHOOD OF ENCOUNTER

2.1 Aim, Research Restrictions & Indemnity

This risk assessment has drawn upon archive records which are within the public domain; however, these are acknowledged to be incomplete. Consequently, some incidents may have occurred where the records no longer exist or could not be located. The Secretary of State of the United Kingdom and MACC International Ltd does not accept responsibility for the accuracy or completeness of the information contained within the records. Some records regarding the UXO situation on some sites may not yet be within the public domain. Consequently, such information was not available for evaluation by MACC International Ltd. Research of the site history, regarding military usage, bombing raids and bomb impacts has been undertaken to establish the following:

- Frequency and location of enemy bombing raids and damage sustained to the site.
- The potential for UXO to remain on the site.
- Records of UXO removal activities and encounters.

2.2 Relevant Publications & Credible Internet Information

Published sources of information used in the compilation of this assessment are listed within the reference section including those provided by the client. Additional information was provided through credible internet sites; their assistance is credited where appropriate and details are listed within the reference section of this report.

3 THE SITE

The site footprint is located at Channel View Road, Cardiff, CF11 7HZ and is centred at approximate grid reference 318018, 174081. The site is currently occupied by terraced residential properties at the north, three separate residential blocks with adjacent grassed areas at the east and an access road at the west.

Cardiff suffered a significant level of enemy bombing during WWII, during which time the site footprint was largely undeveloped land within West Cardiff Moors known as The Marl, much of which was requisitioned for military use. Areas of the site footprint have undergone post-war development through construction of the existing residential properties.

4 FUTURE INTENTIONS

Future intentions for the site were not disclosed. It is however known that Geo-environmental investigations including deep boreholes will be conducted prior to the commencement of any subsequent development works.

5 HISTORICAL INFORMATION

5.1 British Archives

Prior to 1942 the United Kingdom did not operate a national recording system for EO/UXO incidents or military use of land. The records compiled during 1939-1942 were conducted under local arrangements and were only as detailed and accurate as the availability of time, personnel and the ease of access to information would allow. In April 1942, the Ministry of Home Security instigated a training programme for all personnel maintaining bomb census records, these standardised national records and greatly improved the accuracy of the information. Lack of exact bomb strike positions were most common where bombs fell on open ground well away from structures or buildings.

5.2 Manned Air Raids & Unmanned Rocket Attack Reports

WWI: No records were found to confirm a bomb strike within the site footprint or general surrounding area during this period. Consequently, this source of UXO contamination is considered to be highly unlikely.

WWII: The general area suffered a significant level of enemy bombing during WWII. Major bombing targets for the enemy in the surrounding area of the site included the Ferry Road Gas Works approximately 550m to the north-west at Grangetown and Cardiff Docks approximately 1.1km to the north-east, both of which recorded significant enemy attention.

The most extensive enemy bombing raid targeting Cardiff occurred on 2nd January 1941 with the Riverside, Grangetown and Butetown areas all significantly affected. The Ferry Road Gas Works approximately 550m north-west of the site was hit by one HE bomb early in the raid before later suffering a parachute mine strike that damaged three gasholders. The supply of gas was cut off immediately and was not restored for several days. Civilian casualties were recorded in the surrounding area at Ferry Road and Clive Street. Further loss of life and damage to property was recorded across the Grangetown area to the north-west of the site. Mapping compiled by the Cardiff Fire Department indicates that the Clive Street area of Grangetown suffered further enemy attention on 18th May 1943 when several fires were reported in this residential area. For the nearby Earl Street, this raid was not the first encounter with enemy action with the area already having suffered a HE bomb strike on 27th September 1940.

Grangetown suffered a further bombing raid on 6th January 1941 with Grangetown School for Boys, approximately 800m north-west of the site at Bromsgrove Street, suffering damage as a result of incendiary bombing. Areas of Clarence Road to the north-east of the site also suffered enemy attention during this raid.

Bomb mapping for the Leckwith and Llandough areas indicates that the lesser developed area to the west of the site footprint also suffered enemy bombing during this period, with several HE bomb strikes recorded on undeveloped land near the River Ely, approximately 900m west of the site. Given the significant level of enemy attention western Cardiff received during this period, there is also the potential for additional munitions to have fallen unrecorded within the River Taff and the Penarth Flats to the south-east of the site.

Wartime aerial imagery and historic mapping indicates that the site footprint and surrounding area to the north and west was largely undeveloped during WWII. The undeveloped nature of site is considered to increase the likelihood of munitions falling unrecorded. Whilst the northern area of the Marl adjacent to Ferry Road was in military use and therefore likely frequently accessed, the site footprint at the south of the Marl remained undeveloped during this period and is therefore likely to have been less frequently accessed. Consequently, this source of UXO contamination is considered to be credible within post-war unworked ground.

5.3 Airdropped Sub-Munitions' Reports

Records confirm that Cardiff suffered extensive enemy cluster/incendiary bombing during WWII with the Grangetown area to the north-west of the site significantly affected on numerous occasions. However, no records were found to confirm strikes within the site footprint specifically. Whilst considering the low ground penetration potential for such weapons and the significant level of post-war development that has taken place within the site footprint, this source of UXO contamination is on balance considered to be unlikely, but cannot be ruled out entirely.

5.4 Anti-Aircraft Ammunition (AAA) Reports

Several Heavy Anti-Aircraft batteries were positioned in the general area to defend against air attack, the nearest of which was located approximately 1.3km to the south-west of the site footprint at Llandough. Additional mobile Anti-Aircraft defences are also likely to have been in operation in the area. It is considered reasonable to assume that test firing and combat engagements with enemy aircraft did take place during WWII. Consequently, this source of UXO contamination is considered to be credible.

5.5 Abandoned Bomb Reports

No records were found to confirm or otherwise indicate that an unexploded bomb was abandoned within the site footprint.

5.6 **Migration of UXO**

It is considered possible; albeit unlikely, that a bomb was imported onto the site from other bomb sites. Additionally, where land ground levels have been increased or in-filled using Marine Dredged Aggregates there is a significant potential for the aggregate to contain items of UXO. Consequently, this must be considered to have the potential to represent an additional source of UXO contamination.

5.7 **Bombing Decoys**

There were no bombing decoys located within the immediate surrounding area of the site during WWII with the nearest located approximately 4.0km to the west. Consequently, this source of UXO contamination is not considered to be credible.

5.8 **Military Use**

There was a significant wartime military presence in Cardiff with local Home Guard units including the 22nd Cardiff Battalion in operation in the area during WWII. Various parks and open spaces in Cardiff were also used for defensive measures during WWII. By 1943, a significant area of the Marl (encompassing the site footprint and adjacent land to the north) had been requisitioned for such use. An Air Raid Precautions (ARP) post, first aid post and decontamination centre were all established within the northern area of the Marl to the north of the site footprint. Wartime aerial imagery also shows a Barrage Balloon anchored to the northern area of the Marl to the north of the site. This establishment is likely to have been accompanied by a camp for military personnel.

Despite confirmed military use of the northern area of the Marl to the north of the site, no records were found to confirm that military use extended to within the site footprint itself, although this cannot be ruled out entirely given its undeveloped nature during this period. The site footprint has however undergone significant post-war development in areas through construction of the existing residential properties. Consequently, UXO contamination as a result of military use is on balance considered to be unlikely, but cannot be ruled out entirely.

5.9 **Downed / Crashed Military Aircraft**

No records were found to indicate that an armed aircraft crashed within the site footprint.

6 DETERMINING THE NATURE OF RISK

6.1 General

While HE warheads are very unlikely to detonate if left undisturbed they remain inherently dangerous and may function if subjected to suitable stimuli. The most common of these stimuli is shock, friction or heat which may cause the fuze to function or unstable explosive materials such as Picric Acid (2-4-6 Trinitrophenol (TNP)) to explode. However, in the case of incendiary bombs containing White Phosphorus (WP_4) exposure of the WP to the oxygen in the air will result in its violent ignition and combustion which may cause any HE content within the munition to detonate.

6.2 German Bombing Tactics

The tactics employed by the German Air Force during WWII show that they had a wide variety of bombs at their disposal. The most common ranged in weight from 50 kg through to 500 kg. Some models in this range of bombs were designed to be “carrier” bombs. These containers could hold potentially hundreds of smaller sub-munitions (anti personnel or incendiary bomblets). Although dropped in lesser quantities, the German arsenal also included larger bombs and parachute mines up to 1,400 kg in weight. Unmanned attacks were also mounted by the Germans using V1 Rockets and V2 Missiles, each with a warhead around 1,000 kg in weight.

6.3 Bomb Trajectory & Ground Penetration

During WWII, the Ministry of Home Security undertook a major study on bomb penetration depths using 1,328 actual bomb impact events to provide statistical analysis of penetration potential. As a result, they determined the expected behaviour of a range of bomb weights through different geological strata around the Capital. Their findings remain the only empirical gained figures to have been gathered to date for England. A summary of their findings can be found in Table 1 of this study. A number of factors will influence the behaviour of a bomb on impact with the target and its trajectory through the ground. Relevant factors include: Height and speed of release of the bomb, aerodynamic qualities of the bomb, the angle of flight and impact and the nature of impact surface and sub soil.

6.3.1 In determining the potential bomb penetration depths into the ground, using the historic geotechnical information, other factors considered were: Release height 4,545 metres (15,000 ft). Most common GP Bomb used of 500 kg in weight and an impact Angle Range of 90° (tail vertical) to 0° (tail horizontal).

6.3.2 Table 1. Extract of Ministry of Home Security Bomb Penetration Study

	Bomb Weights			
Sub Soil Type	50kg	250kg	500kg	1000kg
Soft Rock or Made Ground	2.442	5.016	6.006	7.062
Gravel	2.442	5.016	6.006	7.062
Dry Clay	3.7	7.6	9.1	10.7
Average Offset (m)	0.8-1.6	1.6-3.7	3-4.5	3.4-5.3

6.3.3 Bombs on penetration of the surface do not tend to follow a straight line trajectory, due to a number of factors, shape, angle of entry, weight and speed; they tend to arc or curve; known as a "J" curve. With the horizontal distance from the entry point to the resting point known as the offset. The typical offset is generally taken to be $^{1}/_{3}^{rd}$ of the penetration depth. However, this distance can vary greatly if the bomb strikes an obstacle just below the surface. With this mechanism of offset, it is therefore a possibility that a bomb could enter the ground outside a building and come to rest within its footprint. Having reviewed the bomb penetration information and having provided a reasonable safety factor it is considered that:

- The maximum bomb penetration depth is estimated at 8.5 metres from the 1941 ground level. The expected offset from impact point is estimated to be 3.0 metres.
- The maximum ground penetration for an AA Artillery Shell is estimated at 1.5 metre below the 1941 ground level.

7 ENVIRONMENTAL IMPACT FROM UXO

7.1 Ground Contamination & Health Risk vectors

The amount of explosive material within the most common bombs is not considered sufficient to pose a significant widespread environmental risk. Nevertheless, it should be noted that the following components are commonly used in the manufacture of a high explosive bomb and may pose a localised contamination risk to health:

- Lead (Pb)
- Zinc (Zn)
- Copper (Cu)
- Iron (Fe)
- Mercury (Hg)
- Silver Fulminate (AgCNO)
- Aluminium (Al)
- Trinitrophenol ($C_6H_3N_3O_7$)
- Trinitrotoluene ($C_7H_5N_3O_6$)
- Trimethylene ($N(CH_3)_3$)
- Trinitramine ($C_3H_6N_6O_6$)
- Ammonium (NH_4)
- Sodium Nitrate ($NaNO_3$)
- Nitro-glycerine ($C_3H_5N_3O_9$)
- White Phosphorus (WP_4). This chemical may pose a significant immediate risk of spontaneously combusting when exposed to the oxygen in the air. WP will generate large quantities of toxic white smoke when ignited.

7.2 It is recommended that specialist environmental and medical advice be sought to identify any health or other risks posed by these and other chemical compounds.

8 RISK ASSESSMENT

8.1 Risk Source

Although a bomb strike within the site footprint was not confirmed, records indicate that the immediate surrounding area suffered significant enemy bombing during WWII, particularly to the north of the site. Records are acknowledged to be incomplete and include errors; the possibility that items of UXO may have found their way onto the site and remain to the present day is considered credible.

8.2 Risk Pathway

The risk pathway is considered to be ground intrusive investigations and earth works.

8.3 Consequence

The consequences of a UXB detonation on site during construction works are considered to be a factor of the size of the blast and the proximity of assets and individuals to the point of detonation. These will include potential to kill or seriously injure personnel destroy or damage high value site assets, nearby public and private property and infrastructure.

8.4 Risk Rating

H = A figure derived from assessing the history of the site weighing up factors such as recorded bomb damage, threat weapon type, military use and the scope of any post conflict development.

W = A figure derived from assessing the type of the process to be undertaken without putting in place any UXO mitigation measures. A low figure is assigned where the process is relatively non aggressive (minimal ground or point shock). A high figure is used where the work is considered aggressive (significant ground or point shock).

L = A figure derived by multiplying figures H and W to provide an overall likelihood of an encounter with UXO.

S = A figure derived by assessing the scope or extent of the works; a low figure is assigned where the volume of risk material is limited. A high figure is used where for example the volume of risk material is considerable such as “bulk digs” or shafting.

P = A Figure derived from assessing the result of an explosion, including primary and secondary risk pathways and receptors. A high figure is attributed for example in a gas works while a low figure is applied to a remote, rural open space.

C = A figure derived by multiplying figures S and P to provide an overall consequence of an encounter with UXO.

8.5 Table 2 Risk Level – From all potential UXO contamination sources

UXO RISK RATING (Post War Worked Ground)			
Activity	Likelihood (H x W = L)	Consequence (S x P = C)	Risk Rating (L x C = R)
Hand dug excavations	2 x 1 = 2	1 x 5 = 5	2 x 5 = 10
Limited mechanical excavations or trenching	2 x 2 = 4	2 x 5 = 10	4 x 10 = 40
Drilling, sampling, bulk excavations or piling	2 x 3 = 6	3 x 5 = 15	6 x 15 = 90
UXO RISK RATING (Post War Un-Worked Ground)			
Activity	Likelihood (H x W = L)	Consequence (S x P = C)	Risk Rating (L x C = R)
Hand dug excavations	3 x 1 = 3	1 x 5 = 5	3 x 5 = 15
Limited mechanical excavations or trenching	3 x 2 = 6	2 x 5 = 10	6 x 10 = 60
Drilling, sampling, bulk excavations or piling	3 x 3 = 9	3 x 5 = 15	9 x 15 = 135
1= Minimal 5=significant		LOW 0-100 / MEDIUM 100-200 / HIGH 200+	

9 STUDY FINDINGS

9.1 Risk Levels

The risk assessment has determined the UXO risk within the site boundary. The UXO risk is considered to be lowest in post war worked ground increasing within the un-worked post war ground for some processes. When viewed from likelihood versus consequence standpoint; it is considered prudent to recommend a suitable degree of UXO mitigation to permit the work to proceed in the safest “acceptable” manner in compliance with current legislation and best practices.

9.2 Determining Acceptable Level of Risk

The meaning of the term “acceptable” in the context of this assessment is considered to be in keeping with the Health & Safety Executive directive which identifies the acceptable level as that which is; “As Low as Reasonably Practicable” (ALARP) to achieve.

10 RECOMMENDATIONS FOR RISK MITIGATION

All Risk Levels

- Risk Communication & Safety Planning: Stakeholders should be made aware that the risk of encounter is considered to vary from low increasing to medium for some activities. Consequently, the possible impact on the project may be significant and therefore a UXO Safety Plan should be drawn up and included within the overall project safety planning.

- Safety Training: In keeping with CDM Regulations concerning all sub-surface hazards, UXO Safety Induction Training should be provided to everyone working or visiting the site. The training should be commensurate with the individual's responsibilities and duties on site. The training should be provided by a competent individual (preferably a trained EOD Engineer) and delivered as a separate module of the Site Safety Induction Course or as a Toolbox Talk.

Additional mitigation requirements for the medium risk activities within post-war unworked ground:

- Drilling, Sampling & Bulk Excavations: These should be checked for UXO by an EOD Engineer equipped with specialist magnetometers ahead of the drilling/sampling bits. A UXO safety 'watching brief' should be in place during excavations.

- Piling: All positions should be tested using a specialist 'Mag Cone' and be UXO safety certified prior to the commencement of piling.

11 POST MITIGATION RISK

11.1 Overview

Prudent execution of the recommended risk mitigation strategy will reduce the risk however, it is emphasised that zero risk is not achievable given the possible variables. The assessment has confirmed the UXO risk level based on the nature of the work to be undertaken and has recommended suitable mitigation. An effective risk mitigation strategy will require detailed scoping to achieve its desired results in providing an acceptable level of risk. For further information concerning any part of this assessment please contact MACC International Ltd.

11.2 Intent & Use

This document has been produced in the United Kingdom by MACC International Limited and meets the requirements of CIRIA C681 “Unexploded Ordnance (UXO) – A guide for the Construction Industry”. It has been provided solely for the purpose of assessment and evaluation. It is not intended to be used by any person for any purpose other than that specified. Any liability arising out of use by a third party of this document for purposes not wholly connected with the above shall be the responsibility of that party, who shall indemnify MACC International Limited against all claims, costs, damages and losses arising out of such use.

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Annex A

SITE MAPPING

Annex A-1 Site Location

Site Boundary

Annex B

EXPLOSIVE ORDNANCE SAFETY INFORMATION

1 UNEXPLODED ORDNANCE

Since WWII the number of incidents in the UK where EO has detonated has been minimal, though a significant number of bombs have been discovered and safely disposed of without serious consequences. More commonly on mainland Europe (France, Germany and Belgium) incidents have occurred where ground workers have been killed or injured as a result of striking buried UXO or mishandling items of UXO found during excavation and piling work.

The threat to any proposed investigation or development on the site may arise from the effects of a partial or full detonation of a bomb or item of ordnance. The major effects are typically; ground shock, blast, heat and fragmentation. For example, the detonation of a 50kg buried bomb could damage brick/concrete structures up to 16m away and unprotected personnel on the surface up to 70m away from the blast. Larger ordnance is obviously more destructive. Table B-1 shows the MOD's recommended safe distance for UXO. However, it should be noted that the danger posed by primary and secondary fragmentation may be significantly greater. Almost 60% of civilian casualties sustained in London during the blitz were the result of flying glass.

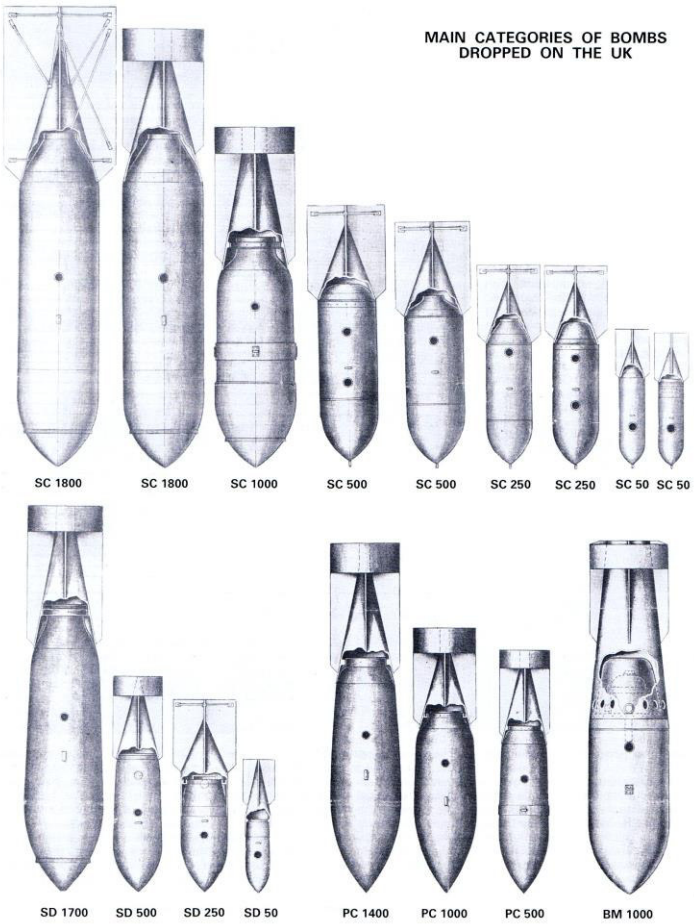
TABLE B-1 SAFETY DISTANCES FOR PERSONNEL

	Safety Distances (m)			
	Surface UXO		Buried UXO	
UXO (Kg)	Protected	Unprotected	Protected	Unprotected
2	20	200	10	20
10	50	400	20	50
50	70	900	40	70
250	185	1100	120	185
500	200	1250	140	200
1000	275	1375	185	275
3000	450	1750	300	450
5000	575	1850	400	575

Explosives rarely become inert or lose effectiveness with age. Over time some explosive materials can become more sensitive and therefore more prone to detonation. This applies equally to items that have been submersed in water or embedded in silt, clay, peat or similar materials.

2 TYPES OF GERMAN AIRDROPPED BOMBS & MINES

2.1 HE Bombs



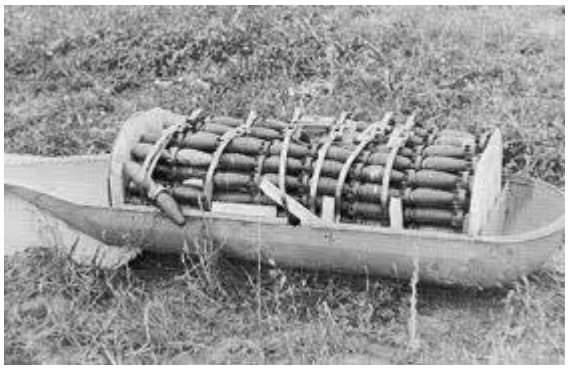
German 250kg Bomb found by MACC below a pre-war cellar floor in Bethnal Green London 10 August 2015

2.2 Incendiary, Anti-Personnel Bombs & Parachute Landmines

1kg incendiary Bomblet (Top as found today)

Flam c500, c250 & c50 Oil Bombs

SD1 Anti-Personnel Bomblets

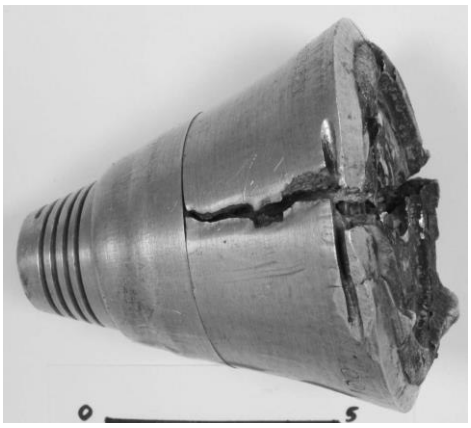


SD1 Container Bomb

Parachute Mines

2.3 British Anti-Aircraft Shells & Rockets

Examples of British Anti-Aircraft shells, rockets and components can be seen below.



Typical shell and rocket fuzes (Above left Proximity Fuzes found by MACC in 2017)

Typical shells (Above left 3.7” Shell found by MACC in 2017)

Typical rockets

3 UXO ENCOUNTER SAFETY PROCEDURE

3.1 All site personnel should be instructed on what action to take if they find an unidentified item which they suspect may be unexploded ordnance. The following actions are recommended until expert advice can be sought:

- **Stop Work**
- **Do not Touch**
- **Alert those around you and Evacuate the vicinity**
- **Call the UXO Specialist or Police (Dial 999)**

3.2 Where appropriate safety posters can be used to remind personnel of the safety procedure, an example can be seen below.

3.3 Where an item of UXO is found on site all work should be suspended until the UXO risk has been reassessed and if appropriate, suitable mitigation measures put in place.

ANNEX C
Risk Assessment Definitions

The contaminated land regime is set out in Part 2A of the Environmental Protection Act (EPA) 1990 and was introduced on the 1st April 2000 in England and 1st July 2001 in Wales. A similar regime was introduced in Scotland on 14th July 2000.

Part 2A was introduced to achieve three overreaching objectives:

(a) To identify and remove unacceptable risks to human health and the environment.
(b) To seek to ensure that contaminated land is made suitable for its current use.
(c) To ensure that the burdens faced by individuals, companies and society as a whole are proportionate, manageable and compatible with the principles of sustainable development.

Under Part 2A the statutory definition of 'contaminated land' is:

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

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

Under Part 2A, for land to be classified as 'Contaminated Land' there must be one or more contaminant, pathway, receptor linkages, known as the '**Pollutant Linkage**'. A pollutant linkage requires three essential elements:

(a) A **CONTAMINANT** (SOURCE) – a substance that is in, on or under the land and has the potential to cause harm or to cause pollution of controlled waters.
(b) A **RECEPTOR** – something which could be adversely affected by a contaminant.
(c) A **PATHWAY** – a route by which a receptor is or might be exposed to or affected by a contaminant.

The term 'Risk' is widely used in different contexts and situations, but a prescriptive definition is given by the Guidelines for Environmental Risk Assessment and Management (DEFRA *et al*, 2000):

'Risk is a combination of the probability, or frequency, of occurrence of a defined hazard and the magnitude of the consequences of the occurrence'.

Model Procedures for the Management of Land Contamination – Contamination Land Report 11 (2004) defines a 'Hazard' as

'*a property or situation that in particular circumstances could lead to harm'.*

A framework for qualitative risk assessment is provided in CIRIA publication C552 Contaminated Land Risk Assessment – A Guide to Good Practice (2001). The method requires an assessment of the magnitude of the probability of the risk occurring and the magnitude of the potential consequence. Classifications of consequences and probability, levels and descriptions of risk have been devised from the above publication and are defined in the following sections.

Classification of Consequence

Table A Classification of Consequence	
Classification	**Definition**
Severe	• Short term (acute) risk to human health likely to result in significant harm • Short term risk to controlled waters • Catastrophic damage to buildings/structures • Short term risk to an ecosystem or organism within the particular ecosystem
Medium	• Chronic damage to human health (long term risk) • Pollution of a sensitive water resource • A significant change in an ecosystem or organism within the ecosystem
Mild	• Pollution of non-sensitive water resources • Significant damage to buildings/structures • Damage to sensitive buildings/structure/services or the environment
Negligible	• Harm (not necessarily significant) which may result in financial loss • Non-permanent health effects to humans (easily prevented by PPE for example) • Easily repairable effects of structural (building) damage

Classification of Probability

Table B Classification of Probability	
Classification	**Definition**
High Likelihood	• There is a complete pollution linkage and an event appears very likely to occur in the short term and is inevitable in the long term. • Evidence of harm to the receptor
Likely	• There is a complete pollution linkage which means that is it probable that an event will occur • The event is not inevitable but possible in short term and likely in the long term
Low Likelihood	• There is a complete pollution linkage and circumstances are possible under which an event could occur • It is not certain that an event will occur in the long term, and it is less likely to occur in the short term
Unlikely	• There is a complete pollution linkage but circumstances are such that it is improbable that an event would occur even in the long term

Risk Assessment Matrix

By comparing the consequences of a risk and the probability of the risk of a pollution linkage, the likely risk category can be determined as shown in **Table C** below.

Table C Risk Assessment Matrix

Increasing acceptability →		Consequence			
		Severe	**Medium**	**Mild**	**Negligible**
Probability	**High Likelihood**	High risk	High risk	Medium risk	Low risk
	Likely	High risk	Medium risk	Low risk	Near zero risk
	Low Likelihood	Medium risk	Low risk	Low risk	Near zero risk
	Unlikely	Low risk	Near zero risk	Near zero risk	Near zero risk

Description of Risks and Likely Actions

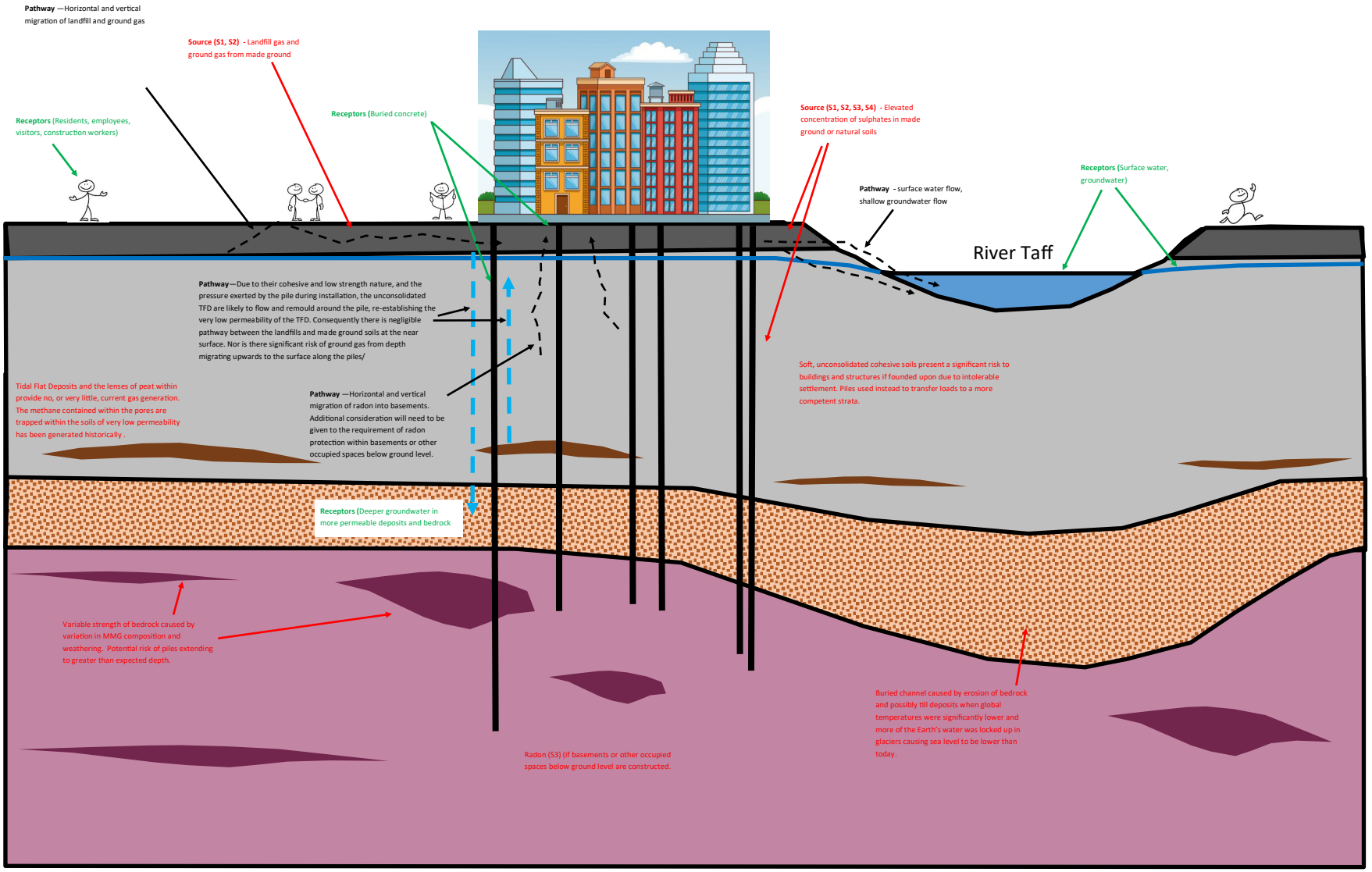
High Risk
There is a high probability that severe harm could arise to a receptor, or there is evidence that a receptor is currently being severely harmed. The risk if realised is likely to result in liability, and urgent investigation or remediation will be required.

Medium Risk
It is probable that harm will arise to a receptor. However, it is relatively unlikely that such harm would be severe, or if harm does occur the harm is likely to be relatively mild. Investigation will be required to determine the liability, and some remedial works may be required in the long term.

Low Risk
It is possible that harm may arise to a receptor, but it is likely that the harm would be mild.

Near Zero Risk
There is a very low risk of harm to the receptor. In the event of harm being realised the harm is not likely to be severe.

ANNEX D
Preliminary Conceptual Site Model


Pathway —Horizontal and vertical migration of landfill and ground gas
Source (S1, S2) - Landfill gas and ground gas from made ground
Receptors (Residents, employees, visitors, construction workers)
Receptors (Buried concrete)
Source (S1, S2, S3, S4) - Elevated concentration of sulphates in made ground or natural soils
Pathway - surface water flow, shallow groundwater flow
Receptors (Surface water, groundwater)
River Taff
Pathway—Due to their cohesive and low strength nature, and the pressure exerted by the pile during installation, the unconsolidated TFD are likely to flow and remould around the pile, re-establishing the very low permeability of the TFD. Consequently there is negligible pathway between the landfills and made ground soils at the near surface. Nor is there significant risk of ground gas from depth migrating upwards to the surface along the piles/
Soft, unconsolidated cohesive soils present a significant risk to buildings and structures if founded upon due to intolerable settlement. Piles used instead to transfer loads to a more competent strata.
Tidal Flat Deposits and the lenses of peat within provide no, or very little, current gas generation. The methane contained within the pores are trapped within the soils of very low permeability has been generated historically .
Pathway —Horizontal and vertical migration of radon into basements. Additional consideration will need to be given to the requirement of radon protection within basements or other occupied spaces below ground level.
Receptors (Deeper groundwater in more permeable deposits and bedrock
Variable strength of bedrock caused by variation in MMG composition and weathering. Potential risk of piles extending to greater than expected depth.
Buried channel caused by erosion of bedrock and possibly till deposits when global temperatures were significantly lower and more of the Earth's water was locked up in glaciers causing sea level to be lower than today.
Radon (S3) (if basements or other occupied spaces below ground level are constructed.

ANNEX E
Exploratory Hole Logs

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Borehole No.
BH101
Sheet 1 of 1

Project Name: Channel View	Project No. 16017	Co-ords: 318099.00 - 173894.00	Hole Type RC
Location: Channel View		Level:	Scale 1:50
Client: Cardiff City Council		Dates: 08/01/2024 - 09/01/2024	Logged By MP

Water Strikes	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Well	Legend	Stratum Description
										Dark brown and black SAND AND GRAVEL. Gravel is fine to coarse sub angular to angular of brick, concrete, plastic, metal and glass.
						N=35 (6,7/10,5,6,14)				
						N=26 (6,7/7,7,6,6)				
						N=13 (2,3/3,4,3,3)				
						N=29 (3,6/7,7,7,8)				
						5.00 50 (9,16/50 for 105mm)				Concrete obstruction.
						5.80 N=23 (12,9/7,6,5,5)				Grey silty CLAY.
						7.00				End of Borehole at 7.000m

1 2 3 4 5 6 7 8 9 10

Remarks: 1] Borehole terminated 7.0m due to signal from UXO detector. 2] On completion borehole backfilled with arisings. 2] Groundwater inflows not recorded.

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Borehole No.
BH101A
Sheet 1 of 3

Project Name: Channel View	Project No. 16017	Co-ords: 318100.00 - 173889.00	Hole Type RC
Location: Channel View		Level:	Scale 1:50
Client: Cardiff City Council		Dates: 11/01/2024 - 25/01/2024	Logged By MP

Water Strikes	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Well	Legend	Stratum Description
										MADE GROUND: Dark brown mottled black and grey very sandy angular fine to coarse GRAVEL of brick and concrete fragments, metal, ceramics, plastic, and mudstone. Sand is fine to coarse. MG
						5.00				MADE GROUND: CONCRETE Obstruction (Drillers Log) MG
						5.80				Grey slightly gravelly silty CLAY. Gravel is sub angular to sub rounded fine to medium mudstone.
						6.00				Grey silty CLAY with occasional organic fiberous matter.
						N=5 (1,1/2,1,1,1)				
						N=5 (2,1/2,1,1,1)				

Remarks: 1] Borehole terminated after coring 7.0m of rock. 2] On completion a 50mm standpipe (50mm) was installed to 18.0m depth. Bentonite plug from 26.5m to 18.0m, slotted pipe with granular response zone from 18.0m-13.0m, solid standpipe with bentonite seal from 13.0m to ground level, and a flush cover. 3] Standing water recorded at 8.9m with borehole at 19.1m depth.

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Borehole No.
BH101A
Sheet 2 of 3

Project Name: Channel View	Project No. 16017	Co-ords: 318100.00 - 173889.00	Hole Type RC
Location: Channel View		Level:	Scale 1:50
Client: Cardiff City Council		Dates: 11/01/2024 - 25/01/2024	Logged By MP

Water Strikes	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Well	Legend	Stratum Description
						N=4 (1,1/1,1,1, 1)				Grey silty CLAY with occasional organic fiberous matter.
						12.00 N=4 (1,1/1,1,1, 1)				Grey clayey SILT.
						13.30 N=33 (7,7/8,8,8, 9)				Orangish brown slighty sandy sub angular to sub rounded fine to coarse GRAVEL of mudstone with medium cobble content. Cobbles are sub rounded mudstone. Sand is fine to coarse.
						14.50 N=40 (7,9/9,10,1 0,11)				Orangish brown SAND AND GRAVEL with occasional cobbles. Gravel and cobbles are fine to coarse sub angular to sub rounded of mudstone. Sand is fine to coarse.
						N=42 (9,10/9,10, 12,11)				
						34 (15,10/34 for 150mm)				
						N=34 (4,7/7,8,9, 10) 19.10 19.50				Orangish brown very sandy sub angular to sub rounded fine to coarse GRAVEL of mudstone with medium cobble content. Cobbles are sub rounded mudstone. Sand is fine to coarse.
										AZCL (Assessed Zone of Core Loss)

11 12 13 14 15 16 17 18 19 20

Remarks: 1] Borehole terminated after coring 7.0m of rock. 2] On completion a 50mm standpipe (50mm) was installed to 18.0m depth. Bentonite plug from 26.5m to 18.0m, slotted pipe with granular response zone from 18.0m-13.0m, solid standpipe with bentonite seal from 13.0m to ground level, and a flush cover. 3] Standing water recorded at 8.9m with borehole at 19.1m depth.

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Borehole No. **BH101A** Sheet 3 of 3

Project Name: Channel View	Project No. 16017	Co-ords: 318100.00 - 173889.00	Hole Type RC
Location: Channel View		Level:	Scale 1:50
Client: Cardiff City Council		Dates: 11/01/2024 - 25/01/2024	Logged By MP

Water Strikes	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Well	Legend	Stratum Description
	19.50 - 20.50	0	0	0	0					AZCL (Assessed Zone of Core Loss)
						20.50 N=50 (6,8/11,14, 21,4)				
	20.50 - 22.00	7	100	80	0	20.80				Very stiff light reddish brown gravelly CLAY with frequent beds of extremely weak reddish brown MUDSTONE. Gravel is angular to sub angular fine to coarse mudstone. (Mercia Mudstone Weathering Grade IVa - Partially Weathered)
										Extremely weak narrowly (7mm to 20mm) bedded light reddish brown mottled light bluish grey MUDSTONE. Bedding fractures are sub horizontal (1-5°) extremely closely to very closely spaced planar-rough, often gravelly clay infill, clean surface. (Mercia Mudstone Weathering Grade II - Partially Weathered)
						N=50 (25,0/22,2 4,4,0)				
	22.00 - 23.50	8	100	80	0					
						23.20				
						N=50 (17,8/20,1 8,12,0)				
	23.50 - 25.00	5	100	73	67	23.90				
						N=50 (25,0/50,0, 0,0)				
	25.00 - 26.50	8	100	100	80					
						26.50				End of Borehole at 26.500m

Remarks: 1] Borehole terminated after coring 7.0m of rock. 2] On completion a 50mm standpipe (50mm) was installed to 18.0m depth. Bentonite plug from 26.5m to 18.0m, slotted pipe with granular response zone from 18.0m-13.0m, solid standpipe with bentonite seal from 13.0m to ground level, and a flush cover. 3] Standing water recorded at 8.9m with borehole at 19.1m depth.

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Borehole No. **BH102** Sheet 1 of 3

Project Name:	Channel View	Project No. 16017	Co-ords: 318098.00 - 173925.00	Hole Type RC
Location:	Channel View		Level:	Scale 1:50
Client:	Cardiff City Council		Dates: 19/01/2024 - 29/01/2024	Logged By MP

Water Strikes	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Well	Legend	Stratum Description
										MADE GROUND: Dark brown mottled black and grey very sandy angular fine to coarse GRAVEL of brick and concrete fragments, metal, ceramics, plastic, and mudstone. Sand is fine to coarse.
						N=34 (5,7/10,12, 6,6)				
						N=22 (7,7/2,7,7, 6)				
						N=15 (2,2/3,3,6, 3)				
						N=27 (4,5/6,6,7, 8)				
						50 (25 for 40mm/50 for 35mm)				
						5.80 N=8 (1,1/2,3,2, 1)				Grey slightly gravelly silty CLAY. Gravel is sub angular to sub rounded fine to medium mudstone.
						N=5 (1,1/1,2,1, 1)				
						N=3 (1,0/1,1,0, 1)				

1 2 3 4 5 6 7 8 9 10

Remarks: 1] Borehole terminated after coring 7.0m of rock. 2] On completion a 50mm standpipe (50mm) was installed to 18.0m depth. Bentonite plug from 26.5m to 18.0m, slotted pipe with granular response zone from 18.0m-13.0m, solid standpipe with bentonite seal from 13.0m to ground level, and a flush cover. 3] Standing water recorded at 8.9m with borehole at 19.1m depth. 4] Groundwater struck at 12.7m depth, rising to 10.0m after 20mins.

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Borehole No.
BH102
Sheet 2 of 3

Project Name: Channel View	Project No. 16017	Co-ords: 318098.00 - 173925.00	Hole Type RC
Location: Channel View		Level:	Scale 1:50
Client: Cardiff City Council		Dates: 19/01/2024 - 29/01/2024	Logged By MP

Water Strikes	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Well	Legend	Stratum Description
						N=3 (1,0/1,0,1, 1)				Grey slightly gravelly silty CLAY. Gravel is sub angular to sub rounded fine to medium mudstone.
						N=2 (1,0/0,0,1, 1)				
						N=37 (5,7/9,9,9, 10)				
						N=45 (8,8/9,10,1 4,12)				
						N=40 (10,12/9,1 0,10,11)				
						17.50 50 (25 for 40mm/50 for 30mm)				Orangish brown very sandy sub angular to sub rounded fine to coarse GRAVEL of mudstone with medium cobble content. Cobbles are sub rounded mudstone. Sand is fine to coarse.
						N=26 (9,7/6,6,7, 7)				

11 12 13 14 15 16 17 18 19 20

Remarks: 1] Borehole terminated after coring 7.0m of rock. 2] On completion a 50mm standpipe (50mm) was installed to 18.0m depth. Bentonite plug from 26.5m to 18.0m, slotted pipe with granular response zone from 18.0m-13.0m, solid standpipe with bentonite seal from 13.0m to ground level, and a flush cover. 3] Standing water recorded at 8.9m with borehole at 19.1m depth. 4] Groundwater struck at 12.7m depth, rising to 10.0m after 20mins.

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Borehole No. **BH102** Sheet 3 of 3

Project Name: Channel View	Project No. 16017	Co-ords: 318098.00 - 173925.00	Hole Type RC
Location: Channel View		Level:	Scale 1:50
Client: Cardiff City Council		Dates: 19/01/2024 - 29/01/2024	Logged By MP

Water Strikes	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Well	Legend	Stratum Description
						20.50 N=50 (7,9/12,12, 14,12)				Orangish brown very sandy sub angular to sub rounded fine to coarse GRAVEL of mudstone with medium cobble content. Cobbles are sub rounded mudstone. Sand is fine to coarse. AZCL (Assessed Zone of Core Loss)
	20.50 - 21.50	0	0	0	0	21.50 N=50 (25,0/50,0, 0,0)				
	21.50 - 23.00	0	100	0	0	23.00 N=50 (12,10/17, 15,16,2)				Very stiff light reddish brown gravelly CLAY with frequent beds of extremely weak reddish brown MUDSTONE. Gravel is angular to sub angular fine to coarse mudstone. (Mercia Mudstone Weathering Grade IVa - Partially Weathered)
	23.00 - 24.50	6	100	100	0	N=50 (20,5/19,1 9,12,0)				Extremely weak narrowly (7mm to 20mm) bedded light reddish brown mottled light bluish grey MUDSTONE. Bedding fractures are sub horizontal (1-5°) extremely closely to very closely spaced planar-rough, often gravelly clay infill, clean surface. (Mercia Mudstone Weathering Grade II - Partially Weathered)
	24.50 - 26.00	8	100	100	0	N=50 (25,0/45,5, 0,0) 26.30				
	26.00 - 27.50	4	100	33	0	27.50 N=50 (25,0/50,0, 0,0)				Very stiff light reddish brown gravelly CLAY with frequent beds of extremely weak reddish brown MUDSTONE. Gravel is angular to sub angular fine to coarse mudstone. (Mercia Mudstone Weathering Grade IVa - Partially Weathered)
										End of Borehole at 27.500m

21 22 23 24 25 26 27 28 29 30

Remarks: 1] Borehole terminated after coring 7.0m of rock. 2] On completion a 50mm standpipe (50mm) was installed to 18.0m depth. Bentonite plug from 26.5m to 18.0m, slotted pipe with granular response zone from 18.0m-13.0m, solid standpipe with bentonite seal from 13.0m to ground level, and a flush cover. 3] Standing water recorded at 8.9m with borehole at 19.1m depth. 4] Groundwater struck at 12.7m depth, rising to 10.0m after 20mins.

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Borehole No.
BH103
Sheet 1 of 3

Project Name: Channel View	Project No. 16017	Co-ords: 318101.00 - 173964.00	Hole Type RC
Location: Channel View		Level:	Scale 1:50
Client: Cardiff City Council		Dates: 25/01/2024 - 06/02/2024	Logged By MP

Water Strikes	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Well	Legend	Stratum Description
										MADE GROUND: Dark brown mottled black and grey very sandy angular fine to coarse GRAVEL of brick and concrete fragments, metal, ceramics, plastic, and mudstone. Sand is fine to coarse.
						N=22 (4,4/5,6,5, 6)				
						N=29 (5,7/7,8,7, 7)				
						N=32 (9,7/6,7,9, 10)				
						N=24 (5,5/6,7,6, 5)				
						N=24 (4,6/6,7,6, 5)				
						5.50				MADE GROUND: CONCRETE Obstruction (Drillers Log)
						5.80				Grey slightly gravelly silty CLAY. Gravel is sub angular to sub rounded fine to medium mudstone.
						N=5 (1,2/1,2,1, 1)				
▼						N=6 (1,1/2,1,1, 2)				
						N=3 (1,0/1,1,0, 1)				

1 2 3 4 5 6 7 8 9 10

Remarks: 1] Borehole terminated after coring 7.0m of rock. 2] On completion a 50mm standpipe (50mm) was installed to 18.0m depth. Bentonite plug from 26.5m to 18.0m, slotted pipe with granular response zone from 18.0m-13.0m, solid standpipe with bentonite seal from 13.0m to ground level, and a flush cover. 3] Standing water recorded at 8.9m with borehole at 19.1m depth. 4] Groundwater struck at 12.9m, rising to 7.9m after 20mins.

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Borehole No. **BH103** Sheet 2 of 3

Project Name: Channel View	Project No. 16017	Co-ords: 318101.00 - 173964.00	Hole Type RC
Location: Channel View		Level:	Scale 1:50
Client: Cardiff City Council		Dates: 25/01/2024 - 06/02/2024	Logged By MP

Water Strikes	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Well	Legend	Stratum Description
										Grey slightly gravelly silty CLAY. Gravel is sub angular to sub rounded fine to medium mudstone.
						N=2 (1,0/1,0,1, 0)				
						N=6 (1,0/1,1,1, 3)				
						12.90				Orangish brown very sandy sub angular to sub rounded fine to coarse GRAVEL of mudstone with medium cobble content. Cobbles are sub rounded mudstone. Sand is fine to coarse.
						N=39 (7,8/9,9,10 ,11)				
						N=50 (19,6/37,1 3,0,0)				
						N=50 (25,50/30, 20,0,0)				
						N=50 (15,10/14, 15,18,3)				
						19.50 N=32 (5,7/8,7,8, 9)				AZCL (Assessed Zone of Core Loss)

11 12 13 14 15 16 17 18 19 20

Remarks: 1] Borehole terminated after coring 7.0m of rock. 2] On completion a 50mm standpipe (50mm) was installed to 18.0m depth. Bentonite plug from 26.5m to 18.0m, slotted pipe with granular response zone from 18.0m-13.0m, solid standpipe with bentonite seal from 13.0m to ground level, and a flush cover. 3] Standing water recorded at 8.9m with borehole at 19.1m depth. 4] Groundwater struck at 12.9m, rising to 7.9m after 20mins.

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Borehole No. **BH103** Sheet 3 of 3

Project Name: Channel View	Project No. 16017	Co-ords: 318101.00 - 173964.00	Hole Type RC
Location: Channel View		Level:	Scale 1:50
Client: Cardiff City Council		Dates: 25/01/2024 - 06/02/2024	Logged By MP

Water Strikes	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Well	Legend	Stratum Description
	19.50 - 20.50	0	0	0	0					AZCL (Assessed Zone of Core Loss)
	20.50 - 21.50	0	150	0	0	20.50 N=47 (11,13/15, 12,10,10)				Very stiff light reddish brown very gravelly CLAY with occasional beds of extremely weak reddish brown MUDSTONE. Gravel is angular to sub angular fine to coarse mudstone. (Mercia Mudstone Weathering Grade III - Partially Weathered)
	21.50 - 23.00	0	100	0	0	N=50 (10,11/12, 13,20,5)				
	23.00 - 24.50	0	100	0	0	N=50 (16,9/20,1 7,13,0)				
	24.50 - 26.00	0	100	0	0	N=50 (25,0/39,1 1,0,0)				
	26.00 - 27.50	7	93	73	67	N=50 (14,11/23, 19,8,0) 26.40				Very weak to weak narrowly (10mm to 20mm) bedded light reddish brown mottled light bluish grey MUDSTONE. Bedding fractures are sub horizontal (2-6°) very closely spaced planar-rough, often gravelly clay infill, clean surface. (Mercia Mudstone Weathering Grade II - Partially Weathered)
						27.50 N=50 (25,0/50,0, 0,0)				End of Borehole at 27.500m

21 22 23 24 25 26 27 28 29 30

Remarks: 1] Borehole terminated after coring 7.0m of rock. 2] On completion a 50mm standpipe (50mm) was installed to 18.0m depth. Bentonite plug from 26.5m to 18.0m, slotted pipe with granular response zone from 18.0m-13.0m, solid standpipe with bentonite seal from 13.0m to ground level, and a flush cover. 3] Standing water recorded at 8.9m with borehole at 19.1m depth. 4] Groundwater struck at 12.9m, rising to 7.9m after 20mins.

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Trial Pit Log

Trial Pit No: TP101
Sheet 1 of 1

Project Name: Channel View	Project No: 16017	Co-ords: -	Date: 01/09/2024
Location: Channel View		Dimensions: Depth 3.00, 0.80 × 2.00	Scale: 1:25
Client: Cardiff City Council			Logged: MP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.10			Brown sandy gravelly CLAY with root and high organic content.
	1.30 1.30	ES ES					Dark brown and black SAND AND GRAVEL. Gravel is fine to coarse sub angular to angular of brick, concrete, plastic, metal and glass.
				3.00			End of Pit at 3.000m

Stability: Stable

Remarks: 1] Consistency, strength and density indicators are based upon field judgement. 2] Density indicator is in brackets and is for guidance only, and is not in accordance with BS 5930:2015. 3] Trial pit terminated at extent of excavator's reach. 4] Trial pit backfilled with arisings.

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Trial Pit Log

Trial Pit No: TP102
Sheet 1 of 1

Project Name: Channel View	Project No: 16017	Co-ords: -	Date: 01/09/2024
Location: Channel View		Dimensions: Depth 3.00 (2.50 × 0.80)	Scale: 1:25
Client: Cardiff City Council			Logged: MP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.10			Brown sandy gravelly CLAY with root and high organic content.
	2.60 2.60	ES ES					Dark brown and black SAND AND GRAVEL. Gravel is fine to coarse sub angular to angular of brick, concrete, plastic, metal and glass.
				3.00			End of Pit at 3.000m

Stability: Stable

Remarks: 1] Consistency, strength and density indicators are based upon field judgement. 2] Density indicator is in brackets and is for guidance only, and is not in accordance with BS 5930:2015. 3] Trial pit terminated at extent of excavator's reach. 4] Trial pit backfilled with arisings.

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Trial Pit Log

Trial Pit No: TP103
Sheet 1 of 1

Project Name: Channel View	Project No: 16017	Co-ords: -	Date: 01/09/2024
Location: Channel View		Dimensions: Depth 3.00, 2.50 × 0.80	Scale: 1:25
Client: Cardiff City Council			Logged: MP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.10			Brown sandy gravelly CLAY with root and high organic content.
	1.50 1.50	ES ES					Dark brown and black SAND AND GRAVEL. Gravel is fine to coarse sub angular to angular of brick, concrete, plastic, metal and glass.
				3.00			End of Pit at 3.000m

Stability: Stable

Remarks: 1] Consistency, strength and density indicators are based upon field judgement. 2] Density indicator is in brackets and is for guidance only, and is not in accordance with BS 5930:2015. 3] Trial pit terminated at extent of excavator's reach. 4] Trial pit backfilled with arisings.

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Trial Pit Log

Trial Pit No: TP104
Sheet 1 of 1

Project Name: Channel View	Project No: 16017	Co-ords: -	Date: 01/09/2024
Location: Channel View		Dimensions: Depth 3.00, 0.80 x 2.50	Scale: 1:25
Client: Cardiff City Council			Logged: MP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.10			Brown sandy gravelly CLAY with root and high organic content.
							Dark brown and black SAND AND GRAVEL. Gravel is fine to coarse sub angular to angular of brick, concrete, plastic, metal and glass.
	2.70 2.70	ES ES					
				3.00			End of Pit at 3.000m

Stability: Stable.

Remarks: 1] Consistency, strength and density indicators are based upon field judgement. 2] Density indicator is in brackets and is for guidance only, and is not in accordance with BS 5930:2015. 3] Trial pit terminated at extent of excavator's reach. 4] Trial pit backfilled with arisings.

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Trial Pit Log

Trial Pit No: TP105
Sheet 1 of 1

Project Name: Channel View	Project No: 16017	Co-ords: -	Date: 01/09/2024
Location: Channel View		Dimensions: Depth 3.00, 0.80 × 2.50	Scale: 1:25
Client: Cardiff City Council			Logged: MP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.10			Brown sandy gravelly CLAY with root and high organic content.
	1.40 1.40	ES ES					Dark brown and black SAND AND GRAVEL. Gravel is fine to coarse sub angular to angular of brick, concrete, plastic, metal and glass.
				3.00			End of Pit at 3.000m

Stability: Stable

Remarks: 1] Consistency, strength and density indicators are based upon field judgement. 2] Density indicator is in brackets and is for guidance only, and is not in accordance with BS 5930:2015. 3] Trial pit terminated at extent of excavator's reach. 4] Trial pit backfilled with arisings.

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Trial Pit Log

Trial Pit No: TP106
Sheet 1 of 1

Project Name: Channel View	Project No: 16017	Co-ords: - Level:	Date: 01/09/2024
Location: Channel View	Dimensions: Depth 3.00	2.50 / 0.80	Scale: 1:25
Client: Cardiff City Council			Logged: MP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.10			Brown sandy gravelly CLAY with root and high organic content.
	2.80 2.80	ES ES					Dark brown and black SAND AND GRAVEL. Gravel is fine to coarse sub angular to angular of brick, concrete, plastic, metal and glass.
				3.00			End of Pit at 3.000m

Stability: Stable

Remarks: 1] Consistency, strength and density indicators are based upon field judgement. 2] Density indicator is in brackets and is for guidance only, and is not in accordance with BS 5930:2015. 3] Trial pit terminated at extent of excavator's reach. 4] Trial pit backfilled with arisings.

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Borehole Log

Borehole No.
WS101
Sheet 1 of 1

Project Name:	Channel View	Project No: 16017	Co-ords:	Hole Type	WS
Location:	Channel View		Level:	Scale	1:50
Client:	Cardiff City Council		Dates: 07/12/2023 - 07/12/2023	Logged By	ES

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Well	Legend	Stratum Description
	Depth (m)	Type	Results					
	0.50	ES						MADE GROUND. Firm dark brown slightly sandy gravelly CLAY with rare fragments of slag, glass, brick and plastic. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of mixed lithologies.
				1.20				MADE GROUND. Firm dark brown slightly sandy slightly gravelly CLAY with rare fragments of slag, glass, brick and plastic. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of mixed lithologies.
				2.00				MADE GROUND. Firm dark brown slightly sandy gravelly CLAY with abundant fragments of brick. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of mixed lithologies.
	2.50	SPT	50 (12,13/50 for 170mm)	2.50				End of Borehole at 2.500m

Remarks: Borehole terminated upon refusal- probable layer of brick

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Borehole Log

Borehole No.
WS102
Sheet 1 of 1

Project Name:	Channel View	Project No: 16017	Co-ords:	Hole Type WS
Location:	Channel View		Level:	Scale 1:50
Client:	Cardiff City Council		Dates: 07/12/2023 - 07/12/2023	Logged By ES

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Well	Legend	Stratum Description
	Depth (m)	Type	Results					
				0.60				MADE GROUND. Firm dark brown slightly sandy gravelly CLAY with rare fragments of slag, glass, brick and plastic. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of mixed lithologies.
	0.80 - 1.00	ES						MADE GROUND. Very loose and loose black slightly clayey gravelly SAND with frequent ash, occasional pockets of clay and occasional fragments of brick concrete and glass. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of mixed lithologies.
				3.00				End of Borehole at 3.000m

Remarks: Borehole terminated at target depth to install gas well

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Borehole Log

Borehole No.
WS103
Sheet 1 of 1

Project Name: Channel View	Project No: 16017	Co-ords:	Hole Type WS
Location: Channel View		Level:	Scale 1:50
Client: Cardiff City Council		Dates: 07/12/2023 - 07/12/2023	Logged By ES

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Well	Legend	Stratum Description
	Depth (m)	Type	Results					
	0.30	ES						MADE GROUND. Firm dark brown slightly sandy gravelly CLAY with rare fragments of slag, glass, brick and plastic. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of mixed lithologies.
				1.10				MADE GROUND. Very loose and loose black slightly clayey gravelly SAND with frequent ash, occasional pockets of clay and occasional fragments of brick concrete and glass. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of mixed lithologies.
				2.50				MADE GROUND. Loose sandy GRAVEL. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of brick.
				3.00				End of Borehole at 3.000m

Remarks: Borehole terminated at target depth to install gas well

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Borehole Log

Borehole No. **WS104**
Sheet 1 of 1

Project Name:	Channel View	Project No: 16017	Co-ords:	Hole Type WS
Location:	Channel View		Level:	Scale 1:50
Client:	Cardiff City Council		Dates: 07/12/2023 - 07/12/2023	Logged By ES

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Well	Legend	Stratum Description
	Depth (m)	Type	Results					
	0.30	ES						MADE GROUND. Firm dark brown slightly sandy gravelly CLAY with rare fragments of slag, glass, brick and plastic. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of mixed lithologies.
	1.00	SPT	N=2 (1,0/1,0,0,1)	1.00				MADE GROUND. Very loose and loose black slightly clayey gravelly SAND with frequent ash, occasional pockets of clay and occasional fragments of brick concrete and glass. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of mixed lithologies.
	2.00	SPT	N=4 (0,1/0,0,2,2)					
				2.20				MADE GROUND. Loose sandy GRAVEL. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of brick.
	2.50	SPT	50 (10,13/50 for 155mm)	2.50				End of Borehole at 2.500m

Remarks: Borehole terminated upon refusal- probable layer of brick

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Borehole Log

Borehole No.
WS105
Sheet 1 of 1

Project Name:	Channel View	Project No: 16017	Co-ords:	Hole Type WS
Location:	Channel View		Level:	Scale 1:50
Client:	Cardiff City Council		Dates: 07/12/2023 - 07/12/2023	Logged By ES

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Well	Legend	Stratum Description
	Depth (m)	Type	Results					
	0.50	ES						MADE GROUND. Firm dark brown slightly sandy gravelly CLAY with rare fragments of slag, glass, brick and plastic. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of mixed lithologies.
	1.00	SPT	N=3 (1,0/0,1,1,1)	1.00				MADE GROUND. Very loose and loose black slightly clayey gravelly SAND with frequent ash, occasional pockets of clay and occasional fragments of brick concrete and glass. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of mixed lithologies.
	2.00	SPT	N=1 (1,0/0,0,0,1)					
	3.00	SPT	N=11 (1,1/3,5,2,1)					
	4.00	SPT	N=2 (1,2/1,0,1,0)					
	5.00	SPT	N=1 (1,1/0,1,0,0)	5.00				End of Borehole at 5.000m

1 2 3 4 5 6 7 8 9 10

Remarks: Borehole terminated at target depth

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Borehole Log

Borehole No.
WS106
Sheet 1 of 1

Project Name:	Channel View	Project No: 16017	Co-ords:	Hole Type WS
Location:	Channel View		Level:	Scale 1:50
Client:	Cardiff City Council		Dates: 07/12/2023 - 07/12/2023	Logged By ES

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Well	Legend	Stratum Description
	Depth (m)	Type	Results					
	0.70	ES						MADE GROUND. Firm dark brown slightly sandy gravelly CLAY with rare fragments of slag, glass, brick and plastic. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of mixed lithologies.
	1.00	SPT	N=26 (17,8/8,8,5,5)					
				1.60				
	2.00	SPT	N=7 (1,1/1,1,3,2)					MADE GROUND. Very loose and loose black slightly clayey gravelly SAND with frequent ash, occasional pockets of clay and occasional fragments of brick concrete and glass. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of mixed lithologies.
	3.00	SPT	N=8 (3,3/3,2,1,2)					
	4.00	SPT	N=0 (1,0/0,0,0,0)					
	5.00	SPT	N=0 (1,0/0,0,0,0)	5.00				End of Borehole at 5.000m

Remarks: Borehole terminated at target depth

ANNEX F
Ground Gas Monitoring Results

GROUND GAS & GROUNDWATER MONITORING RESULTS

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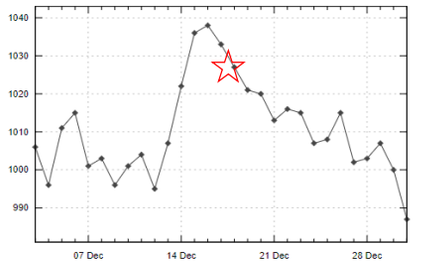
Site Name: Channel View Road - Phase 1 Development
Project Number: 16017
Date: 18th December 2023
Engineer: Michael Watkins
Weather: Dry and mild
Visit: 1 of 6
Baro Pressure Trend: Falling
Equipment/Serial: GA5000/G506329



ID	DATE & TIME	CH4 %	CO2 %	O2 %	BAL %	PEAK CH4 %	PEAK CO2 %	MIN O2 %	CH4%LEL %	BARO mb	TECH ID	FLOW l/h	CO ppm	H2S ppm	CH4/CO2 %	Res N %	VOC ppm	GROUNDWATER (m) LNAPL	GROUNDWATER (m) DNAPL	GROUNDWATER (m) LEVEL	BASE m	REMARKS
WS101	18/12/2023 13:37	0.2	0.3	21	78.5	0.2	0.3	20.9	4	1027	RNH	0.4	0	0	0.67	0				Dry	2.3	
WS102	18/12/2023 13:45	0.2	0.1	21.3	78.4	0.2	0.2	21.2	4	1027	RNH	0.4	0	0	2	0				Dry	2.80	
WS103	18/12/2023 13:56	0.1	0.2	21.3	78.4	0.2	0.6	20.8	2	1027	RNH	0.1	0	0	0.5	0				Dry	2.70	

GROUND GAS & GROUNDWATER MONITORING RESULTS

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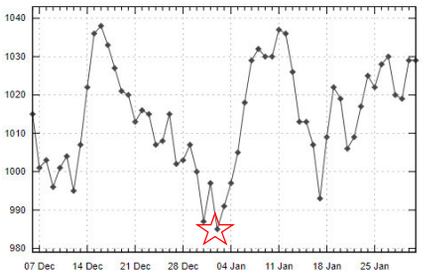
Site Name: Channel View Road - Phase 1 Development
Project Number: 16017
Date: 2nd January 2024
Engineer: Michael Watkins
Weather: Dry and mild
Visit: 2 of 6
Baro Pressure Trend: Falling
Equipment/Serial: GA5000/G506329



ID	DATE & TIME	CH4 %	CO2 %	O2 %	BAL %	PEAK CH4 %	PEAK CO2 %	MIN O2 %	CH4%LEL %	BARO mb	TECH ID	FLOW l/h	CO ppm	H2S ppm	CH4/CO2 %	Res N %	VOC ppm	GROUNDWATER (m) LNAPL	GROUNDWATER (m) DNAPL	GROUNDWATER (m) LEVEL	BASE m	REMARKS
WS101	02/01/2024 15:53	0	0.1	20.8	79.1	0	0.3	19.9	0	982	RNH	1	0	0	0	0.48				Dry	2.3	
WS102	02/01/2024 16:01	0	0.1	21.4	78.5	0	0.2	21	0	982	RNH	0	0	0	0	0				Dry	2.80	
WS103	02/01/2024 16:12	0	0.1	21.9	78	0	0.4	21.3	0	982	RNH	0.1	0	0	0	0				Dry	2.70	

GROUND GAS & GROUNDWATER MONITORING RESULTS

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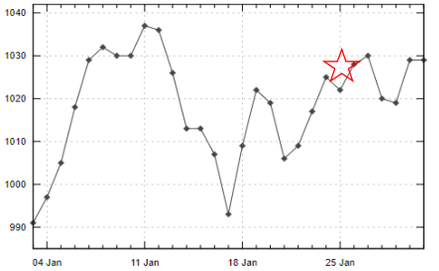
Site Name: Channel View Road - Phase 1 Development
Project Number: 16017
Date: 26th January 2023
Engineer: Michael Watkins
Weather: Dry and mild
Visit: 3 of 6
Baro Pressure Trend: Rising
Equipment/Serial: GA5000/G506329



ID	DATE & TIME	CH4 %	CO2 %	O2 %	BAL %	PEAK CH4 %	PEAK CO2 %	MIN O2 %	CH4%LEL %	BARO mb	TECH ID	FLOW l/h	CO ppm	H2S ppm	CH4/CO2 %	Res N %	VOC ppm	GROUNDWATER (m) LNAPL	GROUNDWATER (m) DNAPL	GROUNDWATER (m) LEVEL	BASE m	REMARKS
WS101	26/01/2024 09:55	0	0.2	21.4	78.4	0	0.2	21.4	0	1029	RNH	0.1	0	0	0	0				Dry	2.3	
WS102	26/01/2024 10:05	0	0.1	21.4	78.5	0	0.1	21.3	0	1029	RNH	0.1	0	0	0	0				Dry	2.80	
WS103	26/01/2024 09:32	0	0.1	20.8	79.1	0	0.1	20.7	0	1029	RNH	0.3	0	0	0	0.48				Dry	2.70	

GROUND GAS & GROUNDWATER MONITORING RESULTS

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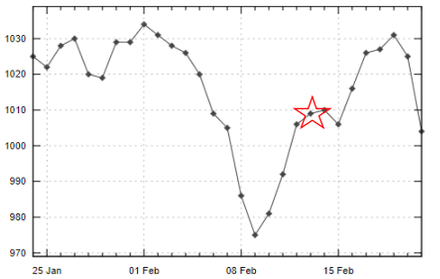
Site Name: Channel View Road - Phase 1 Development
Project Number: 16017
Date: 13th February 2024
Engineer: Michael Watkins
Weather: Dry and mild
Visit: 4 of 6
Baro Pressure Trend: Rising
Equipment/Serial: GA5000/G506329



ID	DATE & TIME	CH4 %	CO2 %	O2 %	BAL %	PEAK CH4 %	PEAK CO2 %	MIN O2 %	CH4%LEL %	BARO mb	TECH ID	FLOW l/h	CO ppm	H2S ppm	CH4/CO2 %	Res N %	VOC ppm	GROUNDWATER (m) LNAPL	GROUNDWATER (m) DNAPL	GROUNDWATER (m) LEVEL	BASE m	REMARKS
WS101	13/02/2024 10:29	0	0.8	19.7	79.1	0	0.8	19.7	0	1009	RNH	0	0	0	0	0.48				Dry	2.3	
WS102	13/02/2024 10:38	0	2.8	17.5	78.5	0	2.8	17.5	0	1009	RNH	0.3	0	0	0	0				Dry	2.80	
WS103	13/02/2024 10:47	0	1.4	19.7	78	0	1.4	19.6	0	1009	RNH	0.7	0	0	0	0				Dry	2.70	

GROUND GAS & GROUNDWATER MONITORING RESULTS

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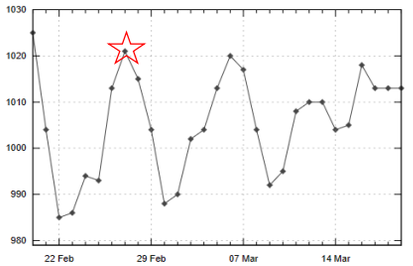
Site Name: Channel View Road - Phase 1 Development
Project Number: 16017
Date: 27th February 2023
Engineer: Michael Watkins
Weather: Dry and mild
Visit: 5 of 6
Baro Pressure Trend: Rising
Equipment/Serial: GA5000/G506329

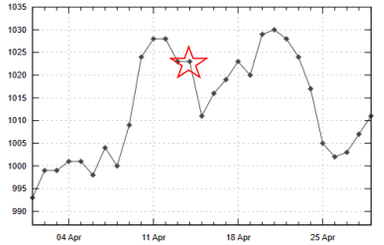


ID	DATE & TIME	CH4 %	CO2 %	O2 %	BAL %	PEAK CH4 %	PEAK CO2 %	MIN O2 %	CH4%LEL %	BARO mb	TECH ID	FLOW l/h	CO ppm	H2S ppm	CH4/CO2 %	Res N %	VOC ppm	GROUNDWATER (m) LNAPL	GROUNDWATER (m) DNAPL	GROUNDWATER (m) LEVEL	BASE m	REMARKS
WS101	27/02/2024 10:05	0	1.3	19.7	79	0	1.3	19.7	0	1021	RNH	0.6	0	0	0	4.53				Dry	2.3	
WS102	27/02/2024 09:36	0	1	19.4	79.6	0	1	19.4	0	1021	RNH	0.6	0	0	0	6.27				Dry	2.80	
WS103	27/02/2024 09:51	0	1.4	20.2	78.4	0	1.4	20.2	0	1021	RNH	0.6	0	0	0	2.04				Dry	2.70	

GROUND GAS & GROUNDWATER MONITORING RESULTS

terra firma
Geotechnical & Geoenvironmental Specialists

Site Name: Channel View Road - Phase 1 Development
Project Number: 16017
Date: 14th March 2024
Engineer: Michael Watkins
Weather: Rain and mild
Visit: 6 of 6
Baro Pressure Trend: Falling
Equipment/Serial: GA5000/G506329



ID	DATE & TIME	CH4 %	CO2 %	O2 %	BAL %	PEAK CH4 %	PEAK CO2 %	MIN O2 %	CH4%LEL %	BARO mb	TECH ID	FLOW l/h	CO ppm	H2S ppm	CH4/CO2 %	Res N %	VOC ppm	GROUNDWATER (m) LNAPL	GROUNDWATER (m) DNAPL	GROUNDWATER (m) LEVEL	BASE m	REMARKS
WS101	14/03/2024 10:55	0	0.9	18	81.1	0	0.9	18	0	1027	RNH	0	0	0	0	0				Dry	2.3	
WS102	14/03/2024 11:24	0	0.9	19	80.1	0	0.9	18.9	0	1027	RNH	0	0	0	0	0				Dry	2.80	
WS103	14/03/2024 11:46	0	1	19.8	78.2	0	1.1	19	0	1027	RNH	0	0	0	0	0				Dry	2.70	

ANNEX G
Laboratory Soil Chemical Test Results

Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	24-04053-1
Initial Date of Issue:	15-Feb-2024
Re-Issue Details:	
Client	Terra Firma
Client Address:	5 Deryn Court Wharfedale Road Pentwyn Cardiff CF23 7HA
Contact(s):	aaron@terrafirmawales.co.uk
Project	Channel View - TOC / DOC Samples

Quotation No.:	Q24-33674	**Date Received:**	12-Feb-2024
Order No.:	16017-MP	**Date Instructed:**	12-Feb-2024
No. of Samples:	9		
Turnaround (Wkdays):	5	**Results Due:**	16-Feb-2024
Date Approved:	15-Feb-2024		

Approved By:

Details: Stuart Henderson, Technical Manager

For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Results - Single Stage WAC

Project: Channel View - TOC / DOC Samples

						Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	24-04053							
Chemtest Sample ID:	1764997							
Sample Ref:	BH101A							
Sample ID:	BH101A							
Sample Location:	BH101A							
Top Depth(m):	0.50							
Bottom Depth(m):								
Sampling Date:	09-Feb-2024							
Determinand	**SOP**	**HWOL Code**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625		U	%	6.1	3	5	6
Loss on Ignition						--	--	10
Total BTEX						6	--	--
Total PCBs (7 congeners)						1	--	--
TPH Total WAC (Mineral Oil)						500	--	--
Total (of 17) PAHs						100	--	--
pH						--	>6	--
Acid Neutralisation Capacity						--	To evaluate	To evaluate
Eluate Analysis				**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic						0.5	2	25
Barium						20	100	300
Cadmium						0.04	1	5
Chromium						0.5	10	70
Copper						2	50	100
Mercury						0.01	0.2	2
Molybdenum						0.5	10	30
Nickel						0.4	10	40
Lead						0.5	10	50
Antimony						0.06	0.7	5
Selenium						0.1	0.5	7
Zinc						4	50	200
Chloride						800	15000	25000
Fluoride						10	150	500
Sulphate						1000	20000	50000
Total Dissolved Solids						4000	60000	100000
Phenol Index						1	-	-
Dissolved Organic Carbon	1610		U	5.0	50	500	800	1000

Solid Information	
Dry mass of test portion/kg	
Moisture (%)	

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: Channel View - TOC / DOC Samples

						Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	24-04053							
Chemtest Sample ID:	1764998							
Sample Ref:	BH101A							
Sample ID:	BH101A							
Sample Location:	BH101A							
Top Depth(m):	1.20							
Bottom Depth(m):								
Sampling Date:	09-Feb-2024							
Determinand	**SOP**	**HWOL Code**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625		U	%	7.8	3	5	6
Loss on Ignition						--	--	10
Total BTEX						6	--	--
Total PCBs (7 congeners)						1	--	--
TPH Total WAC (Mineral Oil)						500	--	--
Total (of 17) PAHs						100	--	--
pH						--	>6	--
Acid Neutralisation Capacity						--	To evaluate	To evaluate
Eluate Analysis				**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic						0.5	2	25
Barium						20	100	300
Cadmium						0.04	1	5
Chromium						0.5	10	70
Copper						2	50	100
Mercury						0.01	0.2	2
Molybdenum						0.5	10	30
Nickel						0.4	10	40
Lead						0.5	10	50
Antimony						0.06	0.7	5
Selenium						0.1	0.5	7
Zinc						4	50	200
Chloride						800	15000	25000
Fluoride						10	150	500
Sulphate						1000	20000	50000
Total Dissolved Solids						4000	60000	100000
Phenol Index						1	-	-
Dissolved Organic Carbon	1610		U	3.8	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	
Moisture (%)	

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: Channel View - TOC / DOC Samples

						Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	24-04053							
Chemtest Sample ID:	1764999							
Sample Ref:	BH101A							
Sample ID:	BH101A							
Sample Location:	BH101A							
Top Depth(m):	2.00							
Bottom Depth(m):								
Sampling Date:	09-Feb-2024							
Determinand	**SOP**	**HWOL Code**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625		U	%	3.6	3	5	6
Loss on Ignition						--	--	10
Total BTEX						6	--	--
Total PCBs (7 congeners)						1	--	--
TPH Total WAC (Mineral Oil)						500	--	--
Total (of 17) PAHs						100	--	--
pH						--	>6	--
Acid Neutralisation Capacity						--	To evaluate	To evaluate
Eluate Analysis				**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic						0.5	2	25
Barium						20	100	300
Cadmium						0.04	1	5
Chromium						0.5	10	70
Copper						2	50	100
Mercury						0.01	0.2	2
Molybdenum						0.5	10	30
Nickel						0.4	10	40
Lead						0.5	10	50
Antimony						0.06	0.7	5
Selenium						0.1	0.5	7
Zinc						4	50	200
Chloride						800	15000	25000
Fluoride						10	150	500
Sulphate						1000	20000	50000
Total Dissolved Solids						4000	60000	100000
Phenol Index						1	-	-
Dissolved Organic Carbon	1610		U	5.0	50	500	800	1000

Solid Information	
Dry mass of test portion/kg	
Moisture (%)	

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: Channel View - TOC / DOC Samples

						Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	24-04053							
Chemtest Sample ID:	1765000							
Sample Ref:	BH102							
Sample ID:	BH102							
Sample Location:	BH102							
Top Depth(m):	1.20							
Bottom Depth(m):								
Sampling Date:	09-Feb-2024							
Determinand	**SOP**	**HWOL Code**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625		U	%	35	3	5	6
Loss on Ignition						--	--	10
Total BTEX						6	--	--
Total PCBs (7 congeners)						1	--	--
TPH Total WAC (Mineral Oil)						500	--	--
Total (of 17) PAHs						100	--	--
pH						--	>6	--
Acid Neutralisation Capacity						--	To evaluate	To evaluate
Eluate Analysis				**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic						0.5	2	25
Barium						20	100	300
Cadmium						0.04	1	5
Chromium						0.5	10	70
Copper						2	50	100
Mercury						0.01	0.2	2
Molybdenum						0.5	10	30
Nickel						0.4	10	40
Lead						0.5	10	50
Antimony						0.06	0.7	5
Selenium						0.1	0.5	7
Zinc						4	50	200
Chloride						800	15000	25000
Fluoride						10	150	500
Sulphate						1000	20000	50000
Total Dissolved Solids						4000	60000	100000
Phenol Index						1	-	-
Dissolved Organic Carbon	1610		U	4.7	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	
Moisture (%)	

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: Channel View - TOC / DOC Samples

						Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	24-04053							
Chemtest Sample ID:	1765001							
Sample Ref:	BH102							
Sample ID:	BH102							
Sample Location:	BH102							
Top Depth(m):	2.00							
Bottom Depth(m):								
Sampling Date:	09-Feb-2024							
Determinand	**SOP**	**HWOL Code**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625		U	%	28	3	5	6
Loss on Ignition						--	--	10
Total BTEX						6	--	--
Total PCBs (7 congeners)						1	--	--
TPH Total WAC (Mineral Oil)						500	--	--
Total (of 17) PAHs						100	--	--
pH						--	>6	--
Acid Neutralisation Capacity						--	To evaluate	To evaluate
Eluate Analysis				**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic						0.5	2	25
Barium						20	100	300
Cadmium						0.04	1	5
Chromium						0.5	10	70
Copper						2	50	100
Mercury						0.01	0.2	2
Molybdenum						0.5	10	30
Nickel						0.4	10	40
Lead						0.5	10	50
Antimony						0.06	0.7	5
Selenium						0.1	0.5	7
Zinc						4	50	200
Chloride						800	15000	25000
Fluoride						10	150	500
Sulphate						1000	20000	50000
Total Dissolved Solids						4000	60000	100000
Phenol Index						1	-	-
Dissolved Organic Carbon	1610		U	4.7	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	
Moisture (%)	

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: Channel View - TOC / DOC Samples

						Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	24-04053							
Chemtest Sample ID:	1765002							
Sample Ref:	BH102							
Sample ID:	BH102							
Sample Location:	BH102							
Top Depth(m):	3.00							
Bottom Depth(m):								
Sampling Date:	09-Feb-2024							
Determinand	**SOP**	**HWOL Code**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625		U	%	41	3	5	6
Loss on Ignition						--	--	10
Total BTEX						6	--	--
Total PCBs (7 congeners)						1	--	--
TPH Total WAC (Mineral Oil)						500	--	--
Total (of 17) PAHs						100	--	--
pH						--	>6	--
Acid Neutralisation Capacity						--	To evaluate	To evaluate
Eluate Analysis				**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic						0.5	2	25
Barium						20	100	300
Cadmium						0.04	1	5
Chromium						0.5	10	70
Copper						2	50	100
Mercury						0.01	0.2	2
Molybdenum						0.5	10	30
Nickel						0.4	10	40
Lead						0.5	10	50
Antimony						0.06	0.7	5
Selenium						0.1	0.5	7
Zinc						4	50	200
Chloride						800	15000	25000
Fluoride						10	150	500
Sulphate						1000	20000	50000
Total Dissolved Solids						4000	60000	100000
Phenol Index						1	-	-
Dissolved Organic Carbon	1610		U	3.0	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	
Moisture (%)	

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: Channel View - TOC / DOC Samples

						Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	24-04053					**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Chemtest Sample ID:	1765003							
Sample Ref:	BH103							
Sample ID:	BH103							
Sample Location:	BH103							
Top Depth(m):	1.20							
Bottom Depth(m):								
Sampling Date:	09-Feb-2024							
Determinand	**SOP**	**HWOL Code**	**Accred.**	**Units**				
Total Organic Carbon	2625		U	%	18	3	5	6
Loss on Ignition						--	--	10
Total BTEX						6	--	--
Total PCBs (7 congeners)						1	--	--
TPH Total WAC (Mineral Oil)						500	--	--
Total (of 17) PAHs						100	--	--
pH						--	>6	--
Acid Neutralisation Capacity						--	To evaluate	To evaluate
Eluate Analysis				**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic						0.5	2	25
Barium						20	100	300
Cadmium						0.04	1	5
Chromium						0.5	10	70
Copper						2	50	100
Mercury						0.01	0.2	2
Molybdenum						0.5	10	30
Nickel						0.4	10	40
Lead						0.5	10	50
Antimony						0.06	0.7	5
Selenium						0.1	0.5	7
Zinc						4	50	200
Chloride						800	15000	25000
Fluoride						10	150	500
Sulphate						1000	20000	50000
Total Dissolved Solids						4000	60000	100000
Phenol Index						1	-	-
Dissolved Organic Carbon	1610		U	2.7	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	
Moisture (%)	

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: Channel View - TOC / DOC Samples

Chemtest Job No:	24-04053					**Landfill Waste Acceptance Criteria Limits**		
Chemtest Sample ID:	1765004							
Sample Ref:	BH103							
Sample ID:	BH103							
Sample Location:	BH103							
Top Depth(m):	2.00							
Bottom Depth(m):								
Sampling Date:	09-Feb-2024					**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Determinand	**SOP**	**HWOL Code**	**Accred.**	**Units**				
Total Organic Carbon	2625		U	%	33	3	5	6
Loss on Ignition						--	--	10
Total BTEX						6	--	--
Total PCBs (7 congeners)						1	--	--
TPH Total WAC (Mineral Oil)						500	--	--
Total (of 17) PAHs						100	--	--
pH						--	>6	--
Acid Neutralisation Capacity						--	To evaluate	To evaluate
Eluate Analysis				**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic						0.5	2	25
Barium						20	100	300
Cadmium						0.04	1	5
Chromium						0.5	10	70
Copper						2	50	100
Mercury						0.01	0.2	2
Molybdenum						0.5	10	30
Nickel						0.4	10	40
Lead						0.5	10	50
Antimony						0.06	0.7	5
Selenium						0.1	0.5	7
Zinc						4	50	200
Chloride						800	15000	25000
Fluoride						10	150	500
Sulphate						1000	20000	50000
Total Dissolved Solids						4000	60000	100000
Phenol Index						1	-	-
Dissolved Organic Carbon	1610		U	4.5	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	
Moisture (%)	

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: Channel View - TOC / DOC Samples

						Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	24-04053					**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Chemtest Sample ID:	1765005							
Sample Ref:	BH103							
Sample ID:	BH103							
Sample Location:	BH103							
Top Depth(m):	3.00							
Bottom Depth(m):								
Sampling Date:	09-Feb-2024							
Determinand	**SOP**	**HWOL Code**	**Accred.**	**Units**				
Total Organic Carbon	2625		U	%	22	3	5	6
Loss on Ignition						--	--	10
Total BTEX						6	--	--
Total PCBs (7 congeners)						1	--	--
TPH Total WAC (Mineral Oil)						500	--	--
Total (of 17) PAHs						100	--	--
pH						--	>6	--
Acid Neutralisation Capacity						--	To evaluate	To evaluate
Eluate Analysis				**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic						0.5	2	25
Barium						20	100	300
Cadmium						0.04	1	5
Chromium						0.5	10	70
Copper						2	50	100
Mercury						0.01	0.2	2
Molybdenum						0.5	10	30
Nickel						0.4	10	40
Lead						0.5	10	50
Antimony						0.06	0.7	5
Selenium						0.1	0.5	7
Zinc						4	50	200
Chloride						800	15000	25000
Fluoride						10	150	500
Sulphate						1000	20000	50000
Total Dissolved Solids						4000	60000	100000
Phenol Index						1	-	-
Dissolved Organic Carbon	1610		U	4.3	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	
Moisture (%)	

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation	
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.	
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930	
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.	
640	Characterisation of Waste (Leaching C10)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge	

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

Water Sample Category Key for Accreditation

DW - Drinking Water
GW - Ground Water
LE - Land Leachate
NA - Not Applicable
PL - Prepared Leachate
PW - Processed Water

Report Information

RE - Recreational Water
SA - Saline Water
SW - Surface Water
TE - Treated Effluent
TS - Treated Sewage
UL - Unspecified Liquid

Clean Up Codes

NC - No Clean Up
MC - Mathematical Clean Up
FC - Florisil Clean Up

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

eurofins | Chemtest
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Amended Report

Report No.:	24-01368-2		
Initial Date of Issue:	30-Jan-2024	**Date of Re-Issue:**	18-Mar-2024
Re-Issue Details:	This report has been revised and directly supersedes 24-01368-1 in its entirety		
Client	Terra Firma		
Client Address:	5 Deryn Court Wharfedale Road Pentwyn Cardiff CF23 7HA		
Contact(s):	michael@terrafirmawales.co.uk; morgan@terrafirmawales.co.uk		
Project	16017 Channel View WAC Testing		
Quotation No.:		**Date Received:**	18-Jan-2024
Order No.:	16017MPWAC	**Date Instructed:**	18-Jan-2024
No. of Samples:	12		
Turnaround (Wkdays):	5	**Results Due:**	24-Jan-2024
Date Approved:	30-Jan-2024		
Approved By:			
Details:	Stuart Henderson, Technical Manager		

For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Results - Soil

Project: 16017 Channel View WAC Testing

Client: Terra Firma				**Chemtest Job No.:**		24-01368	24-01368	24-01368	24-01368	24-01368	24-01368
Quotation No.:				**Chemtest Sample ID.:**		1755214	1755216	1755218	1755220	1755222	1755224
Order No.: 16017MPWAC				Client Sample Ref.:		2	4	6	8	10	12
				Client Sample ID.:		TP01E1	TP02E1	TP03E1	TP04E1	TP05E1	TP06E1
				Sample Location:		TP01	TP02	TP03	TP04	TP05	TP06
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		1.3	2.6	1.5	2.7	1.4	2.8
				Date Sampled:		15-Jan-2024	15-Jan-2024	15-Jan-2024	15-Jan-2024	15-Jan-2024	15-Jan-2024
				Time Sampled:		12:00	12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**						
ACM Type		U	2192		N/A	-	-	-	-	-	-
Asbestos Identification		U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture		N	2030	%	0.020	17	24	24	19	15	14
Soil Colour		N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown
Other Material		N	2040		N/A	Stones	Stones	Stones	Stones	Stones	Stones
Soil Texture		N	2040		N/A	Sand	Sand	Sand	Sand	Sand	Sand
pH at 20C		M	2010		4.0	8.0	7.9	7.6	7.9	7.9	7.5
Boron (Hot Water Soluble)		M	2120	mg/kg	0.40	< 0.40	0.71	1.2	< 0.40	1.8	0.83
Cyanide (Complex)		M	2300	mg/kg	0.50	4.4	2.7	4.1	3.2	< 0.50	< 0.50
Cyanide (Free)		M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cyanide (Total)		M	2300	mg/kg	0.50	4.4	2.7	4.1	3.2	< 0.50	< 0.50
Sulphate (Acid Soluble)		U	2430	%	0.010	0.13	0.18	0.14	0.12	0.18	0.14
Arsenic		M	2455	mg/kg	0.5	19	22	17	18	16	13
Beryllium		U	2455	mg/kg	0.5	1.2	1.0	1.1	1.2	0.9	0.7
Cadmium		M	2455	mg/kg	0.10	0.63	0.65	0.73	2.5	1.0	0.79
Chromium		M	2455	mg/kg	0.5	39	24	17	31	27	20
Mercury Low Level		N	2450	mg/kg	0.05	0.88	0.98	0.20	0.46	0.38	0.25
Manganese		M	2455	mg/kg	1.0	520	440	400	470	620	530
Molybdenum		M	2455	mg/kg	0.5	5.4	5.9	5.3	3.9	3.0	2.4
Antimony		N	2455	mg/kg	2.0	9.0	20	9.6	6.1	5.4	4.1
Copper		M	2455	mg/kg	0.50	160	140	380	220	84	97
Nickel		M	2455	mg/kg	0.50	64	52	60	52	36	26
Lead		M	2455	mg/kg	0.50	390	330	260	320	190	140
Selenium		M	2455	mg/kg	0.25	1.2	1.0	0.97	0.82	0.69	0.64
Zinc		M	2455	mg/kg	0.50	620	500	1000	1600	1800	350
Chromium (Trivalent)		N	2490	mg/kg	1.0	39	24	17	31	27	20
Chromium (Hexavalent)		N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Aliphatic VPH >C5-C6	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C6-C7	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C7-C8	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C6-C8 (Sum)	HS_2D_AL	N	2780	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aliphatic VPH >C8-C10	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total Aliphatic VPH >C5-C10	HS_2D_AL	U	2780	mg/kg	0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
Aliphatic EPH >C10-C12 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Aliphatic EPH >C12-C16 MC	EH_2D_AL_#1	M	2690	mg/kg	1.00	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	2.7

Results - Soil

Project: 16017 Channel View WAC Testing

Client: Terra Firma				**Chemtest Job No.:**		24-01368	24-01368	24-01368	24-01368	24-01368	24-01368
Quotation No.:				**Chemtest Sample ID.:**		1755214	1755216	1755218	1755220	1755222	1755224
Order No.: 16017MPWAC				Client Sample Ref.:		2	4	6	8	10	12
				Client Sample ID.:		TP01E1	TP02E1	TP03E1	TP04E1	TP05E1	TP06E1
				Sample Location:		TP01	TP02	TP03	TP04	TP05	TP06
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		1.3	2.6	1.5	2.7	1.4	2.8
				Date Sampled:		15-Jan-2024	15-Jan-2024	15-Jan-2024	15-Jan-2024	15-Jan-2024	15-Jan-2024
				Time Sampled:		12:00	12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**						
Aliphatic EPH >C16-C21 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	< 2.0	< 2.0	< 2.0	< 2.0	3.8	20
Aliphatic EPH >C21-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	3.00	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	18
Aliphatic EPH >C35-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	< 10	< 10	< 10	< 10	< 10	< 10
Total Aliphatic EPH >C10-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	5.00	< 5.0	< 5.0	< 5.0	< 5.0	6.1	42
Total Aliphatic EPH >C10-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	< 10	< 10	< 10	< 10	< 10	42
Aromatic VPH >C5-C7	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aromatic VPH >C7-C8	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aromatic VPH >C8-C10	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total Aromatic VPH >C5-C10	HS_2D_AR	U	2780	mg/kg	0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
Aromatic EPH >C10-C12 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic EPH >C12-C16 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic EPH >C16-C21 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	2.4	2.5	3.4	6.2	4.0	5.0
Aromatic EPH >C21-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	< 2.0	< 2.0	4.3	53	4.2	22
Aromatic EPH >C35-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	1.00	< 1.0	< 1.0	1.5	3.7	1.1	4.2
Total Aromatic EPH >C10-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	5.00	< 5.0	< 5.0	7.7	59	8.2	27
Total Aromatic EPH >C10-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	10.00	< 10	< 10	< 10	63	< 10	32
Total VPH >C5-C10	HS_2D_Total	U	2780	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Total EPH >C10-C35 MC	EH_2D_Total_#1	U	2690	mg/kg	10.00	< 10	< 10	< 10	62	14	69
Total EPH >C10-C40 MC	EH_2D_Total_#1	N	2690	mg/kg	10.00	< 10	< 10	< 10	65	15	73
Naphthalene		M	2700	mg/kg	0.10	< 0.10	< 0.10	0.63	< 0.10	< 0.10	< 0.10
Acenaphthylene		M	2700	mg/kg	0.10	< 0.10	< 0.10	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene		M	2700	mg/kg	0.10	< 0.10	< 0.10	0.34	< 0.10	< 0.10	< 0.10
Fluorene		M	2700	mg/kg	0.10	< 0.10	< 0.10	0.28	< 0.10	< 0.10	< 0.10
Phenanthrene		M	2700	mg/kg	0.10	1.9	0.97	1.1	2.4	0.63	1.1
Anthracene		M	2700	mg/kg	0.10	0.26	0.16	< 0.10	0.49	0.14	0.21
Fluoranthene		M	2700	mg/kg	0.10	3.8	1.7	0.74	5.3	1.2	2.2
Pyrene		M	2700	mg/kg	0.10	3.3	1.4	0.85	4.9	1.1	2.2
Benzo[a]anthracene		M	2700	mg/kg	0.10	2.1	1.0	0.59	3.2	0.71	1.4
Chrysene		M	2700	mg/kg	0.10	2.9	1.5	1.2	3.8	1.3	1.5
Benzo[b]fluoranthene		M	2700	mg/kg	0.10	2.9	1.8	0.91	4.4	1.1	1.6
Benzo[k]fluoranthene		M	2700	mg/kg	0.10	1.0	0.63	0.33	1.7	0.55	0.81
Benzo[a]pyrene		M	2700	mg/kg	0.10	1.9	1.0	0.54	3.2	0.75	1.4
Indeno(1,2,3-c,d)Pyrene		M	2700	mg/kg	0.10	1.1	0.82	0.37	2.4	0.58	0.81
Dibenz(a,h)Anthracene		M	2700	mg/kg	0.10	0.58	0.48	0.44	0.93	0.21	0.43
Benzo[g,h,i]perylene		M	2700	mg/kg	0.10	1.3	1.0	0.43	2.2	0.92	1.7
Total Of 16 PAH's		M	2700	mg/kg	2.0	23	13	8.9	35	9.2	15

Results - Soil

Project: 16017 Channel View WAC Testing

Client: Terra Firma				**Chemtest Job No.:**		24-01368	24-01368	24-01368	24-01368	24-01368	24-01368
Quotation No.:				**Chemtest Sample ID.:**		1755214	1755216	1755218	1755220	1755222	1755224
Order No.: 16017MPWAC				Client Sample Ref.:		2	4	6	8	10	12
				Client Sample ID.:		TP01E1	TP02E1	TP03E1	TP04E1	TP05E1	TP06E1
				Sample Location:		TP01	TP02	TP03	TP04	TP05	TP06
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		1.3	2.6	1.5	2.7	1.4	2.8
				Date Sampled:		15-Jan-2024	15-Jan-2024	15-Jan-2024	15-Jan-2024	15-Jan-2024	15-Jan-2024
				Time Sampled:		12:00	12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**						
Total Phenols		M	2920	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Organic Matter BS1377		N	2930	%	0.10	0.30	1.5	1.5	0.60	0.90	1.3

Results - 2 Stage WAC

Project: 16017 Channel View WAC Testing

							Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	24-01368								
Chemtest Sample ID:	1755213								
Sample Ref:	1								
Sample ID:	TP01WAC1						**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Sample Location:	TP01								
Top Depth(m):	1.3								
Bottom Depth(m):									
Sampling Date:	15-Jan-2024								
Determinand	**SOP**	**Accred.**	**Units**						
Total Organic Carbon	2625	M	%			24	3	5	6
Loss On Ignition	2610	M	%			12	--	--	10
Total BTEX	2760	M	mg/kg			< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg			< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg			76	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg			4.4	100	--	--
pH at 20C	2010	M				7.9	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.013	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative mg/kg 10:1**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0054	0.0013	0.010	0.019	0.5	2	25
Barium	1455	U	0.076	< 0.005	0.15	0.11	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.5	10	70
Copper	1455	U	0.0037	0.0023	0.0072	0.0053	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.022	0.0004	0.043	0.035	0.5	10	30
Nickel	1455	U	0.0051	0.0014	0.0099	0.019	0.4	10	40
Lead	1455	U	< 0.0005	0.0006	< 0.0005	0.0054	0.5	10	50
Antimony	1455	U	0.0034	< 0.0005	0.0066	0.0048	0.06	0.7	5
Selenium	1455	U	0.0051	< 0.0005	0.0098	0.0072	0.1	0.5	7
Zinc	1455	U	0.024	0.006	0.047	0.084	4	50	200
Chloride	1220	U	7.0	< 1.0	14	10	800	15000	25000
Fluoride	1220	U	0.40	0.48	< 1.0	4.7	10	150	500
Sulphate	1220	U	120	< 1.0	230	170	1000	20000	50000
Total Dissolved Solids	1020	N	330	45	630	850	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	U	4.8	5.4	< 50	53	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	21

Leachate Test Information	
Leachant volume 1st extract/l	0.303
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.250

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - 2 Stage WAC

Project: 16017 Channel View WAC Testing

							Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	24-01368								
Chemtest Sample ID:	1755217								
Sample Ref:	5								
Sample ID:	TP03WAC1						**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Sample Location:	TP03								
Top Depth(m):	1.5								
Bottom Depth(m):									
Sampling Date:	15-Jan-2024								
Determinand	**SOP**	**Accred.**	**Units**						
Total Organic Carbon	2625	M	%			34	3	5	6
Loss On Ignition	2610	M	%			15	--	--	10
Total BTEX	2760	M	mg/kg			< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg			< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg			11	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg			9.5	100	--	--
pH at 20C	2010	M				7.6	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.0060	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative mg/kg 10:1**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0034	0.0043	0.0067	0.042	0.5	2	25
Barium	1455	U	0.066	0.035	0.13	0.39	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	0.016	0.0015	0.032	0.036	0.5	10	70
Copper	1455	U	0.0047	0.0041	0.0093	0.0065	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.017	0.0025	0.032	0.044	0.5	10	30
Nickel	1455	U	0.0005	0.0006	0.0010	0.0061	0.4	10	40
Lead	1455	U	< 0.0005	0.0012	< 0.0005	0.011	0.5	10	50
Antimony	1455	U	0.010	0.0027	0.021	0.038	0.06	0.7	5
Selenium	1455	U	0.0019	< 0.0005	0.0037	0.0026	0.1	0.5	7
Zinc	1455	U	0.019	0.014	0.038	0.15	4	50	200
Chloride	1220	U	5.6	< 1.0	11	< 10	800	15000	25000
Fluoride	1220	U	0.88	0.28	1.7	3.6	10	150	500
Sulphate	1220	U	42	5.7	83	110	1000	20000	50000
Total Dissolved Solids	1020	N	210	60	410	810	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	U	4.4	3.9	< 50	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	17

Leachate Test Information	
Leachant volume 1st extract/l	0.315
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.242

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - 2 Stage WAC

Project: 16017 Channel View WAC Testing

							Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	24-01368						**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Chemtest Sample ID:	1755219								
Sample Ref:	7								
Sample ID:	TP04WAC1								
Sample Location:	TP04								
Top Depth(m):	2.7								
Bottom Depth(m):									
Sampling Date:	15-Jan-2024								
Determinand	**SOP**	**Accred.**	**Units**						
Total Organic Carbon	2625	M	%			18	3	5	6
Loss On Ignition	2610	M	%			9.3	--	--	10
Total BTEX	2760	M	mg/kg			< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg			< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg			84	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg			32	100	--	--
pH at 20C	2010	M				7.7	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.012	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative mg/kg 10:1**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0015	0.0008	0.0030	0.0094	0.5	2	25
Barium	1455	U	0.074	0.070	0.15	0.71	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	0.010	0.0016	0.020	0.027	0.5	10	70
Copper	1455	U	0.0036	0.0030	0.0071	0.0047	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.015	0.0098	0.030	0.10	0.5	10	30
Nickel	1455	U	0.0094	0.0010	0.019	0.021	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.5	10	50
Antimony	1455	U	0.0023	0.0013	0.0045	0.014	0.06	0.7	5
Selenium	1455	U	0.0032	0.0007	0.0064	0.0099	0.1	0.5	7
Zinc	1455	U	0.061	0.010	0.12	0.16	4	50	200
Chloride	1220	U	4.6	< 1.0	< 10	< 10	800	15000	25000
Fluoride	1220	U	0.41	0.36	< 1.0	3.7	10	150	500
Sulphate	1220	U	320	29	630	670	1000	20000	50000
Total Dissolved Solids	1020	N	530	98	1000	1600	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	U	4.9	< 2.5	< 50	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	15

Leachate Test Information	
Leachant volume 1st extract/l	0.320
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.232

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - 2 Stage WAC

Project: 16017 Channel View WAC Testing

							Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	24-01368								
Chemtest Sample ID:	1755221								
Sample Ref:	9								
Sample ID:	TP05WAC1								
Sample Location:	TP05								
Top Depth(m):	1.4								
Bottom Depth(m):									
Sampling Date:	15-Jan-2024								
Determinand	**SOP**	**Accred.**	**Units**				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%			2.5	3	5	6
Loss On Ignition	2610	M	%			5.8	--	--	10
Total BTEX	2760	M	mg/kg			< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg			< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg			66	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg			12	100	--	--
pH at 20C	2010	M				9.0	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.016	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative mg/kg 10:1**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0015	0.0016	0.0030	0.016	0.5	2	25
Barium	1455	U	0.077	0.040	0.15	0.42	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	0.0028	0.0006	0.0056	0.0077	0.5	10	70
Copper	1455	U	0.0023	0.0018	0.0046	0.0017	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.025	0.0048	0.050	0.063	0.5	10	30
Nickel	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.5	10	50
Antimony	1455	U	0.0020	0.0009	0.0040	0.010	0.06	0.7	5
Selenium	1455	U	0.0006	< 0.0005	0.0013	< 0.0005	0.1	0.5	7
Zinc	1455	U	0.025	0.023	0.049	0.24	4	50	200
Chloride	1220	U	3.0	< 1.0	< 10	< 10	800	15000	25000
Fluoride	1220	U	0.54	0.14	1.1	1.7	10	150	500
Sulphate	1220	U	65	7.9	130	120	1000	20000	50000
Total Dissolved Solids	1020	N	200	52	400	630	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	U	4.6	2.6	< 50	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	13

Leachate Test Information	
Leachant volume 1st extract/l	0.325
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.126

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - 2 Stage WAC

Project: 16017 Channel View WAC Testing

							Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	24-01368								
Chemtest Sample ID:	1755223								
Sample Ref:	11								
Sample ID:	TP06WAC1						**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Sample Location:	TP06								
Top Depth(m):	2.8								
Bottom Depth(m):									
Sampling Date:	15-Jan-2024								
Determinand	**SOP**	**Accred.**	**Units**						
Total Organic Carbon	2625	M	%			7.5	3	5	6
Loss On Ignition	2610	M	%			6.7	--	--	10
Total BTEX	2760	M	mg/kg			< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg			< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg			< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg			8.2	100	--	--
pH at 20C	2010	M				8.0	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.016	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative mg/kg 10:1**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0009	0.0025	0.0018	0.023	0.5	2	25
Barium	1455	U	0.061	0.054	0.12	0.55	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	0.020	0.0011	0.039	0.035	0.5	10	70
Copper	1455	U	0.017	0.0023	0.034	0.022	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.022	0.011	0.043	0.12	0.5	10	30
Nickel	1455	U	0.0006	0.0010	0.0012	0.0098	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.5	10	50
Antimony	1455	U	0.0020	0.0021	0.0039	0.021	0.06	0.7	5
Selenium	1455	U	0.0014	0.0007	0.0029	0.0084	0.1	0.5	7
Zinc	1455	U	0.003	0.008	0.005	0.076	4	50	200
Chloride	1220	U	20	< 1.0	40	26	800	15000	25000
Fluoride	1220	U	0.27	0.29	< 1.0	2.9	10	150	500
Sulphate	1220	U	18	14	36	150	1000	20000	50000
Total Dissolved Solids	1020	N	660	84	1300	1600	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	U	12	< 2.5	< 50	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	12

Leachate Test Information	
Leachant volume 1st extract/l	0.326
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.225

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity at 25°C and Total Dissolved Solids (TDS) in Waters	Conductivity Meter	
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.	
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).	
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation	
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.	
2010	pH Value of Soils	pH at 20°C	pH Meter	
2015	Acid Neutralisation Capacity	Acid Reserve	Titration	
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.	
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930	
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES	
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry	
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.	
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.	
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.	
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.	
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.	
2610	Loss on Ignition	loss on ignition (LOI)	Determination of the proportion by mass that is lost from a soil by ignition at 550°C.	
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.	
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID	
2690	EPH A/A Split	Aliphatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40 Aromatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40	Acetone/Heptane extraction / GCxGC FID detection	
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)	

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.	
2780	VPH A/A Split	Aliphatics: >C5–C6, >C6–C7,>C7–C8,>C8-C10 Aromatics: >C5–C7,>C7-C8,>C8–C10	Water extraction / Headspace GCxGC FID detection	
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS	
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.	
2930	Organic Matter	Organic Matter	Acid Dichromate digestion/Titration	
640	Characterisation of Waste (Leaching C10)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge	
650	Characterisation of Waste (Leaching WAC)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge	

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

Water Sample Category Key for Accreditation

DW - Drinking Water
GW - Ground Water
LE - Land Leachate
NA - Not Applicable
PL - Prepared Leachate
PW - Processed Water

Report Information

RE - Recreational Water
SA - Saline Water
SW - Surface Water
TE - Treated Effluent
TS - Treated Sewage
UL - Unspecified Liquid

Clean Up Codes

NC - No Clean Up
MC - Mathematical Clean Up
FC - Florisil Clean Up

HWOL Acronym System

HS - Headspace analysis
EH - Extractable hydrocarbons – i.e. everything extracted by the solvent
CU - Clean-up – e.g. by Florisil, silica gel
1D - GC – Single coil gas chromatography
Total - Aliphatics & Aromatics
AL - Aliphatics only
AR - Aromatic only
2D - GC-GC – Double coil gas chromatography
#1 - EH_2D_Total but with humics mathematically subtracted
#2 - EH_2D_Total but with fatty acids mathematically subtracted
+ - Operator to indicate cumulative e.g. EH+EH_Total or EH_CU+HS_Total

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

eurofins | Chemtest
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Amended Report

Report No.:	24-01368-2		
Initial Date of Issue:	30-Jan-2024	**Date of Re-Issue:**	18-Mar-2024
Re-Issue Details:	This report has been revised and directly supersedes 24-01368-1 in its entirety		
Client	Terra Firma		
Client Address:	5 Deryn Court Wharfedale Road Pentwyn Cardiff CF23 7HA		
Contact(s):	michael@terrafirmawales.co.uk; morgan@terrafirmawales.co.uk		
Project	16017 Channel View WAC Testing		
Quotation No.:		**Date Received:**	18-Jan-2024
Order No.:	16017MPWAC	**Date Instructed:**	18-Jan-2024
No. of Samples:	12		
Turnaround (Wkdays):	5	**Results Due:**	24-Jan-2024
Date Approved:	30-Jan-2024		
Approved By:			
Details:	Stuart Henderson, Technical Manager		

For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Results - Soil

Project: 16017 Channel View WAC Testing

Client: Terra Firma				**Chemtest Job No.:**		24-01368	24-01368	24-01368	24-01368	24-01368	24-01368
Quotation No.:				**Chemtest Sample ID.:**		1755214	1755216	1755218	1755220	1755222	1755224
Order No.: 16017MPWAC				Client Sample Ref.:		2	4	6	8	10	12
				Client Sample ID.:		TP01E1	TP02E1	TP03E1	TP04E1	TP05E1	TP06E1
				Sample Location:		TP01	TP02	TP03	TP04	TP05	TP06
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		1.3	2.6	1.5	2.7	1.4	2.8
				Date Sampled:		15-Jan-2024	15-Jan-2024	15-Jan-2024	15-Jan-2024	15-Jan-2024	15-Jan-2024
				Time Sampled:		12:00	12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**						
ACM Type		U	2192		N/A	-	-	-	-	-	-
Asbestos Identification		U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture		N	2030	%	0.020	17	24	24	19	15	14
Soil Colour		N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown
Other Material		N	2040		N/A	Stones	Stones	Stones	Stones	Stones	Stones
Soil Texture		N	2040		N/A	Sand	Sand	Sand	Sand	Sand	Sand
pH at 20C		M	2010		4.0	8.0	7.9	7.6	7.9	7.9	7.5
Boron (Hot Water Soluble)		M	2120	mg/kg	0.40	< 0.40	0.71	1.2	< 0.40	1.8	0.83
Cyanide (Complex)		M	2300	mg/kg	0.50	4.4	2.7	4.1	3.2	< 0.50	< 0.50
Cyanide (Free)		M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cyanide (Total)		M	2300	mg/kg	0.50	4.4	2.7	4.1	3.2	< 0.50	< 0.50
Sulphate (Acid Soluble)		U	2430	%	0.010	0.13	0.18	0.14	0.12	0.18	0.14
Arsenic		M	2455	mg/kg	0.5	19	22	17	18	16	13
Beryllium		U	2455	mg/kg	0.5	1.2	1.0	1.1	1.2	0.9	0.7
Cadmium		M	2455	mg/kg	0.10	0.63	0.65	0.73	2.5	1.0	0.79
Chromium		M	2455	mg/kg	0.5	39	24	17	31	27	20
Mercury Low Level		N	2450	mg/kg	0.05	0.88	0.98	0.20	0.46	0.38	0.25
Manganese		M	2455	mg/kg	1.0	520	440	400	470	620	530
Molybdenum		M	2455	mg/kg	0.5	5.4	5.9	5.3	3.9	3.0	2.4
Antimony		N	2455	mg/kg	2.0	9.0	20	9.6	6.1	5.4	4.1
Copper		M	2455	mg/kg	0.50	160	140	380	220	84	97
Nickel		M	2455	mg/kg	0.50	64	52	60	52	36	26
Lead		M	2455	mg/kg	0.50	390	330	260	320	190	140
Selenium		M	2455	mg/kg	0.25	1.2	1.0	0.97	0.82	0.69	0.64
Zinc		M	2455	mg/kg	0.50	620	500	1000	1600	1800	350
Chromium (Trivalent)		N	2490	mg/kg	1.0	39	24	17	31	27	20
Chromium (Hexavalent)		N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Aliphatic VPH >C5-C6	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C6-C7	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C7-C8	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C6-C8 (Sum)	HS_2D_AL	N	2780	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aliphatic VPH >C8-C10	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total Aliphatic VPH >C5-C10	HS_2D_AL	U	2780	mg/kg	0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
Aliphatic EPH >C10-C12 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Aliphatic EPH >C12-C16 MC	EH_2D_AL_#1	M	2690	mg/kg	1.00	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	2.7

Results - Soil

Project: 16017 Channel View WAC Testing

Client: Terra Firma				**Chemtest Job No.:**		24-01368	24-01368	24-01368	24-01368	24-01368	24-01368
Quotation No.:				**Chemtest Sample ID.:**		1755214	1755216	1755218	1755220	1755222	1755224
Order No.: 16017MPWAC				Client Sample Ref.:		2	4	6	8	10	12
				Client Sample ID.:		TP01E1	TP02E1	TP03E1	TP04E1	TP05E1	TP06E1
				Sample Location:		TP01	TP02	TP03	TP04	TP05	TP06
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		1.3	2.6	1.5	2.7	1.4	2.8
				Date Sampled:		15-Jan-2024	15-Jan-2024	15-Jan-2024	15-Jan-2024	15-Jan-2024	15-Jan-2024
				Time Sampled:		12:00	12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**						
Aliphatic EPH >C16-C21 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	< 2.0	< 2.0	< 2.0	< 2.0	3.8	20
Aliphatic EPH >C21-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	3.00	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	18
Aliphatic EPH >C35-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	< 10	< 10	< 10	< 10	< 10	< 10
Total Aliphatic EPH >C10-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	5.00	< 5.0	< 5.0	< 5.0	< 5.0	6.1	42
Total Aliphatic EPH >C10-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	< 10	< 10	< 10	< 10	< 10	42
Aromatic VPH >C5-C7	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aromatic VPH >C7-C8	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aromatic VPH >C8-C10	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total Aromatic VPH >C5-C10	HS_2D_AR	U	2780	mg/kg	0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
Aromatic EPH >C10-C12 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic EPH >C12-C16 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic EPH >C16-C21 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	2.4	2.5	3.4	6.2	4.0	5.0
Aromatic EPH >C21-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	< 2.0	< 2.0	4.3	53	4.2	22
Aromatic EPH >C35-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	1.00	< 1.0	< 1.0	1.5	3.7	1.1	4.2
Total Aromatic EPH >C10-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	5.00	< 5.0	< 5.0	7.7	59	8.2	27
Total Aromatic EPH >C10-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	10.00	< 10	< 10	< 10	63	< 10	32
Total VPH >C5-C10	HS_2D_Total	U	2780	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Total EPH >C10-C35 MC	EH_2D_Total_#1	U	2690	mg/kg	10.00	< 10	< 10	< 10	62	14	69
Total EPH >C10-C40 MC	EH_2D_Total_#1	N	2690	mg/kg	10.00	< 10	< 10	< 10	65	15	73
Naphthalene		M	2700	mg/kg	0.10	< 0.10	< 0.10	0.63	< 0.10	< 0.10	< 0.10
Acenaphthylene		M	2700	mg/kg	0.10	< 0.10	< 0.10	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene		M	2700	mg/kg	0.10	< 0.10	< 0.10	0.34	< 0.10	< 0.10	< 0.10
Fluorene		M	2700	mg/kg	0.10	< 0.10	< 0.10	0.28	< 0.10	< 0.10	< 0.10
Phenanthrene		M	2700	mg/kg	0.10	1.9	0.97	1.1	2.4	0.63	1.1
Anthracene		M	2700	mg/kg	0.10	0.26	0.16	< 0.10	0.49	0.14	0.21
Fluoranthene		M	2700	mg/kg	0.10	3.8	1.7	0.74	5.3	1.2	2.2
Pyrene		M	2700	mg/kg	0.10	3.3	1.4	0.85	4.9	1.1	2.2
Benzo[a]anthracene		M	2700	mg/kg	0.10	2.1	1.0	0.59	3.2	0.71	1.4
Chrysene		M	2700	mg/kg	0.10	2.9	1.5	1.2	3.8	1.3	1.5
Benzo[b]fluoranthene		M	2700	mg/kg	0.10	2.9	1.8	0.91	4.4	1.1	1.6
Benzo[k]fluoranthene		M	2700	mg/kg	0.10	1.0	0.63	0.33	1.7	0.55	0.81
Benzo[a]pyrene		M	2700	mg/kg	0.10	1.9	1.0	0.54	3.2	0.75	1.4
Indeno(1,2,3-c,d)Pyrene		M	2700	mg/kg	0.10	1.1	0.82	0.37	2.4	0.58	0.81
Dibenz(a,h)Anthracene		M	2700	mg/kg	0.10	0.58	0.48	0.44	0.93	0.21	0.43
Benzo[g,h,i]perylene		M	2700	mg/kg	0.10	1.3	1.0	0.43	2.2	0.92	1.7
Total Of 16 PAH's		M	2700	mg/kg	2.0	23	13	8.9	35	9.2	15

Results - Soil

Project: 16017 Channel View WAC Testing

Client: Terra Firma				**Chemtest Job No.:**		24-01368	24-01368	24-01368	24-01368	24-01368	24-01368
Quotation No.:				**Chemtest Sample ID.:**		1755214	1755216	1755218	1755220	1755222	1755224
Order No.: 16017MPWAC				Client Sample Ref.:		2	4	6	8	10	12
				Client Sample ID.:		TP01E1	TP02E1	TP03E1	TP04E1	TP05E1	TP06E1
				Sample Location:		TP01	TP02	TP03	TP04	TP05	TP06
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		1.3	2.6	1.5	2.7	1.4	2.8
				Date Sampled:		15-Jan-2024	15-Jan-2024	15-Jan-2024	15-Jan-2024	15-Jan-2024	15-Jan-2024
				Time Sampled:		12:00	12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**						
Total Phenols		M	2920	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Organic Matter BS1377		N	2930	%	0.10	0.30	1.5	1.5	0.60	0.90	1.3

Results - 2 Stage WAC

Project: 16017 Channel View WAC Testing

							Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	24-01368								
Chemtest Sample ID:	1755213								
Sample Ref:	1								
Sample ID:	TP01WAC1						**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Sample Location:	TP01								
Top Depth(m):	1.3								
Bottom Depth(m):									
Sampling Date:	15-Jan-2024								
Determinand	**SOP**	**Accred.**	**Units**						
Total Organic Carbon	2625	M	%			24	3	5	6
Loss On Ignition	2610	M	%			12	--	--	10
Total BTEX	2760	M	mg/kg			< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg			< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg			76	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg			4.4	100	--	--
pH at 20C	2010	M				7.9	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.013	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative mg/kg 10:1**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0054	0.0013	0.010	0.019	0.5	2	25
Barium	1455	U	0.076	< 0.005	0.15	0.11	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.5	10	70
Copper	1455	U	0.0037	0.0023	0.0072	0.0053	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.022	0.0004	0.043	0.035	0.5	10	30
Nickel	1455	U	0.0051	0.0014	0.0099	0.019	0.4	10	40
Lead	1455	U	< 0.0005	0.0006	< 0.0005	0.0054	0.5	10	50
Antimony	1455	U	0.0034	< 0.0005	0.0066	0.0048	0.06	0.7	5
Selenium	1455	U	0.0051	< 0.0005	0.0098	0.0072	0.1	0.5	7
Zinc	1455	U	0.024	0.006	0.047	0.084	4	50	200
Chloride	1220	U	7.0	< 1.0	14	10	800	15000	25000
Fluoride	1220	U	0.40	0.48	< 1.0	4.7	10	150	500
Sulphate	1220	U	120	< 1.0	230	170	1000	20000	50000
Total Dissolved Solids	1020	N	330	45	630	850	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	U	4.8	5.4	< 50	53	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	21

Leachate Test Information	
Leachant volume 1st extract/l	0.303
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.250

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - 2 Stage WAC

Project: 16017 Channel View WAC Testing

							Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	24-01368								
Chemtest Sample ID:	1755217								
Sample Ref:	5								
Sample ID:	TP03WAC1						**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Sample Location:	TP03								
Top Depth(m):	1.5								
Bottom Depth(m):									
Sampling Date:	15-Jan-2024								
Determinand	**SOP**	**Accred.**	**Units**						
Total Organic Carbon	2625	M	%			34	3	5	6
Loss On Ignition	2610	M	%			15	--	--	10
Total BTEX	2760	M	mg/kg			< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg			< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg			11	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg			9.5	100	--	--
pH at 20C	2010	M				7.6	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.0060	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative mg/kg 10:1**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0034	0.0043	0.0067	0.042	0.5	2	25
Barium	1455	U	0.066	0.035	0.13	0.39	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	0.016	0.0015	0.032	0.036	0.5	10	70
Copper	1455	U	0.0047	0.0041	0.0093	0.0065	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.017	0.0025	0.032	0.044	0.5	10	30
Nickel	1455	U	0.0005	0.0006	0.0010	0.0061	0.4	10	40
Lead	1455	U	< 0.0005	0.0012	< 0.0005	0.011	0.5	10	50
Antimony	1455	U	0.010	0.0027	0.021	0.038	0.06	0.7	5
Selenium	1455	U	0.0019	< 0.0005	0.0037	0.0026	0.1	0.5	7
Zinc	1455	U	0.019	0.014	0.038	0.15	4	50	200
Chloride	1220	U	5.6	< 1.0	11	< 10	800	15000	25000
Fluoride	1220	U	0.88	0.28	1.7	3.6	10	150	500
Sulphate	1220	U	42	5.7	83	110	1000	20000	50000
Total Dissolved Solids	1020	N	210	60	410	810	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	U	4.4	3.9	< 50	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	17

Leachate Test Information	
Leachant volume 1st extract/l	0.315
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.242

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - 2 Stage WAC

Project: 16017 Channel View WAC Testing

							Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	24-01368						**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Chemtest Sample ID:	1755219								
Sample Ref:	7								
Sample ID:	TP04WAC1								
Sample Location:	TP04								
Top Depth(m):	2.7								
Bottom Depth(m):									
Sampling Date:	15-Jan-2024								
Determinand	**SOP**	**Accred.**	**Units**						
Total Organic Carbon	2625	M	%			18	3	5	6
Loss On Ignition	2610	M	%			9.3	--	--	10
Total BTEX	2760	M	mg/kg			< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg			< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg			84	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg			32	100	--	--
pH at 20C	2010	M				7.7	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.012	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative mg/kg 10:1**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0015	0.0008	0.0030	0.0094	0.5	2	25
Barium	1455	U	0.074	0.070	0.15	0.71	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	0.010	0.0016	0.020	0.027	0.5	10	70
Copper	1455	U	0.0036	0.0030	0.0071	0.0047	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.015	0.0098	0.030	0.10	0.5	10	30
Nickel	1455	U	0.0094	0.0010	0.019	0.021	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.5	10	50
Antimony	1455	U	0.0023	0.0013	0.0045	0.014	0.06	0.7	5
Selenium	1455	U	0.0032	0.0007	0.0064	0.0099	0.1	0.5	7
Zinc	1455	U	0.061	0.010	0.12	0.16	4	50	200
Chloride	1220	U	4.6	< 1.0	< 10	< 10	800	15000	25000
Fluoride	1220	U	0.41	0.36	< 1.0	3.7	10	150	500
Sulphate	1220	U	320	29	630	670	1000	20000	50000
Total Dissolved Solids	1020	N	530	98	1000	1600	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	U	4.9	< 2.5	< 50	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	15

Leachate Test Information	
Leachant volume 1st extract/l	0.320
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.232

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - 2 Stage WAC

Project: 16017 Channel View WAC Testing

							Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	24-01368								
Chemtest Sample ID:	1755221								
Sample Ref:	9								
Sample ID:	TP05WAC1								
Sample Location:	TP05								
Top Depth(m):	1.4								
Bottom Depth(m):									
Sampling Date:	15-Jan-2024								
Determinand	**SOP**	**Accred.**	**Units**				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%			2.5	3	5	6
Loss On Ignition	2610	M	%			5.8	--	--	10
Total BTEX	2760	M	mg/kg			< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg			< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg			66	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg			12	100	--	--
pH at 20C	2010	M				9.0	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.016	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative mg/kg 10:1**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0015	0.0016	0.0030	0.016	0.5	2	25
Barium	1455	U	0.077	0.040	0.15	0.42	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	0.0028	0.0006	0.0056	0.0077	0.5	10	70
Copper	1455	U	0.0023	0.0018	0.0046	0.0017	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.025	0.0048	0.050	0.063	0.5	10	30
Nickel	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.5	10	50
Antimony	1455	U	0.0020	0.0009	0.0040	0.010	0.06	0.7	5
Selenium	1455	U	0.0006	< 0.0005	0.0013	< 0.0005	0.1	0.5	7
Zinc	1455	U	0.025	0.023	0.049	0.24	4	50	200
Chloride	1220	U	3.0	< 1.0	< 10	< 10	800	15000	25000
Fluoride	1220	U	0.54	0.14	1.1	1.7	10	150	500
Sulphate	1220	U	65	7.9	130	120	1000	20000	50000
Total Dissolved Solids	1020	N	200	52	400	630	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	U	4.6	2.6	< 50	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	13

Leachate Test Information	
Leachant volume 1st extract/l	0.325
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.126

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - 2 Stage WAC

Project: 16017 Channel View WAC Testing

							Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	24-01368								
Chemtest Sample ID:	1755223								
Sample Ref:	11								
Sample ID:	TP06WAC1						**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Sample Location:	TP06								
Top Depth(m):	2.8								
Bottom Depth(m):									
Sampling Date:	15-Jan-2024								
Determinand	**SOP**	**Accred.**	**Units**						
Total Organic Carbon	2625	M	%			7.5	3	5	6
Loss On Ignition	2610	M	%			6.7	--	--	10
Total BTEX	2760	M	mg/kg			< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg			< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg			< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg			8.2	100	--	--
pH at 20C	2010	M				8.0	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.016	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative mg/kg 10:1**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0009	0.0025	0.0018	0.023	0.5	2	25
Barium	1455	U	0.061	0.054	0.12	0.55	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	0.020	0.0011	0.039	0.035	0.5	10	70
Copper	1455	U	0.017	0.0023	0.034	0.022	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.022	0.011	0.043	0.12	0.5	10	30
Nickel	1455	U	0.0006	0.0010	0.0012	0.0098	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.5	10	50
Antimony	1455	U	0.0020	0.0021	0.0039	0.021	0.06	0.7	5
Selenium	1455	U	0.0014	0.0007	0.0029	0.0084	0.1	0.5	7
Zinc	1455	U	0.003	0.008	0.005	0.076	4	50	200
Chloride	1220	U	20	< 1.0	40	26	800	15000	25000
Fluoride	1220	U	0.27	0.29	< 1.0	2.9	10	150	500
Sulphate	1220	U	18	14	36	150	1000	20000	50000
Total Dissolved Solids	1020	N	660	84	1300	1600	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	U	12	< 2.5	< 50	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	12

Leachate Test Information	
Leachant volume 1st extract/l	0.326
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.225

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity at 25°C and Total Dissolved Solids (TDS) in Waters	Conductivity Meter	
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.	
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).	
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation	
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.	
2010	pH Value of Soils	pH at 20°C	pH Meter	
2015	Acid Neutralisation Capacity	Acid Reserve	Titration	
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.	
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930	
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES	
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry	
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.	
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.	
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.	
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.	
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.	
2610	Loss on Ignition	loss on ignition (LOI)	Determination of the proportion by mass that is lost from a soil by ignition at 550°C.	
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.	
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID	
2690	EPH A/A Split	Aliphatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40 Aromatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40	Acetone/Heptane extraction / GCxGC FID detection	
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)	

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.	
2780	VPH A/A Split	Aliphatics: >C5–C6, >C6–C7,>C7–C8,>C8-C10 Aromatics: >C5–C7,>C7-C8,>C8–C10	Water extraction / Headspace GCxGC FID detection	
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS	
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.	
2930	Organic Matter	Organic Matter	Acid Dichromate digestion/Titration	
640	Characterisation of Waste (Leaching C10)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge	
650	Characterisation of Waste (Leaching WAC)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge	

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

Water Sample Category Key for Accreditation

DW - Drinking Water
GW - Ground Water
LE - Land Leachate
NA - Not Applicable
PL - Prepared Leachate
PW - Processed Water

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Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	23-40937-1
Initial Date of Issue:	20-Dec-2023
Re-Issue Details:	
Client	Terra Firma
Client Address:	5 Deryn Court Wharfedale Road Pentwyn Cardiff CF23 7HA
Contact(s):	elliot@terrafirmawales.co.uk; morgan@terrafirmawales.co.uk
Project	Channel View

Quotation No.:		**Date Received:**	11-Dec-2023
Order No.:	16017	**Date Instructed:**	11-Dec-2023
No. of Samples:	6		
Turnaround (Wkdays):	8	**Results Due:**	20-Dec-2023
Date Approved:	20-Dec-2023		

Approved By:

Details: Stuart Henderson, Technical Manager

Results - Soil

Project: Channel View

Client: Terra Firma				**Chemtest Job No.:**		23-40937	23-40937	23-40937	23-40937	23-40937	23-40937
Quotation No.:				**Chemtest Sample ID.:**		1743792	1743793	1743794	1743795	1743796	1743797
				Client Sample ID.:		ES1	ES1	ES1	ES1	ES1	ES1
				Sample Location:		WS101	WS102	WS103	WS104	WS105	WS106
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.5	0.8	0.3	0.3	0.5	0.7
				Bottom Depth (m):		0.5	1	0.3	0.3	0.5	0.7
				Date Sampled:		07-Dec-2023	07-Dec-2023	07-Dec-2023	07-Dec-2023	07-Dec-2023	07-Dec-2023
				Time Sampled:		12:00	12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**						
ACM Type		U	2192		N/A	Cement	-	-	-	-	-
Asbestos Identification		U	2192		N/A	Chrysotile	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Asbestos by Gravimetry		U	2192	%	0.001	0.019					
Asbestos By Fibre Counting		U	2192	%	0.001	-					
Total Asbestos		U	2192	%	0.001	0.019					
Moisture		N	2030	%	0.020	14	21	14	15	7.2	5.2
Soil Colour		N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown
Other Material		N	2040		N/A	Stones and Roots	Stones and Roots	Stones and Glass	Stones and Roots	Stones	Stones
Soil Texture		N	2040		N/A	Clay	Loam	Clay	Clay	Clay	Loam
pH at 20C		M	2010		4.0	8.4	8.0	8.7	8.6	8.8	9.1
Boron (Hot Water Soluble)		M	2120	mg/kg	0.40	0.48	1.0	< 0.40	0.53	< 0.40	< 0.40
Cyanide (Complex)		M	2300	mg/kg	0.50	< 0.50	3.4	2.7	1.1	0.80	< 0.50
Cyanide (Free)		M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cyanide (Total)		M	2300	mg/kg	0.50	< 0.50	3.4	2.7	1.1	0.80	< 0.50
Sulphate (Acid Soluble)		U	2430	%	0.010	0.13	0.14	0.11	0.15	0.068	0.052
Arsenic		M	2455	mg/kg	0.5	13	19	37	25	10	7.2
Beryllium		U	2455	mg/kg	0.5	0.7	1.1	1.1	1.0	0.6	< 0.5
Cadmium		M	2455	mg/kg	0.10	0.72	0.85	2.5	0.66	0.51	0.52
Chromium		M	2455	mg/kg	0.5	21	22	44	32	18	13
Mercury Low Level		M	2450	mg/kg	0.05	0.23	0.49	1.0	1.7	0.14	0.06
Manganese		M	2455	mg/kg	1.0	510	610	810	700	1100	780
Molybdenum		M	2455	mg/kg	0.5	2.4	6.3	5.9	3.8	2.9	2.1
Antimony		N	2455	mg/kg	2.0	2.7	6.1	8.8	11	< 2.0	< 2.0
Copper		M	2455	mg/kg	0.50	180	1600	300	110	16	11
Nickel		M	2455	mg/kg	0.50	27	61	80	40	19	14
Lead		M	2455	mg/kg	0.50	160	410	380	290	38	25
Selenium		M	2455	mg/kg	0.25	0.64	1.3	1.1	1.3	0.86	0.57
Zinc		M	2455	mg/kg	0.50	510	780	370	280	78	54
Chromium (Trivalent)		N	2490	mg/kg	1.0	21	22	44	32	18	13
Chromium (Hexavalent)		N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Aliphatic VPH >C5-C6	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C6-C7	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C7-C8	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C6-C8 (Sum)	HS_2D_AL	N	2780	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

Results - Soil

Project: Channel View

Client: Terra Firma				**Chemtest Job No.:**		23-40937	23-40937	23-40937	23-40937	23-40937	23-40937
Quotation No.:				**Chemtest Sample ID.:**		1743792	1743793	1743794	1743795	1743796	1743797
				Client Sample ID.:		ES1	ES1	ES1	ES1	ES1	ES1
				Sample Location:		WS101	WS102	WS103	WS104	WS105	WS106
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.5	0.8	0.3	0.3	0.5	0.7
				Bottom Depth (m):		0.5	1	0.3	0.3	0.5	0.7
				Date Sampled:		07-Dec-2023	07-Dec-2023	07-Dec-2023	07-Dec-2023	07-Dec-2023	07-Dec-2023
				Time Sampled:		12:00	12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**						
Aliphatic VPH >C8-C10	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total Aliphatic VPH >C5-C10	HS_2D_AL	U	2780	mg/kg	0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
Aliphatic EPH >C10-C12	EH_2D_AL_#1	M	2690	mg/kg	2.00	2.7	3.8	3.0	3.9	2.8	2.7
Aliphatic EPH >C12-C16	EH_2D_AL_#1	M	2690	mg/kg	1.00	3.7	4.5	3.4	6.2	3.3	2.6
Aliphatic EPH >C16-C21	EH_2D_AL_#1	M	2690	mg/kg	2.00	4.9	5.7	3.2	7.1	2.4	< 2.0
Aliphatic EPH >C21-C35	EH_2D_AL_#1	M	2690	mg/kg	3.00	7.0	21	< 3.0	14	3.2	5.1
Aliphatic EPH >C35-C40	EH_2D_AL_#1	N	2690	mg/kg	10.00	< 10	12	< 10	< 10	< 10	< 10
Total Aliphatic EPH >C10-C35	EH_2D_AL_#1	M	2690	mg/kg	5.00	18	35	13	31	12	12
Total Aliphatic EPH >C10-C40	EH_2D_AL_#1	N	2690	mg/kg	10.00	18	47	13	31	12	12
Aromatic VPH >C5-C7	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aromatic VPH >C7-C8	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aromatic VPH >C8-C10	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total Aromatic VPH >C5-C10	HS_2D_AR	U	2780	mg/kg	0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
Aromatic EPH >C10-C12	EH_2D_AR_#1	U	2690	mg/kg	1.00	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic EPH >C12-C16	EH_2D_AR_#1	U	2690	mg/kg	1.00	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic EPH >C16-C21	EH_2D_AR_#1	U	2690	mg/kg	2.00	13	71	4.8	5.7	4.2	2.2
Aromatic EPH >C21-C35	EH_2D_AR_#1	U	2690	mg/kg	2.00	18	470	8.7	18	7.5	2.6
Aromatic EPH >C35-C40	EH_2D_AR_#1	N	2690	mg/kg	1.00	5.6	74	15	6.4	22	4.8
Total Aromatic EPH >C10-C35	EH_2D_AR_#1	U	2690	mg/kg	5.00	31	550	13	24	12	< 5.0
Total Aromatic EPH >C10-C40	EH_2D_AR_#1	N	2690	mg/kg	10.00	36	620	28	30	34	< 10
Total VPH >C5-C10	HS_2D_Total	U	2780	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Total EPH >C10-C35	EH_2D_Total_#1	U	2690	mg/kg	10.00	49	580	26	54	23	17
Total EPH >C10-C40	EH_2D_Total_#1	N	2690	mg/kg	10.00	54	670	41	61	45	22
Total Organic Carbon		M	2625	%	0.20		19		8.5		2.2
Naphthalene		M	2700	mg/kg	0.10	< 0.10	1.2	0.25	< 0.10	< 0.10	< 0.10
Acenaphthylene		M	2700	mg/kg	0.10	< 0.10	0.14	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene		M	2700	mg/kg	0.10	< 0.10	1.2	0.17	< 0.10	< 0.10	< 0.10
Fluorene		M	2700	mg/kg	0.10	< 0.10	0.55	0.21	< 0.10	< 0.10	< 0.10
Phenanthrene		M	2700	mg/kg	0.10	0.93	2.4	0.87	0.53	< 0.10	< 0.10
Anthracene		M	2700	mg/kg	0.10	0.24	0.14	0.12	< 0.10	< 0.10	< 0.10
Fluoranthene		M	2700	mg/kg	0.10	2.1	1.7	1.2	0.53	< 0.10	< 0.10
Pyrene		M	2700	mg/kg	0.10	2.0	1.9	1.3	0.48	< 0.10	< 0.10
Benzo[a]anthracene		M	2700	mg/kg	0.10	1.6	1.3	0.99	0.73	< 0.10	< 0.10
Chrysene		M	2700	mg/kg	0.10	1.7	1.7	1.0	0.67	< 0.10	< 0.10

Results - Soil

Project: Channel View

Client: Terra Firma			**Chemtest Job No.:**	23-40937	23-40937	23-40937	23-40937	23-40937	23-40937
Quotation No.:			**Chemtest Sample ID.:**	1743792	1743793	1743794	1743795	1743796	1743797
			Client Sample ID.:	ES1	ES1	ES1	ES1	ES1	ES1
			Sample Location:	WS101	WS102	WS103	WS104	WS105	WS106
			Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):	0.5	0.8	0.3	0.3	0.5	0.7
			Bottom Depth (m):	0.5	1	0.3	0.3	0.5	0.7
			Date Sampled:	07-Dec-2023	07-Dec-2023	07-Dec-2023	07-Dec-2023	07-Dec-2023	07-Dec-2023
			Time Sampled:	12:00	12:00	12:00	12:00	12:00	12:00
			Asbestos Lab:	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY

Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**						
Benzo[b]fluoranthene		M	2700	mg/kg	0.10	1.8	2.1	2.0	1.2	< 0.10	< 0.10
Benzo[k]fluoranthene		M	2700	mg/kg	0.10	0.68	0.74	0.74	0.25	< 0.10	< 0.10
Benzo[a]pyrene		M	2700	mg/kg	0.10	1.1	1.1	1.5	0.61	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene		M	2700	mg/kg	0.10	0.87	0.72	1.4	0.75	< 0.10	< 0.10
Dibenz(a,h)Anthracene		M	2700	mg/kg	0.10	0.33	0.58	0.52	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene		M	2700	mg/kg	0.10	0.85	0.93	1.3	0.56	< 0.10	< 0.10
Total Of 16 PAH's		M	2700	mg/kg	2.0	14	18	14	6.3	< 2.0	< 2.0
Total Phenols		M	2920	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Organic Matter BS1377		N	2930	%	0.10	0.70	3.3	2.0	3.4	0.70	0.30

Results - 2 Stage WAC

Project: Channel View

							Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	23-40937								
Chemtest Sample ID:	1743793								
Sample Ref:									
Sample ID:	ES1								
Sample Location:	WS102								
Top Depth(m):	0.8								
Bottom Depth(m):	1								
Sampling Date:	07-Dec-2023								
Determinand	**SOP**	**Accred.**	**Units**				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%			19	3	5	6
Loss On Ignition	2610	M	%			17	--	--	10
Total BTEX	2760	M	mg/kg			< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg			< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg			710	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg			18	100	--	--
pH at 20C	2010	M				8.0	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.0080	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative mg/kg 10:1**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0037	0.0043	0.0071	0.042	0.5	2	25
Barium	1455	U	0.034	0.015	0.065	0.17	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	0.017	0.0055	0.032	0.069	0.5	10	70
Copper	1455	U	0.035	0.042	0.068	0.045	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.090	0.023	0.18	0.31	0.5	10	30
Nickel	1455	U	0.0015	0.0015	0.0029	0.015	0.4	10	40
Lead	1455	U	< 0.0005	0.0011	< 0.0005	0.0092	0.5	10	50
Antimony	1455	U	0.0039	0.0035	0.0077	0.035	0.06	0.7	5
Selenium	1455	U	0.0029	0.0017	0.0056	0.018	0.1	0.5	7
Zinc	1455	U	0.009	0.019	0.018	0.18	4	50	200
Chloride	1220	U	68	17	130	240	800	15000	25000
Fluoride	1220	U	0.58	0.41	1.1	4.3	10	150	500
Sulphate	1220	U	77	19	150	260	1000	20000	50000
Total Dissolved Solids	1020	N	320	140	620	1600	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	U	16	14	< 50	150	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	21

Leachate Test Information	
Leachant volume 1st extract/l	0.303
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.226

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - 2 Stage WAC

Project: Channel View

							Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	23-40937								
Chemtest Sample ID:	1743795								
Sample Ref:									
Sample ID:	ES1								
Sample Location:	WS104								
Top Depth(m):	0.3								
Bottom Depth(m):	0.3								
Sampling Date:	07-Dec-2023								
Determinand	**SOP**	**Accred.**	**Units**				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%			8.5	3	5	6
Loss On Ignition	2610	M	%			8.9	--	--	10
Total BTEX	2760	M	mg/kg			< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg			< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg			< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg			6.3	100	--	--
pH at 20C	2010	M				8.6	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.0040	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative mg/kg 10:1**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic							0.5	2	25
Barium							20	100	300
Cadmium							0.04	1	5
Chromium							0.5	10	70
Copper							2	50	100
Mercury							0.01	0.2	2
Molybdenum							0.5	10	30
Nickel							0.4	10	40
Lead							0.5	10	50
Antimony							0.06	0.7	5
Selenium							0.1	0.5	7
Zinc							4	50	200
Chloride							800	15000	25000
Fluoride							10	150	500
Sulphate							1000	20000	50000
Total Dissolved Solids							4000	60000	100000
Phenol Index							1	-	-
Dissolved Organic Carbon							500	800	1000

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	15

Leachate Test Information	
Leachant volume 1st extract/l	
Leachant volume 2nd extract/l	
Eluant recovered from 1st extract/l	

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - 2 Stage WAC

Project: Channel View

							Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	23-40937								
Chemtest Sample ID:	1743797								
Sample Ref:									
Sample ID:	ES1								
Sample Location:	WS106								
Top Depth(m):	0.7								
Bottom Depth(m):	0.7								
Sampling Date:	07-Dec-2023								
Determinand	**SOP**	**Accred.**	**Units**				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%			2.2	3	5	6
Loss On Ignition	2610	M	%			0.97	--	--	10
Total BTEX	2760	M	mg/kg			< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg			< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg			< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg			< 2.0	100	--	--
pH at 20C	2010	M				9.1	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.0060	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative mg/kg 10:1**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0004	< 0.0002	0.0008	0.0006	0.5	2	25
Barium	1455	U	0.11	0.059	0.21	0.66	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.5	10	70
Copper	1455	U	0.0009	< 0.0005	0.0018	0.0013	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.036	0.0027	0.072	0.076	0.5	10	30
Nickel	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.5	10	50
Antimony	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.06	0.7	5
Selenium	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.1	0.5	7
Zinc	1455	U	0.017	0.017	0.034	0.17	4	50	200
Chloride	1220	U	9.9	< 1.0	20	15	800	15000	25000
Fluoride	1220	U	0.18	0.086	< 1.0	< 1.0	10	150	500
Sulphate	1220	U	14	1.7	28	35	1000	20000	50000
Total Dissolved Solids	1020	N	100	36	200	460	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	U	7.4	5.3	< 50	56	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	5.2

Leachate Test Information	
Leachant volume 1st extract/l	0.340
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.260

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Test Methods

SOP	Title	Parameters included	Method summary
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity at 25°C and Total Dissolved Solids (TDS) in Waters	Conductivity Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH at 20°C	pH Meter
2015	Acid Neutralisation Capacity	Acid Reserve	Titration
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2610	Loss on Ignition	loss on ignition (LOI)	Determination of the proportion by mass that is lost from a soil by ignition at 550°C.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2690	EPH A/A Split	Aliphatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40 Aromatics: >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C40	Acetone/Heptane extraction / GCxGC FID detection

Test Methods

SOP	Title	Parameters included	Method summary
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2780	VPH A/A Split	Aliphatics: >C5–C6, >C6–C7,>C7–C8,>C8-C10 Aromatics: >C5–C7,>C7-C8,>C8–C10	Water extraction / Headspace GCxGC FID detection
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.
2930	Organic Matter	Organic Matter	Acid Dichromate digestion/Titration
640	Characterisation of Waste (Leaching C10)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge
650	Characterisation of Waste (Leaching WAC)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

ANNEX H
Laboratory Groundwater Chemical Test Results

Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	24-07215-1
Initial Date of Issue:	17-Mar-2024
Re-Issue Details:	
Client	Terra Firma
Client Address:	5 Deryn Court Wharfedale Road Pentwyn Cardiff CF23 7HA
Contact(s):	morgan@terrafirmawales.co.uk Michael Watkins Morgan Peregrine
Project	TF Suites
Quotation No.:	Q20-21666
Order No.:	16017MPWATER1
No. of Samples:	3
Turnaround (Wkdays):	5
Date Approved:	17-Mar-2024
Approved By:	
Details:	Stuart Henderson, Technical Manager

Date Received:	08-Mar-2024
Date Instructed:	08-Mar-2024
Results Due:	14-Mar-2024

For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Results - Water

Project: TF Suites

Client: Terra Firma				**Chemtest Job No.:**		24-07215	24-07215	24-07215
Quotation No.: Q20-21666				**Chemtest Sample ID.:**		1777438	1777439	1777440
Order No.: 16017MPWATER1				Client Sample Ref.:		1	2	3
				Client Sample ID.:		BH01E1	BH02E1	BH03E1
				Sample Location:		BH01	BH02	BH03
				Sample Type:		WATER	WATER	WATER
				Sample Sub Type:				
				Top Depth (m):		10.00	12.00	17.00
				Date Sampled:		04-Mar-2024	04-Mar-2024	04-Mar-2024
				Time Sampled:		12:00	12:00	12:00
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**			
pH at 20C		U	1010		4.0	7.9	7.4	8.2
Electrical Conductivity at 25C		U	1020	µS/cm	1.0	750	1100	960
Biochemical Oxygen Demand		N	1090	mg O2/l	4.0	[B] < 4.0	[B] 26	[B] 5.0
Chemical Oxygen Demand		U	1100	mg O2/l	10	11	100	14
Sulphate		U	1220	mg/l	1.0	70	180	51
Cyanide (Total) Low-Level		N	1300	mg/l	0.0050	< 0.0050	< 0.0050	< 0.0050
Sulphide		U	1325	mg/l	0.050	< 0.050	< 0.050	0.052
Hardness		N	1415	mg/l	1.0	360	620	260
Arsenic (Dissolved)		U	1455	µg/l	0.20	1.1	1.4	2.2
Cadmium (Dissolved)		U	1455	µg/l	0.11	< 0.11	< 0.11	< 0.11
Chromium (Dissolved)		U	1455	µg/l	0.50	0.74	< 0.50	< 0.50
Copper (Dissolved)		U	1455	µg/l	0.50	3.4	< 0.50	2.5
Nickel (Dissolved)		U	1455	µg/l	0.50	4.8	4.3	1.8
Lead (Dissolved)		U	1455	µg/l	0.50	< 0.50	< 0.50	< 0.50
Selenium (Dissolved)		U	1455	µg/l	0.50	1.7	< 0.50	< 0.50
Zinc (Dissolved)		U	1455	µg/l	2.5	140	23	17
Mercury Low Level		U	1460	µg/l	0.010	< 0.010	< 0.010	< 0.010
Chromium (Trivalent)		N	1490	µg/l	20	[B] < 20	[B] < 20	[B] < 20
Chromium (Hexavalent)		U	1490	µg/l	20	[B] < 20	[B] < 20	[B] < 20
Total TPH >C6-C40	EH_1D_Total	U	1670	µg/l	10	< 10	82	< 10
Aliphatic TPH >C5-C6	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C6-C8	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C8-C10	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C10-C12	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C12-C16	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C16-C21	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C21-C35	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C35-C44	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Total Aliphatic Hydrocarbons	EH_2D_AL_#1	N	1675	µg/l	5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C7-C8	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C8-C10	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C10-C12	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C12-C16	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C16-C21	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C21-C35	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10

Results - Water

Project: TF Suites

Client: Terra Firma				**Chemtest Job No.:**		24-07215	24-07215	24-07215
Quotation No.: Q20-21666				**Chemtest Sample ID.:**		1777438	1777439	1777440
Order No.: 16017MPWATER1				Client Sample Ref.:		1	2	3
				Client Sample ID.:		BH01E1	BH02E1	BH03E1
				Sample Location:		BH01	BH02	BH03
				Sample Type:		WATER	WATER	WATER
				Sample Sub Type:				
				Top Depth (m):		10.00	12.00	17.00
				Date Sampled:		04-Mar-2024	04-Mar-2024	04-Mar-2024
				Time Sampled:		12:00	12:00	12:00
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**			
Aromatic TPH >C35-C44	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Total Aromatic Hydrocarbons	EH_2D_AR_#1	N	1675	µg/l	5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	EH_2D_Total_#1	N	1675	µg/l	10	< 10	< 10	< 10
Naphthalene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Fluorene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Phenanthrene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Anthracene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Fluoranthene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Pyrene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Chrysene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's		U	1800	µg/l	2.0	< 2.0	< 2.0	< 2.0
Resorcinol		U	1920	mg/l	0.0050	< 0.0050	< 0.0050	< 0.0050
Phenol		U	1920	mg/l	0.0050	< 0.0050	< 0.0050	< 0.0050
Cresols		U	1920	mg/l	0.0050	< 0.0050	< 0.0050	< 0.0050
Xylenols		U	1920	mg/l	0.0050	< 0.0050	< 0.0050	< 0.0050
1-Naphthol		N	1920	mg/l	0.0050	< 0.0050	< 0.0050	< 0.0050
Trimethylphenols		U	1920	mg/l	0.0050	< 0.0050	< 0.0050	< 0.0050
Total Phenols		U	1920	mg/l	0.030	< 0.030	< 0.030	< 0.030

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
1777438	1	BH01E1	BH01	04-Mar-2024	B	Coloured Winchester 1000ml
1777438	1	BH01E1	BH01	04-Mar-2024	B	EPA Vial 40ml
1777438	1	BH01E1	BH01	04-Mar-2024	B	Plastic Bottle 1000ml
1777439	2	BH02E1	BH02	04-Mar-2024	B	Coloured Winchester 1000ml
1777439	2	BH02E1	BH02	04-Mar-2024	B	EPA Vial 40ml
1777439	2	BH02E1	BH02	04-Mar-2024	B	Plastic Bottle 1000ml
1777440	3	BH03E1	BH03	04-Mar-2024	B	Coloured Winchester 1000ml
1777440	3	BH03E1	BH03	04-Mar-2024	B	EPA Vial 40ml
1777440	3	BH03E1	BH03	04-Mar-2024	B	Plastic Bottle 1000ml

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
1010	pH Value of Waters	pH at 20°C	pH Meter	RE PW TE TS PL DW GW
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity at 25°C and Total Dissolved Solids (TDS) in Waters	Conductivity Meter	TE TS PL LE SW GW
1090	Biochemical Oxygen Demand	Biochemical Oxygen demand (BOD)	Colorimetric determination of dissolved oxygen in seeded sample after 5 days incubation at 20°C.	
1100	Chemical Oxygen Demand	Chemical Oxygen demand (COD)	Dichromate oxidation of organic matter in sample followed by colorimetric determination of residual Cr[VI].	TE TS PL LE GW
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.	RE PW PL LE DW GW
1300	Cyanides & Thiocyanate in Waters	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Continuous Flow Analysis.	
1325	Sulphide in Waters	Sulphides	Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using N,N–dimethyl-pphenylenediamine.	PL LE GW
1415	Cations in Waters by ICP-MS	Sodium; Potassium; Calcium; Magnesium	Direct determination by inductively coupled plasma - mass spectrometry (ICP-MS).	RE PW PL SW DW GW
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).	RE PW PL SW DW GW
1460	Mercury low-level in Waters by AFS	Mercury	Atomic Fluorescence Spectrometry, with collimated UV source, wavelength 253.7 nm.	PL GW
1490	Hexavalent Chromium in Waters	Chromium [VI]	Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.	PL GW
1670	Total Petroleum Hydrocarbons (TPH) in Waters by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO	Pentane extraction / GC FID detection	
1675	TPH Aliphatic/Aromatic split in Waters by GC-FID(cf. Texas Method 1006 / TPH CWG)	Aliphatics: >C5–C6, >C6–C8, >C8– C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Pentane extraction / GCxGC FID detection	
1800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Waters by GC-MS	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Pentane extraction / GCMS detection	PL GW
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.	PL GW

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

Water Sample Category Key for Accreditation

DW - Drinking Water
GW - Ground Water
LE - Land Leachate
NA - Not Applicable
PL - Prepared Leachate
PW - Processed Water

Report Information

RE - Recreational Water
SA - Saline Water
SW - Surface Water
TE - Treated Effluent
TS - Treated Sewage
UL - Unspecified Liquid

Clean Up Codes

NC - No Clean Up
MC - Mathematical Clean Up
FC - Florisil Clean Up

HWOL Acronym System

HS - Headspace analysis
EH - Extractable hydrocarbons – i.e. everything extracted by the solvent
CU - Clean-up – e.g. by Florisil, silica gel
1D - GC – Single coil gas chromatography
Total - Aliphatics & Aromatics
AL - Aliphatics only
AR - Aromatic only
2D - GC-GC – Double coil gas chromatography
#1 - EH_2D_Total but with humics mathematically subtracted
#2 - EH_2D_Total but with fatty acids mathematically subtracted
+ - Operator to indicate cumulative e.g. EH+EH_Total or EH_CU+HS_Total

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

2183

Final Report

Report No.:	24-15358-1
Initial Date of Issue:	22-May-2024
Re-Issue Details:	
Client	Terra Firma
Client Address:	5 Deryn Court Wharfedale Road Pentwyn Cardiff CF23 7HA
Contact(s):	morgan@terrafirmawales.co.uk
Project	16017 Cannel View

Quotation No.:		**Date Received:**	15-May-2024
Order No.:	16017MPQWATER2	**Date Instructed:**	15-May-2024
No. of Samples:	3		
Turnaround (Wkdays):	5	**Results Due:**	21-May-2024
Date Approved:	22-May-2024		

Approved By:

Details: David Smith, Technical Director

For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Results - Water

Project: 16017 Cannel View

Client: Terra Firma				**Chemtest Job No.:**		24-15358	24-15358	24-15358
Quotation No.:				**Chemtest Sample ID.:**		1807976	1807977	1807978
Order No.: 16017MPQWATER2				Client Sample Ref.:		1	2	3
				Client Sample ID.:		BH01W1	BH02W1	BH03W1
				Sample Location:		BH01	BH02	BH03
				Sample Type:		WATER	WATER	WATER
				Sample Sub Type:				
				Top Depth (m):		10.00	12.00	14.00
				Date Sampled:		14-May-2024	14-May-2024	14-May-2024
				Time Sampled:		12:00	12:00	12:00
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**			
pH at 20C		U	1010		4.0	7.3	6.9	6.8
Electrical Conductivity at 25C		U	1020	µS/cm	1.0	1200	1200	1200
Biochemical Oxygen Demand		N	1090	mg O2/l	4.0	< 4.0	< 4.0	4.0
Chemical Oxygen Demand		U	1100	mg O2/l	10	11	17	14
Sulphate		U	1220	mg/l	1.0	180	160	180
Cyanide (Total)		U	1300	mg/l	0.050	< 0.050	< 0.050	< 0.050
Sulphide		U	1325	mg/l	0.050	< 0.050	< 0.050	< 0.050
Total Hardness as CaCO3		U	1270	mg/l	15	630	650	630
Arsenic (Dissolved)		U	1455	µg/l	0.20	0.21	0.23	< 0.20
Boron (Dissolved)		U	1455	µg/l	10.0	1100	310	620
Chromium (Dissolved)		U	1455	µg/l	0.50	< 0.50	< 0.50	< 0.50
Copper (Dissolved)		U	1455	µg/l	0.50	< 0.50	< 0.50	< 0.50
Mercury (Dissolved)		U	1455	µg/l	0.05	< 0.05	< 0.05	< 0.05
Nickel (Dissolved)		U	1455	µg/l	0.50	4.0	3.0	3.4
Lead (Dissolved)		U	1455	µg/l	0.50	< 0.50	< 0.50	< 0.50
Selenium (Dissolved)		U	1455	µg/l	0.50	< 0.50	< 0.50	< 0.50
Zinc (Dissolved)		U	1455	µg/l	2.5	64	65	60
Cadmium (Dissolved)		N	1455	µg/l	0.08	< 0.08	< 0.08	< 0.08
Chromium (Trivalent)		N	1490	µg/l	20	< 20	< 20	< 20
Chromium (Hexavalent)		U	1490	µg/l	20	< 20	< 20	< 20
Total TPH >C6-C40	EH_1D_Total	U	1670	µg/l	10	< 10	< 10	< 10
Aliphatic TPH >C5-C6	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C6-C8	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C8-C10	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C10-C12	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C12-C16	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C16-C21	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C21-C35	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C35-C44	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Total Aliphatic Hydrocarbons	EH_2D_AL_#1	N	1675	µg/l	5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C7-C8	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C8-C10	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C10-C12	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C12-C16	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C16-C21	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10

Results - Water

Project: 16017 Cannel View

Client: Terra Firma				**Chemtest Job No.:**		24-15358	24-15358	24-15358
Quotation No.:				**Chemtest Sample ID.:**		1807976	1807977	1807978
Order No.: 16017MPQWATER2				Client Sample Ref.:		1	2	3
				Client Sample ID.:		BH01W1	BH02W1	BH03W1
				Sample Location:		BH01	BH02	BH03
				Sample Type:		WATER	WATER	WATER
				Sample Sub Type:				
				Top Depth (m):		10.00	12.00	14.00
				Date Sampled:		14-May-2024	14-May-2024	14-May-2024
				Time Sampled:		12:00	12:00	12:00
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**			
Aromatic TPH >C21-C35	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C35-C44	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10
Total Aromatic Hydrocarbons	EH_2D_AR_#1	N	1675	µg/l	5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	EH_2D_Total_#1	N	1675	µg/l	10	< 10	< 10	< 10
Naphthalene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Fluorene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Phenanthrene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Anthracene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Fluoranthene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Pyrene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Chrysene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene		U	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's		U	1800	µg/l	2.0	< 2.0	< 2.0	< 2.0
Total Phenols		U	1920	mg/l	0.030	< 0.030	< 0.030	< 0.030

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
1010	pH Value of Waters	pH at 20°C	pH Meter	RE PW TE TS PL DW GW
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity at 25°C and Total Dissolved Solids (TDS) in Waters	Conductivity Meter	TE TS PL LE SW GW
1090	Biochemical Oxygen Demand	Biochemical Oxygen demand (BOD)	Colorimetric determination of dissolved oxygen in seeded sample after 5 days incubation at 20°C.	
1100	Chemical Oxygen Demand	Chemical Oxygen demand (COD)	Dichromate oxidation of organic matter in sample followed by colorimetric determination of residual Cr[VI].	TE TS PL LE GW
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.	RE PW PL LE DW GW
1270	Total Hardness of Waters	Total hardness	Calculation applied to calcium and magnesium results, expressed as mg l-1 CaCO3 equivalent.	RE PW PL SW DW GW
1300	Cyanides & Thiocyanate in Waters	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Continuous Flow Analysis.	GW
1325	Sulphide in Waters	Sulphides	Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using N,N–dimethyl-pphenylenediamine.	PL LE GW
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).	RE PW PL SW DW GW
1490	Hexavalent Chromium in Waters	Chromium [VI]	Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.	PL GW
1670	Total Petroleum Hydrocarbons (TPH) in Waters by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO	Pentane extraction / GC FID detection	
1675	TPH Aliphatic/Aromatic split in Waters by GC-FID(cf. Texas Method 1006 / TPH CWG)	Aliphatics: >C5–C6, >C6–C8, >C8– C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Pentane extraction / GCxGC FID detection	
1800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Waters by GC-MS	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Pentane extraction / GCMS detection	PL GW
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.	PL GW

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<	"less than"
>	"greater than"
SOP	Standard operating procedure
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This report shall not be reproduced except in full, and only with the prior approval of the laboratory.
Any comments or interpretations are outside the scope of UKAS accreditation.
The Laboratory is not accredited for any sampling activities and reported results relate to the samples 'as received' at the laboratory.
Uncertainty of measurement for the determinands tested are available upon request .
None of the results in this report have been recovery corrected.
All results are expressed on a dry weight basis.

The following tests were analysed on samples 'as received' and the results subsequently corrected to a dry weight basis EPH, VPH, TPH, BTEX, VOCs, SVOCs, PCBs, Phenols.

For all other tests the samples were dried at ≤ 30°C prior to analysis.
All Asbestos testing is performed at the indicated laboratory .
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1.

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

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Water Sample Category Key for Accreditation

DW - Drinking Water
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NA - Not Applicable

Report Information

PL - Prepared Leachate
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TS - Treated Sewage
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Clean Up Codes

NC - No Clean Up
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HWOL Acronym System

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CU - Clean-up – e.g. by Florisil, silica gel
1D - GC – Single coil gas chromatography
Total - Aliphatics & Aromatics
AL - Aliphatics only
AR - Aromatic only
2D - GC-GC – Double coil gas chromatography
#1 - EH_2D_Total but with humics mathematically subtracted
#2 - EH_2D_Total but with fatty acids mathematically subtracted
+ - Operator to indicate cumulative e.g. EH+EH_Total or EH_CU+HS_Total

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

ANNEX I
Geotechnical Test Results

Results Summary

Apex Testing Solutions Limited
Sturmi Way
Village Farm Industrial Estate
Pyle
Bridgend
CF33 6BZ

Telephone: 01656 746762
E-mail: andrew.grogan@apex-drilling.com
laura.davis@apex-drilling.com

Reporting Details		**Key Information**	
Company Name:	TFW Group Ltd	**Site Name:**	Channel View
Address:	5 Deryn Court		
	Wharfdale Road	**Job Number:**	D24065
	Cardiff	**Date Received:**	13/02/2024
	CF23 7HA	**Job Coordinator:**	A. Grogan
Contact Name:	**Morgan Perigrine**		
Contact Number:			

Item No.	Tests Undertaken	Number of Tests
1	* Point Load Testing - ISRM Standard	14
2	* UCS Testing - ISRM Standard	3

Results Issued: 14/02/2024

Comments

Results herein relate only to samples received in the laboratory and where not sampled by Apex Testing Solutions personnel relate to the samples as received.
Where tests are UKAS accredited any Opinion and/or Interpretation expressed herein are outside the scope of the UKAS Accreditation. The reports shall not be reproduced in full without the written approval of the laboratory.

Please contact the job coordinator should any further information be required.

SUMMARY OF RESULTS
UNIAXIAL COMPRESSIVE STRENGTH OF ROCK
ISRM 2007

Project No:	**D2405**	**Project Name:**	**Channel View**

Borehole	Sample				Rock Type	Specimen Dimensions[2]			Bulk Density[2]	Water Content[1]	Uniaxial Compressive[3]				Remarks
	No.	Depth (m)		Type		Dia	Height	H/D			Load Rate	Time to failure	Mode of failure	UCS	
		from	to			mm	mm		Mg/m^3	%	kN/min	secs		Mpa	
101A	1	23.90	24.00	C	Rediish brown MUDSTONE	86	90	1.1	2.24	14.5	0.7	55	AC	0.6	
101A	2	25.60	25.72	C	Reddish brown MUDSTONE	85	121	1.4	2.22	15.7	0.7	31	AC	0.7	
103	1	27.00	27.10	C	Reddish brown MUDSTONE	85	104	1.2	2.18	16.9	0.7	44	F	0.1	

Notes: Test Specification : International Society for Rock Mechanics, The complete ISRM suggested methods for Rock Characterization Testing and Monitoring, 2007

1 ISRM p87 test 1, water content at 105 ± 3°C, specimen as received at the laboratory.

2 ISRM p86 clause (vii), Caliper method used for determination of bulk volume and derivation of bulk density

3 ISRM p153 part 1 determination of Uniaxial Compressive Strength (UCS) of Rock Materials

Mode of failure: S - Single Shear MS - Multiple Shear AC - Axial Cleavage F - Fragmented

QA Ref. ISRM Rev 1.0	**Apex Testing Solutions** Sturmi Way, Village Farm Industrial Est, Pyle, Bridgend, CF33 6BZ Tel: 01656 746762 Fax: 01656 749096	Approver: *A. Grogan,* A. Grogan, Laboratory Manager	Date: 14/02/2024	Fig. **UCS 1**

TEST REPORT
POINT LOAD INDEX TEST
ISRM: 1985

Project No: D24065
Project Name: 16017 - Channel View

Client: TFW Group Ltd
Address: 5 Deryn Court
Wharfdale Road
Cardiff
CF23 7HA

Borehole	Depth m	Sample Ref	Sample Type	Specimen Ref	Speciment Depth	Rock Type	Test Type see ISRM Fig 5 and 8		Failure Valid (Y/N)	Dimensions			LOAD P	De equivalent diameter, mm	Point Load Index Mpa $F=(De/50)^{0.45}$		Remarks
							Type (D, A, I, B)	Direction (L, P or U)		Lne mm	Dps' mm	W mm	kN		I_s	$I_{s(50)}$	
101A	20.80		C		20.80	Mudstone											Crumbled in hand
101A	24.50		C		24.50	Mudstone	D	U	Y	25	90	90	0.16	90.00	0.02	0.03	
101A	24.50		C		24.50	Mudstone	A	U	Y		20	90	0.14	47.87	0.06	0.06	
102	22.90		C		22.90	Mudstone	D	U	Y	30	90	90	0.12	90.00	0.01	0.02	
102	22.90		C		22.90	Mudstone	A	U	Y		26	90	0.13	54.58	0.04	0.04	
102	25.80		C		25.80	Mudstone	D	U	Y	25	90	90	0.14	90.00	0.02	0.02	
102	25.80		C		25.80	Mudstone	A	U	Y		27	90	0.13	55.62	0.04	0.05	
102	25.00		C		25.00	Mudstone	D	U	Y	40	90	90	0.20	90.00	0.02	0.03	
102	25.00		C		25.00	Mudstone	A	U	Y		54	90	0.32	78.66	0.05	0.06	
103	26.60		C		26.60	Mudstone	D	U	Y	25	90	90	0.13	90.00	0.02	0.02	
103	26.60		C		26.60	Mudstone	A	U	Y		19	90	0.12	46.66	0.05	0.05	
103	26.20		C		26.20	Mudstone	D	U	Y	27	90	90	0.12	90.00	0.01	0.02	
103	26.20		C		26.20	Mudstone	A	U	Y		18	90	0.11	45.42	0.05	0.05	
103	27.30		C		27.30	Mudstone	D	U	Y	50	90	90	0.12	90.00	0.01	0.02	
103	27.30		C		27.30	Mudstone	A	U	Y		43	90	0.14	70.20	0.03	0.03	

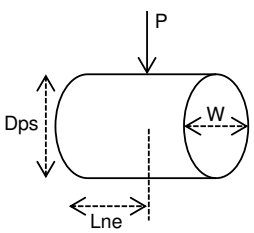
All specimens tested as received water content unless shown otherwise

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block

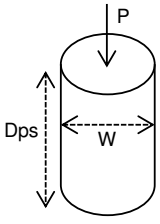
Direction
U - Unknown or Random
L - Parallel to planes of weakness
P - Perpendicular to planes of weakness

Dimensions
Dps' - Distance between platens at failure
Lne - Length from platens to nearest free end
W - Width of shortest dimension perpendicular to load, P

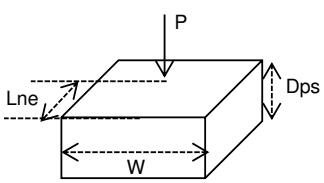
Diametral



Axial



Block / Irregular Lump



QA Ref.		Approver	Date	Fig.
ISRM Rev 2.0	**Apex Testing Solutions** Sturmi Way, Village Farm Industrial Est, Pyle, Bridgend, CF33 6BZ Tel: 01656 746762 Fax: 01656 749096	A Grogan	14/02/2024	**PLT 1**
		A Grogan, Laboratory Manager		

ANNEX J
Soil Waste Classification Report

terra firma
Geotechnical & Geoenvironmental Specialists
www.terrafirmawales.co.uk

Our Ref: MW/16017/WASTE

Your Ref:

Contact: Michael Watkins

21st March 2024

Cardiff City Council

For the attention of Ms Teresa Barnes

Dear Teresa,

SOIL WASTE CLASSIFICATION OF IN-SITU SOILS: LAND OFF CHANNEL VIEW ROAD, CARDIFF

TFW Group Limited has been retained by Cardiff City Council (the client) to classify in-situ soil at their site off Channel View Road in Cardiff.

On 7th December 2023, and 15th January 2024 12No. samples were collected and subject to Total Analysis and 8No. samples for Full 2 Stage WAC Analysis. The exploratory hole logs are presented in **Annex A**, and their locations are presented on **Drawing 01**. Soil chemical test results are provided in **Annex B**.

On the basis of the soil chemical test results, the soil was classified based on the identified Hazards as defined in accordance with waste classification algorithms detailed in Environment Agency publication WM3 (V1.1. 2018).

Representative compounds were selected for the detected elements for waste classification. Where necessary, appropriate factors were employed to account for discrepancies between elemental and molecular concentrations.

Sub-visible asbestos was detected in 1No. sample during analysis at a concentration of 0.019% (wt/wt)

TPH was recorded up to 710 mg/kg during TPH Analysis. Free product was not observed and the potential for HP 3 is therefore omitted from the assessment.

A summary of the soil classification is presented in **Table 3.1**.

Table 3.1 Summary of Classification

Location	Sample	Soil Type	Waste Classification	EWC Code	Additional Comments
TP01	1.3	Made Ground	Non-Hazardous	17 05 04	-
TP02	2.6	Made Ground	Non-Hazardous	17 05 04	-
TP03	1.5	Made Ground	Non-Hazardous	17 05 04	-
TP04	2.7	Made Ground	Non-Hazardous	17 05 04	-
TP05	1.4	Made Ground	Non-Hazardous	17 05 04	-
TP06	2.8	Made Ground	Non-Hazardous	17 05 04	-
WS101	0.5	Made Ground	Non-Hazardous	17 05 04	-
WS102	0.8	Made Ground	Non-Hazardous	17 05 04	-
WS103	0.3	Made Ground	Non-Hazardous	17 05 04	-

WS104	0.3	Made Ground	Non-Hazardous	17 05 04	-
WS105	0.5	Made Ground	Non-Hazardous	17 05 04	-
WS106	0.7	Made Ground	Non-Hazardous	17 05 04	-

Seven samples were submitted for WAC analysis. An appraisal of the WAC results is presented in **Table 3.2**.

Table 3.2 Summary of WAC Testing

Location	Sample	Soil Type	Comments
TP101	1.3	Made Ground	Fails Inert Chemical Criteria on account of elevated Total Organic Carbon
TP103	1.5	Made Ground	Fails Inert Chemical Criteria on account of elevated Total Organic Carbon
TP104	2.7	Made Ground	Fails Inert Chemical Criteria on account of elevated Total Organic Carbon
TP105	1.4	Made Ground	Satisfies Inert Chemical Criteria
TP106	2.8	Made Ground	Fails Inert Chemical Criteria on account of elevated Total Organic Carbon
WS102	0.8	Made Ground	Fails Inert Chemical Criteria on account of elevated Total Organic Carbon and TPH
WS106	0.7	Made Ground	Satisfies Inert.

If materials cannot be satisfactorily segregated, the worst-case classification should apply.

The classifications do not include an assessment of invasive plant species.

If anomalous materials are encountered during excavation the classification should be revisited.

We trust that the above is to your satisfaction, however, if you have any queries or require any further information, please do not hesitate to contact us.

Yours sincerely
for: TFW Group Limited

Mr Michael Watkins

Enc.

Annex A – Exploratory Hole Logs
Annex B – Soil Chemical Test Results

Annex A
Exploratory Hole Logs

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Trial Pit Log

Trial Pit No: TP101
Sheet 1 of 1

Project Name: Channel View	Project No: 16017	Co-ords: -	Date: 01/09/2024
Location: Channel View		Dimensions: Depth 3.00, 0.80 × 2.00	Scale: 1:25
Client: Cardiff City Council			Logged: MP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.10			Brown sandy gravelly CLAY with root and high organic content.
	1.30 1.30	ES ES					Dark brown and black SAND AND GRAVEL. Gravel is fine to coarse sub angular to angular of brick, concrete, plastic, metal and glass.
				3.00			End of Pit at 3.000m

Stability: Stable

Remarks: 1] Consistency, strength and density indicators are based upon field judgement. 2] Density indicator is in brackets and is for guidance only, and is not in accordance with BS 5930:2015. 3] Trial pit terminated at extent of excavator's reach. 4] Trial pit backfilled with arisings.

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Trial Pit Log

Trial Pit No: TP102
Sheet 1 of 1

Project Name: Channel View	Project No: 16017	Co-ords: -	Date: 01/09/2024
Location: Channel View		Dimensions: Depth 3.00 (2.50 × 0.80)	Scale: 1:25
Client: Cardiff City Council			Logged: MP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.10			Brown sandy gravelly CLAY with root and high organic content.
	2.60 2.60	ES ES					Dark brown and black SAND AND GRAVEL. Gravel is fine to coarse sub angular to angular of brick, concrete, plastic, metal and glass.
				3.00			End of Pit at 3.000m

Stability: Stable

Remarks: 1] Consistency, strength and density indicators are based upon field judgement. 2] Density indicator is in brackets and is for guidance only, and is not in accordance with BS 5930:2015. 3] Trial pit terminated at extent of excavator's reach. 4] Trial pit backfilled with arisings.

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Trial Pit Log

Trial Pit No: TP103
Sheet 1 of 1

Project Name: Channel View	Project No: 16017	Co-ords: -	Date: 01/09/2024
Location: Channel View		Dimensions: Depth 3.00, 2.50 × 0.80	Scale: 1:25
Client: Cardiff City Council			Logged: MP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.10			Brown sandy gravelly CLAY with root and high organic content.
	1.50 1.50	ES ES					Dark brown and black SAND AND GRAVEL. Gravel is fine to coarse sub angular to angular of brick, concrete, plastic, metal and glass.
				3.00			End of Pit at 3.000m

Stability: Stable

Remarks: 1] Consistency, strength and density indicators are based upon field judgement. 2] Density indicator is in brackets and is for guidance only, and is not in accordance with BS 5930:2015. 3] Trial pit terminated at extent of excavator's reach. 4] Trial pit backfilled with arisings.

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Trial Pit Log

Trial Pit No: TP104
Sheet 1 of 1

Project Name: Channel View	Project No: 16017	Co-ords: -	Date: 01/09/2024
Location: Channel View		Dimensions: Depth 3.00, 0.80 x 2.50	Scale: 1:25
Client: Cardiff City Council			Logged: MP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.10			Brown sandy gravelly CLAY with root and high organic content.
							Dark brown and black SAND AND GRAVEL. Gravel is fine to coarse sub angular to angular of brick, concrete, plastic, metal and glass.
	2.70 2.70	ES ES					
				3.00			End of Pit at 3.000m

Stability: Stable.

Remarks: 1] Consistency, strength and density indicators are based upon field judgement. 2] Density indicator is in brackets and is for guidance only, and is not in accordance with BS 5930:2015. 3] Trial pit terminated at extent of excavator's reach. 4] Trial pit backfilled with arisings.

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Trial Pit Log

Trial Pit No: TP105
Sheet 1 of 1

Project Name: Channel View	Project No: 16017	Co-ords: -	Date: 01/09/2024
Location: Channel View		Dimensions: Depth 3.00, 0.80 × 2.50	Scale: 1:25
Client: Cardiff City Council			Logged: MP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.10			Brown sandy gravelly CLAY with root and high organic content.
	1.40 1.40	ES ES					Dark brown and black SAND AND GRAVEL. Gravel is fine to coarse sub angular to angular of brick, concrete, plastic, metal and glass.
				3.00			End of Pit at 3.000m

Stability: Stable

Remarks: 1] Consistency, strength and density indicators are based upon field judgement. 2] Density indicator is in brackets and is for guidance only, and is not in accordance with BS 5930:2015. 3] Trial pit terminated at extent of excavator's reach. 4] Trial pit backfilled with arisings.

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Trial Pit Log

Trial Pit No: TP106
Sheet 1 of 1

Project Name: Channel View	Project No: 16017	Co-ords: - Level:	Date: 01/09/2024
Location: Channel View	Dimensions: Depth 3.00	2.50 / 0.80	Scale: 1:25
Client: Cardiff City Council			Logged: MP

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.10			Brown sandy gravelly CLAY with root and high organic content.
	2.80 2.80	ES ES					Dark brown and black SAND AND GRAVEL. Gravel is fine to coarse sub angular to angular of brick, concrete, plastic, metal and glass.
				3.00			End of Pit at 3.000m

Stability: Stable

Remarks: 1] Consistency, strength and density indicators are based upon field judgement. 2] Density indicator is in brackets and is for guidance only, and is not in accordance with BS 5930:2015. 3] Trial pit terminated at extent of excavator's reach. 4] Trial pit backfilled with arisings.

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Borehole Log

Borehole No.
WS101
Sheet 1 of 1

Project Name:	Channel View	Project No: 16017	Co-ords:	Hole Type	WS
Location:	Channel View		Level:	Scale	1:50
Client:	Cardiff City Council		Dates: 07/12/2023 - 07/12/2023	Logged By	ES

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Well	Legend	Stratum Description
	Depth (m)	Type	Results					
	0.50	ES						MADE GROUND. Firm dark brown slightly sandy gravelly CLAY with rare fragments of slag, glass, brick and plastic. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of mixed lithologies.
				1.20				MADE GROUND. Firm dark brown slightly sandy slightly gravelly CLAY with rare fragments of slag, glass, brick and plastic. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of mixed lithologies.
				2.00				MADE GROUND. Firm dark brown slightly sandy gravelly CLAY with abundant fragments of brick. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of mixed lithologies.
	2.50	SPT	50 (12,13/50 for 170mm)	2.50				End of Borehole at 2.500m

Remarks: Borehole terminated upon refusal- probable layer of brick

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Borehole Log

Borehole No.
WS102
Sheet 1 of 1

Project Name:	Channel View	Project No: 16017	Co-ords:	Hole Type WS
Location:	Channel View		Level:	Scale 1:50
Client:	Cardiff City Council		Dates: 07/12/2023 - 07/12/2023	Logged By ES

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Well	Legend	Stratum Description
	Depth (m)	Type	Results					
				0.60				MADE GROUND. Firm dark brown slightly sandy gravelly CLAY with rare fragments of slag, glass, brick and plastic. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of mixed lithologies.
	0.80 - 1.00	ES						MADE GROUND. Very loose and loose black slightly clayey gravelly SAND with frequent ash, occasional pockets of clay and occasional fragments of brick concrete and glass. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of mixed lithologies.
				3.00				End of Borehole at 3.000m

Remarks: Borehole terminated at target depth to install gas well

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Borehole Log

Borehole No.
WS103
Sheet 1 of 1

Project Name: Channel View	Project No: 16017	Co-ords:	Hole Type WS
Location: Channel View		Level:	Scale 1:50
Client: Cardiff City Council		Dates: 07/12/2023 - 07/12/2023	Logged By ES

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Well	Legend	Stratum Description
	Depth (m)	Type	Results					
	0.30	ES						MADE GROUND. Firm dark brown slightly sandy gravelly CLAY with rare fragments of slag, glass, brick and plastic. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of mixed lithologies.
				1.10				MADE GROUND. Very loose and loose black slightly clayey gravelly SAND with frequent ash, occasional pockets of clay and occasional fragments of brick concrete and glass. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of mixed lithologies.
				2.50				MADE GROUND. Loose sandy GRAVEL. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of brick.
				3.00				End of Borehole at 3.000m

Remarks: Borehole terminated at target depth to install gas well

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Borehole Log

Borehole No. **WS104**
Sheet 1 of 1

Project Name:	Channel View	Project No: 16017	Co-ords:	Hole Type WS
Location:	Channel View		Level:	Scale 1:50
Client:	Cardiff City Council		Dates: 07/12/2023 - 07/12/2023	Logged By ES

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Well	Legend	Stratum Description
	Depth (m)	Type	Results					
	0.30	ES						MADE GROUND. Firm dark brown slightly sandy gravelly CLAY with rare fragments of slag, glass, brick and plastic. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of mixed lithologies.
	1.00	SPT	N=2 (1,0/1,0,0,1)	1.00				MADE GROUND. Very loose and loose black slightly clayey gravelly SAND with frequent ash, occasional pockets of clay and occasional fragments of brick concrete and glass. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of mixed lithologies.
	2.00	SPT	N=4 (0,1/0,0,2,2)					
				2.20				MADE GROUND. Loose sandy GRAVEL. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of brick.
	2.50	SPT	50 (10,13/50 for 155mm)	2.50				End of Borehole at 2.500m

Remarks: Borehole terminated upon refusal- probable layer of brick

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Borehole Log

Borehole No.
WS105
Sheet 1 of 1

Project Name:	Channel View	Project No: 16017	Co-ords:	Hole Type WS
Location:	Channel View		Level:	Scale 1:50
Client:	Cardiff City Council		Dates: 07/12/2023 - 07/12/2023	Logged By ES

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Well	Legend	Stratum Description
	Depth (m)	Type	Results					
	0.50	ES						MADE GROUND. Firm dark brown slightly sandy gravelly CLAY with rare fragments of slag, glass, brick and plastic. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of mixed lithologies.
	1.00	SPT	N=3 (1,0/0,1,1,1)	1.00				MADE GROUND. Very loose and loose black slightly clayey gravelly SAND with frequent ash, occasional pockets of clay and occasional fragments of brick concrete and glass. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of mixed lithologies.
	2.00	SPT	N=1 (1,0/0,0,0,1)					
	3.00	SPT	N=11 (1,1/3,5,2,1)					
	4.00	SPT	N=2 (1,2/1,0,1,0)					
	5.00	SPT	N=1 (1,1/0,1,0,0)	5.00				End of Borehole at 5.000m

1 2 3 4 5 6 7 8 9 10

Remarks: Borehole terminated at target depth

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Borehole Log

Borehole No.
WS106
Sheet 1 of 1

Project Name:	Channel View	Project No: 16017	Co-ords:	Hole Type WS
Location:	Channel View		Level:	Scale 1:50
Client:	Cardiff City Council		Dates: 07/12/2023 - 07/12/2023	Logged By ES

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Well	Legend	Stratum Description
	Depth (m)	Type	Results					
	0.70	ES						MADE GROUND. Firm dark brown slightly sandy gravelly CLAY with rare fragments of slag, glass, brick and plastic. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of mixed lithologies.
	1.00	SPT	N=26 (17,8/8,8,5,5)					
				1.60				
	2.00	SPT	N=7 (1,1/1,1,3,2)					MADE GROUND. Very loose and loose black slightly clayey gravelly SAND with frequent ash, occasional pockets of clay and occasional fragments of brick concrete and glass. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of mixed lithologies.
	3.00	SPT	N=8 (3,3/3,2,1,2)					
	4.00	SPT	N=0 (1,0/0,0,0,0)					
	5.00	SPT	N=0 (1,0/0,0,0,0)	5.00				End of Borehole at 5.000m

Remarks: Borehole terminated at target depth

Annex B
Soil Chemical Test Results

eurofins | Chemtest
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Amended Report

Report No.:	24-01368-2		
Initial Date of Issue:	30-Jan-2024	**Date of Re-Issue:**	18-Mar-2024
Re-Issue Details:	This report has been revised and directly supersedes 24-01368-1 in its entirety		
Client	Terra Firma		
Client Address:	5 Deryn Court Wharfedale Road Pentwyn Cardiff CF23 7HA		
Contact(s):	michael@terrafirmawales.co.uk; morgan@terrafirmawales.co.uk		
Project	16017 Channel View WAC Testing		
Quotation No.:		**Date Received:**	18-Jan-2024
Order No.:	16017MPWAC	**Date Instructed:**	18-Jan-2024
No. of Samples:	12		
Turnaround (Wkdays):	5	**Results Due:**	24-Jan-2024
Date Approved:	30-Jan-2024		
Approved By:			
Details:	Stuart Henderson, Technical Manager		

For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Results - Soil

Project: 16017 Channel View WAC Testing

Client: Terra Firma				**Chemtest Job No.:**		24-01368	24-01368	24-01368	24-01368	24-01368	24-01368
Quotation No.:				**Chemtest Sample ID.:**		1755214	1755216	1755218	1755220	1755222	1755224
Order No.: 16017MPWAC				Client Sample Ref.:		2	4	6	8	10	12
				Client Sample ID.:		TP101E1	TP102E1	TP103E1	TP104E1	TP105E1	TP106E1
				Sample Location:		TP101	TP102	TP103	TP104	TP105	TP106
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		1.3	2.6	1.5	2.7	1.4	2.8
				Date Sampled:		15-Jan-2024	15-Jan-2024	15-Jan-2024	15-Jan-2024	15-Jan-2024	15-Jan-2024
				Time Sampled:		12:00	12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**						
ACM Type		U	2192		N/A	-	-	-	-	-	-
Asbestos Identification		U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture		N	2030	%	0.020	17	24	24	19	15	14
Soil Colour		N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown
Other Material		N	2040		N/A	Stones	Stones	Stones	Stones	Stones	Stones
Soil Texture		N	2040		N/A	Sand	Sand	Sand	Sand	Sand	Sand
pH at 20C		M	2010		4.0	8.0	7.9	7.6	7.9	7.9	7.5
Boron (Hot Water Soluble)		M	2120	mg/kg	0.40	< 0.40	0.71	1.2	< 0.40	1.8	0.83
Cyanide (Complex)		M	2300	mg/kg	0.50	4.4	2.7	4.1	3.2	< 0.50	< 0.50
Cyanide (Free)		M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cyanide (Total)		M	2300	mg/kg	0.50	4.4	2.7	4.1	3.2	< 0.50	< 0.50
Sulphate (Acid Soluble)		U	2430	%	0.010	0.13	0.18	0.14	0.12	0.18	0.14
Arsenic		M	2455	mg/kg	0.5	19	22	17	18	16	13
Beryllium		U	2455	mg/kg	0.5	1.2	1.0	1.1	1.2	0.9	0.7
Cadmium		M	2455	mg/kg	0.10	0.63	0.65	0.73	2.5	1.0	0.79
Chromium		M	2455	mg/kg	0.5	39	24	17	31	27	20
Mercury Low Level		N	2450	mg/kg	0.05	0.88	0.98	0.20	0.46	0.38	0.25
Manganese		M	2455	mg/kg	1.0	520	440	400	470	620	530
Molybdenum		M	2455	mg/kg	0.5	5.4	5.9	5.3	3.9	3.0	2.4
Antimony		N	2455	mg/kg	2.0	9.0	20	9.6	6.1	5.4	4.1
Copper		M	2455	mg/kg	0.50	160	140	380	220	84	97
Nickel		M	2455	mg/kg	0.50	64	52	60	52	36	26
Lead		M	2455	mg/kg	0.50	390	330	260	320	190	140
Selenium		M	2455	mg/kg	0.25	1.2	1.0	0.97	0.82	0.69	0.64
Zinc		M	2455	mg/kg	0.50	620	500	1000	1600	1800	350
Chromium (Trivalent)		N	2490	mg/kg	1.0	39	24	17	31	27	20
Chromium (Hexavalent)		N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Aliphatic VPH >C5-C6	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C6-C7	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C7-C8	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C6-C8 (Sum)	HS_2D_AL	N	2780	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aliphatic VPH >C8-C10	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total Aliphatic VPH >C5-C10	HS_2D_AL	U	2780	mg/kg	0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
Aliphatic EPH >C10-C12 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Aliphatic EPH >C12-C16 MC	EH_2D_AL_#1	M	2690	mg/kg	1.00	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	2.7

Results - Soil

Project: 16017 Channel View WAC Testing

Client: Terra Firma				**Chemtest Job No.:**		24-01368	24-01368	24-01368	24-01368	24-01368	24-01368
Quotation No.:				**Chemtest Sample ID.:**		1755214	1755216	1755218	1755220	1755222	1755224
Order No.: 16017MPWAC				Client Sample Ref.:		2	4	6	8	10	12
				Client Sample ID.:		TP101E1	TP102E1	TP103E1	TP104E1	TP105E1	TP106E1
				Sample Location:		TP101	TP102	TP103	TP104	TP105	TP106
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		1.3	2.6	1.5	2.7	1.4	2.8
				Date Sampled:		15-Jan-2024	15-Jan-2024	15-Jan-2024	15-Jan-2024	15-Jan-2024	15-Jan-2024
				Time Sampled:		12:00	12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**						
Aliphatic EPH >C16-C21 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	< 2.0	< 2.0	< 2.0	< 2.0	3.8	20
Aliphatic EPH >C21-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	3.00	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	18
Aliphatic EPH >C35-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	< 10	< 10	< 10	< 10	< 10	< 10
Total Aliphatic EPH >C10-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	5.00	< 5.0	< 5.0	< 5.0	< 5.0	6.1	42
Total Aliphatic EPH >C10-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	< 10	< 10	< 10	< 10	< 10	42
Aromatic VPH >C5-C7	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aromatic VPH >C7-C8	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aromatic VPH >C8-C10	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total Aromatic VPH >C5-C10	HS_2D_AR	U	2780	mg/kg	0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
Aromatic EPH >C10-C12 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic EPH >C12-C16 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic EPH >C16-C21 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	2.4	2.5	3.4	6.2	4.0	5.0
Aromatic EPH >C21-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	< 2.0	< 2.0	4.3	53	4.2	22
Aromatic EPH >C35-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	1.00	< 1.0	< 1.0	1.5	3.7	1.1	4.2
Total Aromatic EPH >C10-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	5.00	< 5.0	< 5.0	7.7	59	8.2	27
Total Aromatic EPH >C10-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	10.00	< 10	< 10	< 10	63	< 10	32
Total VPH >C5-C10	HS_2D_Total	U	2780	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Total EPH >C10-C35 MC	EH_2D_Total_#1	U	2690	mg/kg	10.00	< 10	< 10	< 10	62	14	69
Total EPH >C10-C40 MC	EH_2D_Total_#1	N	2690	mg/kg	10.00	< 10	< 10	< 10	65	15	73
Naphthalene		M	2700	mg/kg	0.10	< 0.10	< 0.10	0.63	< 0.10	< 0.10	< 0.10
Acenaphthylene		M	2700	mg/kg	0.10	< 0.10	< 0.10	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene		M	2700	mg/kg	0.10	< 0.10	< 0.10	0.34	< 0.10	< 0.10	< 0.10
Fluorene		M	2700	mg/kg	0.10	< 0.10	< 0.10	0.28	< 0.10	< 0.10	< 0.10
Phenanthrene		M	2700	mg/kg	0.10	1.9	0.97	1.1	2.4	0.63	1.1
Anthracene		M	2700	mg/kg	0.10	0.26	0.16	< 0.10	0.49	0.14	0.21
Fluoranthene		M	2700	mg/kg	0.10	3.8	1.7	0.74	5.3	1.2	2.2
Pyrene		M	2700	mg/kg	0.10	3.3	1.4	0.85	4.9	1.1	2.2
Benzo[a]anthracene		M	2700	mg/kg	0.10	2.1	1.0	0.59	3.2	0.71	1.4
Chrysene		M	2700	mg/kg	0.10	2.9	1.5	1.2	3.8	1.3	1.5
Benzo[b]fluoranthene		M	2700	mg/kg	0.10	2.9	1.8	0.91	4.4	1.1	1.6
Benzo[k]fluoranthene		M	2700	mg/kg	0.10	1.0	0.63	0.33	1.7	0.55	0.81
Benzo[a]pyrene		M	2700	mg/kg	0.10	1.9	1.0	0.54	3.2	0.75	1.4
Indeno(1,2,3-c,d)Pyrene		M	2700	mg/kg	0.10	1.1	0.82	0.37	2.4	0.58	0.81
Dibenz(a,h)Anthracene		M	2700	mg/kg	0.10	0.58	0.48	0.44	0.93	0.21	0.43
Benzo[g,h,i]perylene		M	2700	mg/kg	0.10	1.3	1.0	0.43	2.2	0.92	1.7
Total Of 16 PAH's		M	2700	mg/kg	2.0	23	13	8.9	35	9.2	15

Results - Soil

Project: 16017 Channel View WAC Testing

Client: Terra Firma				**Chemtest Job No.:**		24-01368	24-01368	24-01368	24-01368	24-01368	24-01368
Quotation No.:				**Chemtest Sample ID.:**		1755214	1755216	1755218	1755220	1755222	1755224
Order No.: 16017MPWAC				Client Sample Ref.:		2	4	6	8	10	12
				Client Sample ID.:		TP101E1	TP102E1	TP103E1	TP104E1	TP105E1	TP106E1
				Sample Location:		TP101	TP102	TP103	TP104	TP105	TP106
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		1.3	2.6	1.5	2.7	1.4	2.8
				Date Sampled:		15-Jan-2024	15-Jan-2024	15-Jan-2024	15-Jan-2024	15-Jan-2024	15-Jan-2024
				Time Sampled:		12:00	12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**						
Total Phenols		M	2920	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Organic Matter BS1377		N	2930	%	0.10	0.30	1.5	1.5	0.60	0.90	1.3

Results - 2 Stage WAC

Project: 16017 Channel View WAC Testing

							Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	24-01368						**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Chemtest Sample ID:	1755213								
Sample Ref:	1								
Sample ID:	TP101WAC1								
Sample Location:	TP101								
Top Depth(m):	1.3								
Bottom Depth(m):									
Sampling Date:	15-Jan-2024								
Determinand	**SOP**	**Accred.**	**Units**						
Total Organic Carbon	2625	M	%			24	3	5	6
Loss On Ignition	2610	M	%			12	--	--	10
Total BTEX	2760	M	mg/kg			< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg			< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg			76	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg			4.4	100	--	--
pH at 20C	2010	M				7.9	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.013	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative mg/kg 10:1**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0054	0.0013	0.010	0.019	0.5	2	25
Barium	1455	U	0.076	< 0.005	0.15	0.11	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.5	10	70
Copper	1455	U	0.0037	0.0023	0.0072	0.0053	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.022	0.0004	0.043	0.035	0.5	10	30
Nickel	1455	U	0.0051	0.0014	0.0099	0.019	0.4	10	40
Lead	1455	U	< 0.0005	0.0006	< 0.0005	0.0054	0.5	10	50
Antimony	1455	U	0.0034	< 0.0005	0.0066	0.0048	0.06	0.7	5
Selenium	1455	U	0.0051	< 0.0005	0.0098	0.0072	0.1	0.5	7
Zinc	1455	U	0.024	0.006	0.047	0.084	4	50	200
Chloride	1220	U	7.0	< 1.0	14	10	800	15000	25000
Fluoride	1220	U	0.40	0.48	< 1.0	4.7	10	150	500
Sulphate	1220	U	120	< 1.0	230	170	1000	20000	50000
Total Dissolved Solids	1020	N	330	45	630	850	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	U	4.8	5.4	< 50	53	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	21

Leachate Test Information	
Leachant volume 1st extract/l	0.303
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.250

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - 2 Stage WAC

Project: 16017 Channel View WAC Testing

							Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	24-01368						**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Chemtest Sample ID:	1755217								
Sample Ref:	5								
Sample ID:	TP103WAC1								
Sample Location:	TP103								
Top Depth(m):	1.5								
Bottom Depth(m):									
Sampling Date:	15-Jan-2024								
Determinand	**SOP**	**Accred.**	**Units**						
Total Organic Carbon	2625	M	%			34	3	5	6
Loss On Ignition	2610	M	%			15	--	--	10
Total BTEX	2760	M	mg/kg			< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg			< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg			11	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg			9.5	100	--	--
pH at 20C	2010	M				7.6	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.0060	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative mg/kg 10:1**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0034	0.0043	0.0067	0.042	0.5	2	25
Barium	1455	U	0.066	0.035	0.13	0.39	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	0.016	0.0015	0.032	0.036	0.5	10	70
Copper	1455	U	0.0047	0.0041	0.0093	0.0065	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.017	0.0025	0.032	0.044	0.5	10	30
Nickel	1455	U	0.0005	0.0006	0.0010	0.0061	0.4	10	40
Lead	1455	U	< 0.0005	0.0012	< 0.0005	0.011	0.5	10	50
Antimony	1455	U	0.010	0.0027	0.021	0.038	0.06	0.7	5
Selenium	1455	U	0.0019	< 0.0005	0.0037	0.0026	0.1	0.5	7
Zinc	1455	U	0.019	0.014	0.038	0.15	4	50	200
Chloride	1220	U	5.6	< 1.0	11	< 10	800	15000	25000
Fluoride	1220	U	0.88	0.28	1.7	3.6	10	150	500
Sulphate	1220	U	42	5.7	83	110	1000	20000	50000
Total Dissolved Solids	1020	N	210	60	410	810	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	U	4.4	3.9	< 50	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	17

Leachate Test Information	
Leachant volume 1st extract/l	0.315
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.242

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - 2 Stage WAC

Project: 16017 Channel View WAC Testing

							Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	24-01368						**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Chemtest Sample ID:	1755219								
Sample Ref:	7								
Sample ID:	TP104WAC1								
Sample Location:	TP104								
Top Depth(m):	2.7								
Bottom Depth(m):									
Sampling Date:	15-Jan-2024								
Determinand	**SOP**	**Accred.**	**Units**						
Total Organic Carbon	2625	M	%			18	3	5	6
Loss On Ignition	2610	M	%			9.3	--	--	10
Total BTEX	2760	M	mg/kg			< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg			< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg			84	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg			32	100	--	--
pH at 20C	2010	M				7.7	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.012	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative mg/kg 10:1**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0015	0.0008	0.0030	0.0094	0.5	2	25
Barium	1455	U	0.074	0.070	0.15	0.71	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	0.010	0.0016	0.020	0.027	0.5	10	70
Copper	1455	U	0.0036	0.0030	0.0071	0.0047	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.015	0.0098	0.030	0.10	0.5	10	30
Nickel	1455	U	0.0094	0.0010	0.019	0.021	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.5	10	50
Antimony	1455	U	0.0023	0.0013	0.0045	0.014	0.06	0.7	5
Selenium	1455	U	0.0032	0.0007	0.0064	0.0099	0.1	0.5	7
Zinc	1455	U	0.061	0.010	0.12	0.16	4	50	200
Chloride	1220	U	4.6	< 1.0	< 10	< 10	800	15000	25000
Fluoride	1220	U	0.41	0.36	< 1.0	3.7	10	150	500
Sulphate	1220	U	320	29	630	670	1000	20000	50000
Total Dissolved Solids	1020	N	530	98	1000	1600	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	U	4.9	< 2.5	< 50	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	15

Leachate Test Information	
Leachant volume 1st extract/l	0.320
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.232

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - 2 Stage WAC

Project: 16017 Channel View WAC Testing

							Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	24-01368								
Chemtest Sample ID:	1755221								
Sample Ref:	9								
Sample ID:	TP105WAC1						**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Sample Location:	TP105								
Top Depth(m):	1.4								
Bottom Depth(m):									
Sampling Date:	15-Jan-2024								
Determinand	**SOP**	**Accred.**	**Units**						
Total Organic Carbon	2625	M	%			2.5	3	5	6
Loss On Ignition	2610	M	%			5.8	--	--	10
Total BTEX	2760	M	mg/kg			< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg			< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg			66	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg			12	100	--	--
pH at 20C	2010	M				9.0	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.016	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative mg/kg 10:1**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0015	0.0016	0.0030	0.016	0.5	2	25
Barium	1455	U	0.077	0.040	0.15	0.42	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	0.0028	0.0006	0.0056	0.0077	0.5	10	70
Copper	1455	U	0.0023	0.0018	0.0046	0.0017	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.025	0.0048	0.050	0.063	0.5	10	30
Nickel	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.5	10	50
Antimony	1455	U	0.0020	0.0009	0.0040	0.010	0.06	0.7	5
Selenium	1455	U	0.0006	< 0.0005	0.0013	< 0.0005	0.1	0.5	7
Zinc	1455	U	0.025	0.023	0.049	0.24	4	50	200
Chloride	1220	U	3.0	< 1.0	< 10	< 10	800	15000	25000
Fluoride	1220	U	0.54	0.14	1.1	1.7	10	150	500
Sulphate	1220	U	65	7.9	130	120	1000	20000	50000
Total Dissolved Solids	1020	N	200	52	400	630	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	U	4.6	2.6	< 50	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	13

Leachate Test Information	
Leachant volume 1st extract/l	0.325
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.126

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - 2 Stage WAC

Project: 16017 Channel View WAC Testing

							Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	24-01368						**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Chemtest Sample ID:	1755223								
Sample Ref:	11								
Sample ID:	TP106WAC1								
Sample Location:	TP106								
Top Depth(m):	2.8								
Bottom Depth(m):									
Sampling Date:	15-Jan-2024								
Determinand	**SOP**	**Accred.**	**Units**						
Total Organic Carbon	2625	M	%			7.5	3	5	6
Loss On Ignition	2610	M	%			6.7	--	--	10
Total BTEX	2760	M	mg/kg			< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg			< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg			< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg			8.2	100	--	--
pH at 20C	2010	M				8.0	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.016	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative mg/kg 10:1**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0009	0.0025	0.0018	0.023	0.5	2	25
Barium	1455	U	0.061	0.054	0.12	0.55	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	0.020	0.0011	0.039	0.035	0.5	10	70
Copper	1455	U	0.017	0.0023	0.034	0.022	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.022	0.011	0.043	0.12	0.5	10	30
Nickel	1455	U	0.0006	0.0010	0.0012	0.0098	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.5	10	50
Antimony	1455	U	0.0020	0.0021	0.0039	0.021	0.06	0.7	5
Selenium	1455	U	0.0014	0.0007	0.0029	0.0084	0.1	0.5	7
Zinc	1455	U	0.003	0.008	0.005	0.076	4	50	200
Chloride	1220	U	20	< 1.0	40	26	800	15000	25000
Fluoride	1220	U	0.27	0.29	< 1.0	2.9	10	150	500
Sulphate	1220	U	18	14	36	150	1000	20000	50000
Total Dissolved Solids	1020	N	660	84	1300	1600	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	U	12	< 2.5	< 50	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	12

Leachate Test Information	
Leachant volume 1st extract/l	0.326
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.225

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity at 25°C and Total Dissolved Solids (TDS) in Waters	Conductivity Meter	
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.	
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).	
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation	
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.	
2010	pH Value of Soils	pH at 20°C	pH Meter	
2015	Acid Neutralisation Capacity	Acid Reserve	Titration	
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.	
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930	
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES	
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry	
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.	
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.	
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.	
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.	
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.	
2610	Loss on Ignition	loss on ignition (LOI)	Determination of the proportion by mass that is lost from a soil by ignition at 550°C.	
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.	
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID	
2690	EPH A/A Split	Aliphatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40 Aromatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40	Acetone/Heptane extraction / GCxGC FID detection	
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)	

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.	
2780	VPH A/A Split	Aliphatics: >C5–C6, >C6–C7,>C7–C8,>C8-C10 Aromatics: >C5–C7,>C7-C8,>C8–C10	Water extraction / Headspace GCxGC FID detection	
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS	
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.	
2930	Organic Matter	Organic Matter	Acid Dichromate digestion/Titration	
640	Characterisation of Waste (Leaching C10)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge	
650	Characterisation of Waste (Leaching WAC)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge	

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

Water Sample Category Key for Accreditation

DW - Drinking Water
GW - Ground Water
LE - Land Leachate
NA - Not Applicable
PL - Prepared Leachate
PW - Processed Water

Report Information

RE - Recreational Water
SA - Saline Water
SW - Surface Water
TE - Treated Effluent
TS - Treated Sewage
UL - Unspecified Liquid

Clean Up Codes

NC - No Clean Up
MC - Mathematical Clean Up
FC - Florisil Clean Up

HWOL Acronym System

HS - Headspace analysis
EH - Extractable hydrocarbons – i.e. everything extracted by the solvent
CU - Clean-up – e.g. by Florisil, silica gel
1D - GC – Single coil gas chromatography
Total - Aliphatics & Aromatics
AL - Aliphatics only
AR - Aromatic only
2D - GC-GC – Double coil gas chromatography
#1 - EH_2D_Total but with humics mathematically subtracted
#2 - EH_2D_Total but with fatty acids mathematically subtracted
+ - Operator to indicate cumulative e.g. EH+EH_Total or EH_CU+HS_Total

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

eurofins | Chemtest
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	23-40937-1
Initial Date of Issue:	20-Dec-2023
Re-Issue Details:	
Client	Terra Firma
Client Address:	5 Deryn Court Wharfedale Road Pentwyn Cardiff CF23 7HA
Contact(s):	elliot@terrafirmawales.co.uk; morgan@terrafirmawales.co.uk
Project	Channel View

Quotation No.:		**Date Received:**	11-Dec-2023
Order No.:	16017	**Date Instructed:**	11-Dec-2023
No. of Samples:	6		
Turnaround (Wkdays):	8	**Results Due:**	20-Dec-2023
Date Approved:	20-Dec-2023		

Approved By:

Details: Stuart Henderson, Technical Manager

Results - Soil

Project: Channel View

Client: Terra Firma				**Chemtest Job No.:**		23-40937	23-40937	23-40937	23-40937	23-40937	23-40937
Quotation No.:				**Chemtest Sample ID.:**		1743792	1743793	1743794	1743795	1743796	1743797
				Client Sample ID.:		ES1	ES1	ES1	ES1	ES1	ES1
				Sample Location:		WS101	WS102	WS103	WS104	WS105	WS106
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.5	0.8	0.3	0.3	0.5	0.7
				Bottom Depth (m):		0.5	1	0.3	0.3	0.5	0.7
				Date Sampled:		07-Dec-2023	07-Dec-2023	07-Dec-2023	07-Dec-2023	07-Dec-2023	07-Dec-2023
				Time Sampled:		12:00	12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**						
ACM Type		U	2192		N/A	Cement	-	-	-	-	-
Asbestos Identification		U	2192		N/A	Chrysotile	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Asbestos by Gravimetry		U	2192	%	0.001	0.019					
Asbestos By Fibre Counting		U	2192	%	0.001	-					
Total Asbestos		U	2192	%	0.001	0.019					
Moisture		N	2030	%	0.020	14	21	14	15	7.2	5.2
Soil Colour		N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown
Other Material		N	2040		N/A	Stones and Roots	Stones and Roots	Stones and Glass	Stones and Roots	Stones	Stones
Soil Texture		N	2040		N/A	Clay	Loam	Clay	Clay	Clay	Loam
pH at 20C		M	2010		4.0	8.4	8.0	8.7	8.6	8.8	9.1
Boron (Hot Water Soluble)		M	2120	mg/kg	0.40	0.48	1.0	< 0.40	0.53	< 0.40	< 0.40
Cyanide (Complex)		M	2300	mg/kg	0.50	< 0.50	3.4	2.7	1.1	0.80	< 0.50
Cyanide (Free)		M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cyanide (Total)		M	2300	mg/kg	0.50	< 0.50	3.4	2.7	1.1	0.80	< 0.50
Sulphate (Acid Soluble)		U	2430	%	0.010	0.13	0.14	0.11	0.15	0.068	0.052
Arsenic		M	2455	mg/kg	0.5	13	19	37	25	10	7.2
Beryllium		U	2455	mg/kg	0.5	0.7	1.1	1.1	1.0	0.6	< 0.5
Cadmium		M	2455	mg/kg	0.10	0.72	0.85	2.5	0.66	0.51	0.52
Chromium		M	2455	mg/kg	0.5	21	22	44	32	18	13
Mercury Low Level		M	2450	mg/kg	0.05	0.23	0.49	1.0	1.7	0.14	0.06
Manganese		M	2455	mg/kg	1.0	510	610	810	700	1100	780
Molybdenum		M	2455	mg/kg	0.5	2.4	6.3	5.9	3.8	2.9	2.1
Antimony		N	2455	mg/kg	2.0	2.7	6.1	8.8	11	< 2.0	< 2.0
Copper		M	2455	mg/kg	0.50	180	1600	300	110	16	11
Nickel		M	2455	mg/kg	0.50	27	61	80	40	19	14
Lead		M	2455	mg/kg	0.50	160	410	380	290	38	25
Selenium		M	2455	mg/kg	0.25	0.64	1.3	1.1	1.3	0.86	0.57
Zinc		M	2455	mg/kg	0.50	510	780	370	280	78	54
Chromium (Trivalent)		N	2490	mg/kg	1.0	21	22	44	32	18	13
Chromium (Hexavalent)		N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Aliphatic VPH >C5-C6	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C6-C7	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C7-C8	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C6-C8 (Sum)	HS_2D_AL	N	2780	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

Results - Soil

Project: Channel View

Client: Terra Firma				**Chemtest Job No.:**		23-40937	23-40937	23-40937	23-40937	23-40937	23-40937
Quotation No.:				**Chemtest Sample ID.:**		1743792	1743793	1743794	1743795	1743796	1743797
				Client Sample ID.:		ES1	ES1	ES1	ES1	ES1	ES1
				Sample Location:		WS101	WS102	WS103	WS104	WS105	WS106
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.5	0.8	0.3	0.3	0.5	0.7
				Bottom Depth (m):		0.5	1	0.3	0.3	0.5	0.7
				Date Sampled:		07-Dec-2023	07-Dec-2023	07-Dec-2023	07-Dec-2023	07-Dec-2023	07-Dec-2023
				Time Sampled:		12:00	12:00	12:00	12:00	12:00	12:00
				Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**						
Aliphatic VPH >C8-C10	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total Aliphatic VPH >C5-C10	HS_2D_AL	U	2780	mg/kg	0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
Aliphatic EPH >C10-C12	EH_2D_AL_#1	M	2690	mg/kg	2.00	2.7	3.8	3.0	3.9	2.8	2.7
Aliphatic EPH >C12-C16	EH_2D_AL_#1	M	2690	mg/kg	1.00	3.7	4.5	3.4	6.2	3.3	2.6
Aliphatic EPH >C16-C21	EH_2D_AL_#1	M	2690	mg/kg	2.00	4.9	5.7	3.2	7.1	2.4	< 2.0
Aliphatic EPH >C21-C35	EH_2D_AL_#1	M	2690	mg/kg	3.00	7.0	21	< 3.0	14	3.2	5.1
Aliphatic EPH >C35-C40	EH_2D_AL_#1	N	2690	mg/kg	10.00	< 10	12	< 10	< 10	< 10	< 10
Total Aliphatic EPH >C10-C35	EH_2D_AL_#1	M	2690	mg/kg	5.00	18	35	13	31	12	12
Total Aliphatic EPH >C10-C40	EH_2D_AL_#1	N	2690	mg/kg	10.00	18	47	13	31	12	12
Aromatic VPH >C5-C7	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aromatic VPH >C7-C8	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aromatic VPH >C8-C10	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total Aromatic VPH >C5-C10	HS_2D_AR	U	2780	mg/kg	0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
Aromatic EPH >C10-C12	EH_2D_AR_#1	U	2690	mg/kg	1.00	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic EPH >C12-C16	EH_2D_AR_#1	U	2690	mg/kg	1.00	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic EPH >C16-C21	EH_2D_AR_#1	U	2690	mg/kg	2.00	13	71	4.8	5.7	4.2	2.2
Aromatic EPH >C21-C35	EH_2D_AR_#1	U	2690	mg/kg	2.00	18	470	8.7	18	7.5	2.6
Aromatic EPH >C35-C40	EH_2D_AR_#1	N	2690	mg/kg	1.00	5.6	74	15	6.4	22	4.8
Total Aromatic EPH >C10-C35	EH_2D_AR_#1	U	2690	mg/kg	5.00	31	550	13	24	12	< 5.0
Total Aromatic EPH >C10-C40	EH_2D_AR_#1	N	2690	mg/kg	10.00	36	620	28	30	34	< 10
Total VPH >C5-C10	HS_2D_Total	U	2780	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Total EPH >C10-C35	EH_2D_Total_#1	U	2690	mg/kg	10.00	49	580	26	54	23	17
Total EPH >C10-C40	EH_2D_Total_#1	N	2690	mg/kg	10.00	54	670	41	61	45	22
Total Organic Carbon		M	2625	%	0.20		19		8.5		2.2
Naphthalene		M	2700	mg/kg	0.10	< 0.10	1.2	0.25	< 0.10	< 0.10	< 0.10
Acenaphthylene		M	2700	mg/kg	0.10	< 0.10	0.14	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene		M	2700	mg/kg	0.10	< 0.10	1.2	0.17	< 0.10	< 0.10	< 0.10
Fluorene		M	2700	mg/kg	0.10	< 0.10	0.55	0.21	< 0.10	< 0.10	< 0.10
Phenanthrene		M	2700	mg/kg	0.10	0.93	2.4	0.87	0.53	< 0.10	< 0.10
Anthracene		M	2700	mg/kg	0.10	0.24	0.14	0.12	< 0.10	< 0.10	< 0.10
Fluoranthene		M	2700	mg/kg	0.10	2.1	1.7	1.2	0.53	< 0.10	< 0.10
Pyrene		M	2700	mg/kg	0.10	2.0	1.9	1.3	0.48	< 0.10	< 0.10
Benzo[a]anthracene		M	2700	mg/kg	0.10	1.6	1.3	0.99	0.73	< 0.10	< 0.10
Chrysene		M	2700	mg/kg	0.10	1.7	1.7	1.0	0.67	< 0.10	< 0.10

Results - Soil

Project: Channel View

Client: Terra Firma			**Chemtest Job No.:**	23-40937	23-40937	23-40937	23-40937	23-40937	23-40937
Quotation No.:			**Chemtest Sample ID.:**	1743792	1743793	1743794	1743795	1743796	1743797
			Client Sample ID.:	ES1	ES1	ES1	ES1	ES1	ES1
			Sample Location:	WS101	WS102	WS103	WS104	WS105	WS106
			Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):	0.5	0.8	0.3	0.3	0.5	0.7
			Bottom Depth (m):	0.5	1	0.3	0.3	0.5	0.7
			Date Sampled:	07-Dec-2023	07-Dec-2023	07-Dec-2023	07-Dec-2023	07-Dec-2023	07-Dec-2023
			Time Sampled:	12:00	12:00	12:00	12:00	12:00	12:00
			Asbestos Lab:	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY

Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**						
Benzo[b]fluoranthene		M	2700	mg/kg	0.10	1.8	2.1	2.0	1.2	< 0.10	< 0.10
Benzo[k]fluoranthene		M	2700	mg/kg	0.10	0.68	0.74	0.74	0.25	< 0.10	< 0.10
Benzo[a]pyrene		M	2700	mg/kg	0.10	1.1	1.1	1.5	0.61	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene		M	2700	mg/kg	0.10	0.87	0.72	1.4	0.75	< 0.10	< 0.10
Dibenz(a,h)Anthracene		M	2700	mg/kg	0.10	0.33	0.58	0.52	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene		M	2700	mg/kg	0.10	0.85	0.93	1.3	0.56	< 0.10	< 0.10
Total Of 16 PAH's		M	2700	mg/kg	2.0	14	18	14	6.3	< 2.0	< 2.0
Total Phenols		M	2920	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Organic Matter BS1377		N	2930	%	0.10	0.70	3.3	2.0	3.4	0.70	0.30

Results - 2 Stage WAC

Project: Channel View

							Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	23-40937								
Chemtest Sample ID:	1743793								
Sample Ref:									
Sample ID:	ES1								
Sample Location:	WS102								
Top Depth(m):	0.8								
Bottom Depth(m):	1								
Sampling Date:	07-Dec-2023								
Determinand	**SOP**	**Accred.**	**Units**				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%			19	3	5	6
Loss On Ignition	2610	M	%			17	--	--	10
Total BTEX	2760	M	mg/kg			< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg			< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg			710	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg			18	100	--	--
pH at 20C	2010	M				8.0	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.0080	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative mg/kg 10:1**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0037	0.0043	0.0071	0.042	0.5	2	25
Barium	1455	U	0.034	0.015	0.065	0.17	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	0.017	0.0055	0.032	0.069	0.5	10	70
Copper	1455	U	0.035	0.042	0.068	0.045	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.090	0.023	0.18	0.31	0.5	10	30
Nickel	1455	U	0.0015	0.0015	0.0029	0.015	0.4	10	40
Lead	1455	U	< 0.0005	0.0011	< 0.0005	0.0092	0.5	10	50
Antimony	1455	U	0.0039	0.0035	0.0077	0.035	0.06	0.7	5
Selenium	1455	U	0.0029	0.0017	0.0056	0.018	0.1	0.5	7
Zinc	1455	U	0.009	0.019	0.018	0.18	4	50	200
Chloride	1220	U	68	17	130	240	800	15000	25000
Fluoride	1220	U	0.58	0.41	1.1	4.3	10	150	500
Sulphate	1220	U	77	19	150	260	1000	20000	50000
Total Dissolved Solids	1020	N	320	140	620	1600	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	U	16	14	< 50	150	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	21

Leachate Test Information	
Leachant volume 1st extract/l	0.303
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.226

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - 2 Stage WAC

Project: Channel View

							Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	23-40937								
Chemtest Sample ID:	1743795								
Sample Ref:									
Sample ID:	ES1								
Sample Location:	WS104								
Top Depth(m):	0.3								
Bottom Depth(m):	0.3								
Sampling Date:	07-Dec-2023								
Determinand	**SOP**	**Accred.**	**Units**				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%			8.5	3	5	6
Loss On Ignition	2610	M	%			8.9	--	--	10
Total BTEX	2760	M	mg/kg			< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg			< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg			< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg			6.3	100	--	--
pH at 20C	2010	M				8.6	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.0040	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative mg/kg 10:1**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic							0.5	2	25
Barium							20	100	300
Cadmium							0.04	1	5
Chromium							0.5	10	70
Copper							2	50	100
Mercury							0.01	0.2	2
Molybdenum							0.5	10	30
Nickel							0.4	10	40
Lead							0.5	10	50
Antimony							0.06	0.7	5
Selenium							0.1	0.5	7
Zinc							4	50	200
Chloride							800	15000	25000
Fluoride							10	150	500
Sulphate							1000	20000	50000
Total Dissolved Solids							4000	60000	100000
Phenol Index							1	-	-
Dissolved Organic Carbon							500	800	1000

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	15

Leachate Test Information	
Leachant volume 1st extract/l	
Leachant volume 2nd extract/l	
Eluant recovered from 1st extract/l	

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - 2 Stage WAC

Project: Channel View

							Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	23-40937								
Chemtest Sample ID:	1743797								
Sample Ref:									
Sample ID:	ES1								
Sample Location:	WS106								
Top Depth(m):	0.7								
Bottom Depth(m):	0.7								
Sampling Date:	07-Dec-2023								
Determinand	**SOP**	**Accred.**	**Units**				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%			2.2	3	5	6
Loss On Ignition	2610	M	%			0.97	--	--	10
Total BTEX	2760	M	mg/kg			< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg			< 0.10	1	--	--
TPH Total WAC	2670	M	mg/kg			< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg			< 2.0	100	--	--
pH at 20C	2010	M				9.1	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.0060	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative mg/kg 10:1**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0004	< 0.0002	0.0008	0.0006	0.5	2	25
Barium	1455	U	0.11	0.059	0.21	0.66	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.5	10	70
Copper	1455	U	0.0009	< 0.0005	0.0018	0.0013	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.036	0.0027	0.072	0.076	0.5	10	30
Nickel	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.5	10	50
Antimony	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.06	0.7	5
Selenium	1455	U	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.1	0.5	7
Zinc	1455	U	0.017	0.017	0.034	0.17	4	50	200
Chloride	1220	U	9.9	< 1.0	20	15	800	15000	25000
Fluoride	1220	U	0.18	0.086	< 1.0	< 1.0	10	150	500
Sulphate	1220	U	14	1.7	28	35	1000	20000	50000
Total Dissolved Solids	1020	N	100	36	200	460	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	U	7.4	5.3	< 50	56	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	5.2

Leachate Test Information	
Leachant volume 1st extract/l	0.340
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.260

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Test Methods

SOP	Title	Parameters included	Method summary
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity at 25°C and Total Dissolved Solids (TDS) in Waters	Conductivity Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH at 20°C	pH Meter
2015	Acid Neutralisation Capacity	Acid Reserve	Titration
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2610	Loss on Ignition	loss on ignition (LOI)	Determination of the proportion by mass that is lost from a soil by ignition at 550°C.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2690	EPH A/A Split	Aliphatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40 Aromatics: >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C40	Acetone/Heptane extraction / GCxGC FID detection

Test Methods

SOP	Title	Parameters included	Method summary
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2780	VPH A/A Split	Aliphatics: >C5–C6, >C6–C7,>C7–C8,>C8-C10 Aromatics: >C5–C7,>C7-C8,>C8–C10	Water extraction / Headspace GCxGC FID detection
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.
2930	Organic Matter	Organic Matter	Acid Dichromate digestion/Titration
640	Characterisation of Waste (Leaching C10)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge
650	Characterisation of Waste (Leaching WAC)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

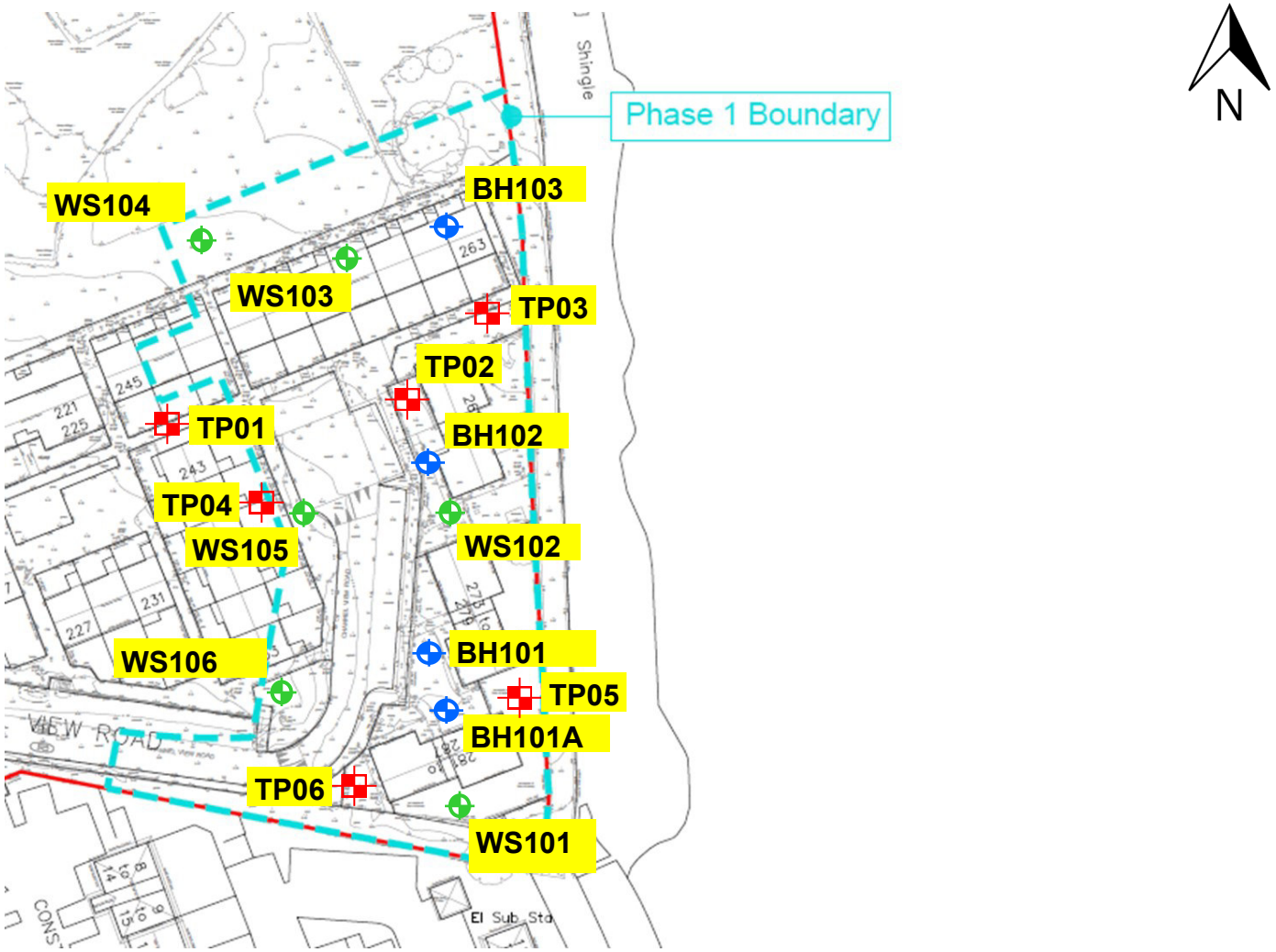
A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

DRAWINGS



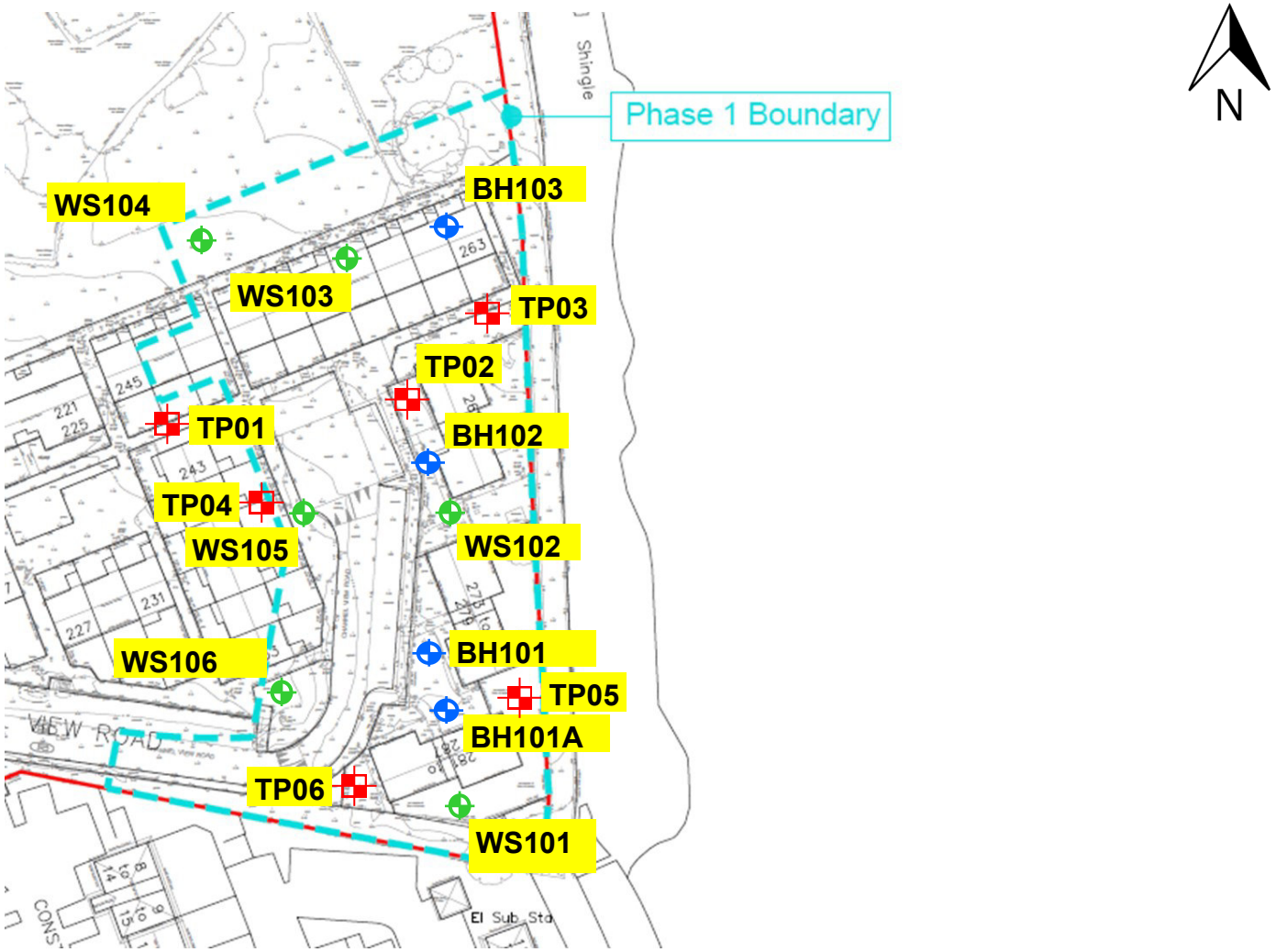
Site Name: Channel View
Project Number: 16017

Drawing Title: Site Investigation Locations
Drawing Number: 01
Scale: Not to scale

KEY

- Window Sample Locations
- Borehole Locations
- Trial Pit Locations

DRAWINGS



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- Window Sample Locations
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APPENDIX 6
REMEDIATION STRATEGY

terra firma

Geotechnical & Geoenvironmental Specialists

Remediation Strategy Report

Site: Phase 1, Channel View, Cardiff

Prepared For: Cardiff City Council

Issue Date: June 2024

Job No: 16017/RS

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REPORT TITLE : **Remediation Strategy Report: Phase 1, Channel View, Cardiff**

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	Name	Signature
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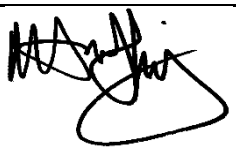
Checked	**Michael Watkins** MESci FGS	
Approved	**Gwyn Lake** BSc (Hons). PhD, CGeol, FGS	

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SECTION 1 Introduction and Proposed Development

1.1 Introduction

Cardiff City Council (the Client) is proposing the construction of a residential development at Phase 1, Channel View, Cardiff.

TFW Group Limited has been commissioned by the client to prepare a Remediation Strategy Report for the site.

The current study site (Phase 1) was part of a larger site investigation undertaken by TFW Group in December 2021 (reference Geotechnical and Geoenvironmental Report 16017). This report was supplemented by a targeted investigations at Phase 1, with a report completed in May of 2024 (report reference 280524-16017-02).

1.2 Objectives of Current Remedial Strategy

The objective of the current Remediation Strategy is to detail the remedial steps that are required to render the site fit for its intended use.

In summary, the following remediation requirements have been identified and are covered in this report.

1. Placement of at least 600mm of 'clean' capping soil beneath landscaped areas.
2. Capping of non-landscaped areas with hard standing.
3. Placement of no-dig barrier beneath capping soils.
4. Tracking of site won soils if reused on-site.
5. Backfilling of service trenches with appropriate imported clean aggregates.
6. Made ground, if disposed off-site, should be classified in accordance with Environment Agency Guidance WM3 to derive a European Waste Code, and disposed in accordance with this code.
7. Potable Water Supply Pipe Material Assessment.

1.3 Previous Investigations and Assessments

The current Remediation Strategy is based on the conclusions of the site investigation performed at the Phase 1 development site. This report shall be read in conjunction with the following documents.

- TFW Group Limited. Proposed Phase 1 Residential Development, Channel View, Cardiff. 16017 May 2024. Report reference 280524-16017-02.

1.4 Limitations and Exceptions of Investigation

This report has been prepared for the sole internal reliance of the Client and the project design and construction team. This report shall not be relied upon or transferred to any other parties without the express written authorisation of TFW Group Limited. If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill. The report represents the findings and opinions of experienced geo-environmental and geotechnical consultants. TFW Group Limited does not provide legal advice and the advice of lawyers may be required.

It is not within the scope of TFW Group Limited to:

- Provide Method Statements and Risk Assessments for the earthwork's contractor undertaking site remediation, preparation and development.

- Design, assess or install utility service trench fill and pipes for potable water supply beneath the site.

1.5 Quality Assurance

The quality and environmental aspects of the assessment and investigation comply with UKAS Accredited ISO 9001:2015 and ISO 14001:2015 standards.

SECTION 2 Site Characteristics

The following subsection information has been summarised from previous investigations and assessments listed in **Section 1**.

2.1 Site Location and Description

The site centres on an approximate National Grid Reference of 318088, 173913 occupying a plan area of approximately 1.1 Hectares and is irregular in shape.

The site is bound by to the north by The Marl Park, to south and west by residential housing and by the River Taff east. The site is level with an elevation of 7-8mAOD.

The site was visited in November 2023 and was seen to comprise a mixture of occupied and unoccupied two storey housing and the southern extent of playing fields (the 'Marl') with some shrub vegetation. An area of completed demolition located in the east of the site, surrounded by high wire fencing.

The River Taff runs to the east of the site.

The site location can be seen on **Figure 2.1**.

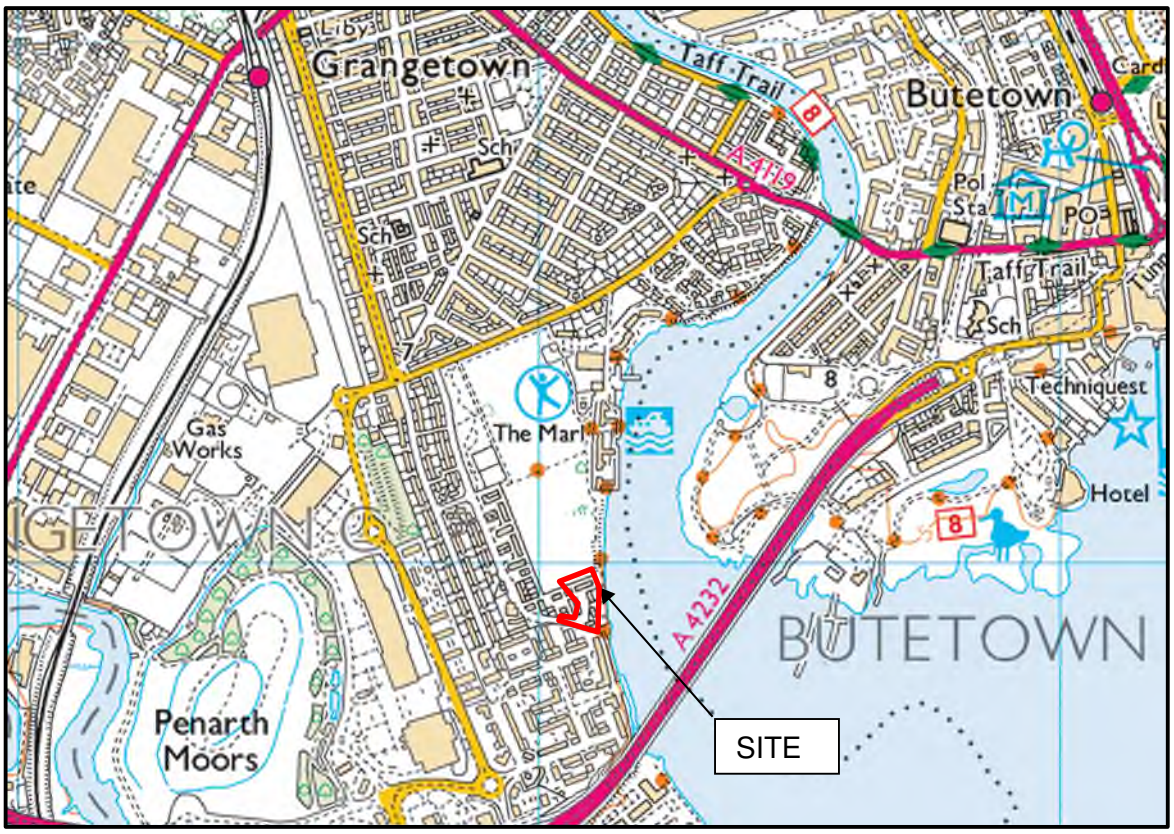

Figure 2.1 Site Location (not to scale)

The extent of the Phase 1 area is presented in **Figure 2.2**

Figure 2.2 Phase 1 Area (not to scale)

The far northern extent of Phase 1 enters the former 'Marl' landfill site **(Figure 2.3)**

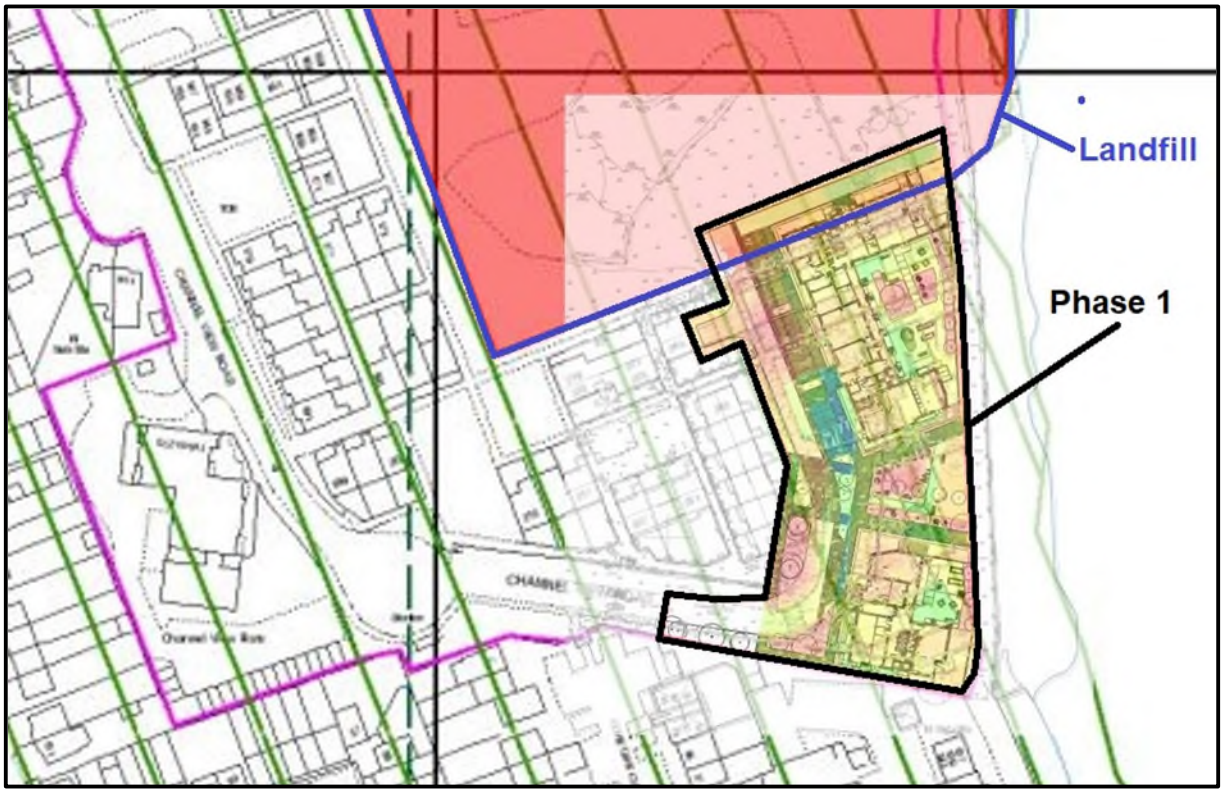

Figure 2.3 Relation of Phase 1 Area and former landfill site (not to scale)

2.2 Site History Summary

A Historical Map Review was performed by TFW Group. Land reclamation has taken place at the site since 1812. Prior to this the site lay seaward of the coastline. Since this time further infilling has taken place beneath and around the site, including a landfill known as 'The Marl'. The site became occupied by housing sometime between 1974 and 1989. These houses were demolished in 2023.

2.3 Geological Setting

2.3.1 Geology

The 1:50,000 scale British Geological Map of the area (Sheet 263) and the publication 'Urban Geology of Cardiff Centre and the Bay Region' were consulted for geology underlying the site. The site is shown to be underlain by rocks of the Mercia Mudstone Group. Above the bedrock is Glaciofluvial Deposits, beneath Alluvium. Made ground is likely to cover the site.

Detailed stratigraphical information is provided in **Table 2.1**.

Table 2.1 Detailed Stratigraphical Information

Age	Name	Description
Modern	Made Ground	Dock construction involved the coastline being extended southwards for about a kilometre. Since the docks were built the tidal flats of the Ely, Taff and Rhymney have been tipped on to reclaim land for industrial use. Reclamation took place in this area of Cardiff by 1810 and any fill materials are likely to be highly variable.
Quaternary	Tidal Flat Deposits	Including mud flat and sand flat deposits form extensive nearly horizontal marshy land in the intertidal zone that is alternately covered and uncovered by the rise and fall of the tide. They consist of unconsolidated sediment, mainly mud, silt and/or sand. They may form the top surface of a deltaic deposit.
Pleistocene	Glaciofluvial Sheet Deposits	Sand and gravel, locally with lenses of silt, clay or organic material; characteristic 'sandur' (sheet) and valley train form; of glaciofluvial origin.
Mid to Late Triassic	Mercia Mudstone Group	Dominantly red, less commonly green-grey, mudstones and subordinate siltstones with thick halite-bearing units in some basinal areas. Thin beds of gypsum/anhydrite are widespread; thin sandstones are also present.

No dip readings are recorded in the local area.

Made ground to a depth of approximately 5m is anticipated at the site based on previous borehole data on site and in the surrounding area.

2.4 Groundwater

Groundwater information recorded during the site investigation is summarised in **Table 2.2**.

Table 2.2 Groundwater Summary

Location	Depth (m)	Details
BH101A	13.5	Rose to 10.4m after 20 minutes

BH102	12.7	Rose to 10.0m after 20 minutes
BH103	12.9	Rose to 7.9m after 20 minutes

Nickel and Zinc have been found above respective guideline values however it is considered that the site falls into the lesser level of pollution and that the risk to the aquatic environment from waters and soils under the site is low and no remediation or mitigation measures.

2.5 Radon

A Radon Report from British Geological Survey details that no radon protective measures are required for new developments on the investigation site. A copy of the radon report is presented in Annex A.

Additional consideration will need to be given to the requirement of radon protection within basements or other occupied spaces below ground level.

Further guidance on reducing the concentration of radon in new buildings, extensions, conversions and refurbishment projects, in order to reduce the risk to occupants, is provided in BR:211:2023.

2.6 Identified Contamination

2.6.1 Contaminants of Concern

Soil contaminants identified as part of the investigation are summarised in **Table 2.3**, along with an interpretation of the likely contamination source. Where applicable, the contaminant, source relationship is based on the inferences made in the preliminary conceptual site model.

Table 2.3 Contaminants of Concern

Location	Depth	Contaminant	Source
TP01	1.3	Lead, dibenzo(ah)anthracene	S1 (Made ground)
TP02	2.6	Lead, dibenzo(ah)anthracene	S1 (Made ground)
TP03	1.5	Lead, dibenzo(ah)anthracene	S1 (Made ground)
TP04	2.7	Lead, dibenzo(ah)anthracene	S1 (Made ground)
TP06	2.8	Dibenzo(ah)anthracene	S1 (Made ground)
WS101	0.5	Dibenzo(ah)anthracene Chrysotile (asbestos)	S1 (Made ground)
WS102	0.8	Lead, dibenzo(ah)anthracene	S1 (Made ground)
WS103	0.3	Lead, dibenzo(ah)anthracene	S1 (Made ground)
WS104	0.3	Lead	S1 (Made ground)

SECTION 3 Sources of Contamination Requiring Remediation

The summary of the refined conceptual site model is presented in **Table 3.1**. and based on findings of previous investigations and assessments, detail significant pollutant linkages requiring remediation or mitigation.

Table 3.1 Refined Conceptual Site Model

Source	Pathway	Receptor
S1 Contaminated Soils	P1 – Direct soil ingestion P3 – Dermal contact with soil P4 – Inhalation and ingestion of soil dust/asbestos	R1 – construction and maintenance workers
S1 Contaminated Soils	P4 – Inhalation and ingestion of soil dust	R2 – Passers-by and neighbouring site users
S1 Contaminated Soils	P1 – Direct soil ingestion P2 – Plant uptake and consumption of home grown produce P3 – Dermal contact with soil P4 – Inhalation and ingestion of soil dust/asbestos P8 – Absorption into potable water pipes	R3 – Future site users (site residents)

SECTION 4 Proposed Remedial and Mitigating Measures

4.1 General

Based on the finding of previous investigations and assessments and the identified pollutant linkages the following remedial measures have been devised for the site.

Specific validation requirements for the proposed remedial measures are discussed in the following section.

4.1.1 Human Health

To protect future site residents from the identified contamination this area of the site will need to be capped. The capping should consist of the proposed buildings and hard standings and, in garden and soft landscaped areas, comprise 600mm of suitable topsoil, and subsoil, conforming to the Generic Assessment Criteria (GAC) for a Residential Setting with Plant Uptake. The capping soils should be underlain by a no-dig barrier comprising a high-visibility geotextile membrane beneath a geogrid.

As good practice, construction workers should adhere to good site management, COSHH, good standards of hygiene and appropriate health & safety on site, with personal protection equipment (PPE) and dust suppression where appropriate.

These measures should be detailed in the contractor's Risk Assessment and Method Statements as well as the contractor's Construction Management Plan.

All imported soils should be validated as clean and suitable for use in accordance with 'Requirements for the Chemical Testing of Imported Soils for Various End Uses and Validation Cover Systems'.

For proposed new supply water pipes, the UK Water Industry Research publication 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites (Report 10/WM/03/21)' should be consulted.

In accordance with EC Regulation 1272/2008 and Environment Agency Guidance WM3 soils destined for off-site disposal should be classified on the basis of their hazard phrases prior to disposal. Soils are classified as a mirror entry waste and should be classified on the basis of their specific chemical properties.

If, during earthworks, ground conditions are encountered that are markedly different to those found during the investigation then the ground should be subject to additional sampling and testing and any necessary remedial measures designed and implemented before continuing with the works.

SECTION 5 Validation of Remedial and Mitigating Measures

The following remedial measures will require validation and inclusion within a Validation Report:

- Validation of Imported Soils
- Records of Off-Site Disposal (transfer/Consignment Notes)
- Potable water supply pipe (assessment and installation)
- Tracking of Site-Won Soils
- Records of Service Trench Backfill

We would recommend that the earthworks, if necessary, be undertaken under a Material Management Plan, prepared and submitted in accordance with CL:AIRE DoWCoP (subject to a feasibility study to determine whether the site falls within the criteria of DoWCoP). Likewise, an appropriate permit, exemption or CL:AIRE Declaration should be in place for any material imports. Please see additional comments in **Section 6.3**, especially those relating to landfill material.

5.1 Imported Soil Validation

All imported soils, aggregate or stone that are not virgin quarry stone should be validated as suitable for use. Imported materials exempt from validation testing should be accompanied by a delivery/transfer note. Notes should be retained and submitted for inclusion within the Validation Report upon completion of the works.

The provider should supply a laboratory analysis report to confirm that the soil/aggregate/stone is suitable for use. Depending on the source and available test data, it may be prudent to independently sample and analyse the materials prior to being brought to site.

Sampling and analysis of the soil/aggregate/stone once imported will be required in addition to any taken at source.

It is recommended that the samples are taken from stockpiles and confirmed as suitable prior to being laid in garden areas to prevent possible logistical problems if having to remove unsuitable capping soils from gardens.

The top 600mm of capping soils in landscaped areas and underlying no-dig barrier, should be inspected, including a photo record, and tested in-situ to confirm its suitability.

All samples should, as a minimum, be analysed for the determinants listed in **Table 5.1**.

Table 5.1 Validation Criteria

Determinand	Units	Guideline Value (Residential)	Source
Inorganic			
Arsenic	mg/kg	37	1
Boron	mg/kg	290	1
Cadmium	mg/kg	11	1
Chromium III	mg/kg	910	1
Chromium VI	mg/kg	6	1
Copper	mg/kg	2400	1
Lead	mg/kg	200	2
Mercury	mg/kg	40	1
Nickel	mg/kg	130	1
Selenium	mg/kg	250	1
Zinc	mg/kg	3700	1
Cyanide	mg/kg	8	3
Asbestos	%	Non Detected	-
Organics – Phenol & PAH			
Phenol	mg/kg	120	1
Naphthalene	mg/kg	2.3	4
Acenaphthylene	mg/kg	170	4
Acenaphthene	mg/kg	210	4
Flourene	mg/kg	170	4
Phenanthene	mg/kg	95	4
Anthracene	mg/kg	2400	4
Fluoranthene	mg/kg	280	4
Pyrene	mg/kg	620	4
Benzo(a)anthracene	mg/kg	7.2	4
Chrysene	mg/kg	15	4
Benzo(b)fluoranthene	mg/kg	2.6	4
Benzo(k)fluoranthene	mg/kg	77	4
Benzo(a)pyrene	mg/kg	2.2	4
Indeno(123cd)pyrene	mg/kg	27	4
Dibenzo(ah)anthracene	mg/kg	0.24	4
Benzo(ghi)perylene	mg/kg	320	4
Organics – TPH			
PH C5 – C6 Aliphatic	mg/kg	42	4
PH C6 – C8 Aliphatic	mg/kg	100	4
PH C8 – C10 Aliphatic	mg/kg	27	4
PH C10 – C12 Aliphatic	mg/kg	130	4
PH C12 – C16 Aliphatic	mg/kg	1100	4
PH C16 – C21 Aliphatic	mg/kg	65000	4
PH C21 – C35 Aliphatic	mg/kg	65000	4
PH C5 – C7 Aromatic	mg/kg	70	4
PH C7 – C8 Aromatic	mg/kg	130	4
PH C8 – C10 Aromatic	mg/kg	34	4
PH C10 – C12 Aromatic	mg/kg	74	4
PH C12 – C16 Aromatic	mg/kg	140	4
PH C16 – C21 Aromatic	mg/kg	260	4
PH C21 – C35 Aromatic	mg/kg	1100	4

1 - LQM/CIEH Suitable For Use Level (S4UL) 2015
2 - Defra Category 4 Screening Level (Provisional value)
3 - Environment Agency CLEA v1.06 Derived Value (Now withdrawn)
4 - S4UL threshold based on 1% soil organic matter

It should be noted that achieving remedial criteria alone does not necessarily legitimise the import of a soil and an appropriate permit/exemption or material management plan will be necessary.

5.2 Off-Site Disposal

Soils should be classified in accordance with WM3 and disposed to an appropriate facility based on their classification. Paperwork pertaining to the haulage and disposal of soils and demolition rubble should be retained for inclusion in the Validation Report.

5.3 Potable Water Supply Pipes

A copy of the potable water supply pipe assessment, along with evidence of the water supply pipe installation, should be retained for inclusion in the Validation Report.

Photographic evidence of the installation shall be provided by the groundworker for inclusion in the Validation Report.

5.4 Tracking of Site Won Soil

During the earthworks phase of the development groundworkers should record the source of site won soils and their destination on annotated site plans, along with a photographic record.

Pre-earthwork and post-earthwork topographic measurements should be performed to confirm the volumes.

Work should be paused and TFW Group Limited should be contacted immediately if unexpected/anomalous ground conditions are encountered.

5.5 Service Trench Backfill

Records of the clean aggregate used for service trench backfilling should be included in the Verification Report, including any supporting documents.

5.6 Validation Report

Following completion of the works a verification report should be compiled demonstrating the completion and effectiveness of the works set out in the Remediation Strategy.

The Verification Report should include, but not limited to, the following:

1. A record of any areas where made ground is removed (service runs, under roads etc).
2. For soils disposed of off-site, a record of the volume removed, from which areas and details of the receiving landfill. Transfer tickets should be retained.
3. Details of the Material Management Plan (MMP).
4. A record of the number of imported soil sources and their respective volumes.
5. Details of the source and supplier of all imported soils and appropriate permits, exemptions of MMPs for the imports.
6. Annotated site plans and photographic records detailing on-site soil movements.
7. Details of site visits.
8. Chemical test certificates for imported soils where available from the provider.
9. Chemical test data for all imported soils as sampled at source (if possible) and on site.
10. Details of the source and volume of any imported stone/aggregate.
11. Details of Potable Water Supply Pipe Assessment and Installations.

It is beyond the responsibilities of TFW Group to source these documents and they should be provided by the appropriate person as and when they become available.

SECTION 6 Working Practices

6.1 Protection of Construction Workers

In order that construction workers are protected during site works across the site the following should be adhered to:

1. Compliance with health and safety regulations
2. Provision of Method Statements and Risk Assessments
3. Compliance with Control of Substances Hazardous to Health (COSHH) Assessment
4. Good level of Personal Protection Equipment (PPE)
5. Good level of hygiene by site workers
6. Dust suppression measures
7. Emergency contingencies should be defined prior to commencement of site works

6.2 Protection of the Environment

During the remediation and construction periods, there is a risk to the environment and adjacent sites from de-watering, excavations, moving contaminated soil, drainage misconnections, discharges of perched groundwater to local surface waters or the ground, runoff from construction materials and/or exposed ground, wheel washing and oil or chemical spills.

A drainage plan should be devised, identifying manholes to prevent pollutants accidentally reaching surface water sewers. Temporary drainage measures may need to be put in place.

The contractor(s) must also strictly adhere to the Pollution Prevention Guidelines for Working at Construction and Demolition Sites (PPG6). This publication gives both advice and guidelines which should be followed with regards to the planning and preparation of site works, site drainage, delivery and storage of construction materials, the management of waste, good housekeeping in particular to prevent runoff of silt and other fines into nearby water courses, refuelling, concrete and what to do in the event of an emergency.

Within the documentation prepared by the contractor(s), the following information should be provided, but not limited to:

- Project Description
- Key participants/contractor(s)
- Technical procedures
- Phasing of works and approximate timescales
- Site plans to scale
- Details of consents or license needed
- Health and Safety, COSHH Assessment, Method Statements and Risk Assessments
- Emergency contingencies

In addition, the following precautions should also be taken.

- All potential chemicals and associated risks and emergency procedures for spills/leaks should be considered in the site risk assessment and the details provided to all site employees.
- Any potential pollutant materials or chemicals/detergents used on site should be adequately stored in suitable containers, with clear labelling.
- Any oil or hazardous substance containers and associated pipe works should be enclosed within a bund.
- Care taken during delivery of materials, with correct supervision and labelling detailing the substance and its quantities.
- All delivery drivers should be informed of procedures and restrictions.

- Any materials on delivery should be covered to ensure there is no spillage.
- Any detergents, paints, chemicals etc should not be allowed to be discharged into surface drains or water courses.
- Washing out and cleaning of concrete/cement plant should be carried out in a contained area with adequate measures to collect all run-off water.
- Security and prevention of vandalism, especially of oil drums/containers.

6.3 Material Management & Disposal of Soils

If earthworks are proposed using site won made ground or imported natural soil a CL:AIRE MMP should be submitted to legitimise the process (subject to the proposal meeting the criteria of CL:AIRE DoWCoP).

As a minimum, for the submission of the MMP, the following will be required;

- Details of the roles of parties involved in the project (client, developer, hauliers, groundworkers etc)
- Ground Investigation Reports
- Remedial Strategy
- Detailed soil volume calculations including plans
- Full Planning Permission
- 'No-Objection' from Environment Agency
- 'No-Objection' from Environmental Health Officer
- Agreement from Environmental Health Officer in relation to proposed test regime for site won soil
- Agreement from Environmental Health Officer in relation to proposed test regime for imported soil
- Contingencies for out of specification material
- Proposed tracking system for soil movements

Due to the need to consult with Regulators and an external CL:AIRE Qualified Person, and the need to address any feedback from these consultees, a minimum timeframe of 8 weeks should be factored in to the project programme for the submission of a CL:AIRE MMP once all supporting documentation has been compiled. CL:AIRE DoWCoP cannot be applied retrospectively and earthworks cannot be commenced until the MMP has been submitted

It was noted that the north of the Phase 1 area included the former 'Marls' landfill site. NRW will need to be consulted regarding the use of an MMP on a former landfill site but we anticipate NRW will not permit the re-use of site-won material from the former landfill site and as such any arisings from this area will require appropriate off-site disposal.

All materials excavated should be managed and stored appropriately in a controlled manner to ensure protection of site construction workers and neighbouring site users, and to prevent the transfer of contamination to other areas of the site. If unexpected/anomalous ground conditions are encountered work should pause and TFW Group Limited be contacted immediately.

The Local Authority should be consulted regarding the import of recycled aggregate to confirm the status of the material and agree a testing regime for such imports. Import of recycled aggregates will not be covered by a CL:AIRE MMP and it may be necessary to ensure imported recycled aggregates have been produced under WRAP Protocol.

Excavated made ground may be disposed of at landfill. Prior to disposal classification of the material will need to be completed in accordance with Environment Agency protocol detailed in 'Technical Guidance WM3 – Waste Classification - Guidance on the Classification and Assessment of Waste'.

Waste transfer and disposal must be undertaken by an authorised person. A waste transfer notes/consignment notes must accompany each load and records should be maintained for inspection if required

DRAWINGS

KEY:

- PHASE 1 BOUNDARY
- PROPOSED 400 X 400mm GLENWOOD TIMBER BOLLARDS OR SIMILIAR APPROVED
- PROPOSED SIGNAGE
- TREE PROTECTION ZONE
- TREE PROTECTION ZONE
- TREE PROTECTION ZONE

NOTES:

1. HIT AND MISS KERBING / RAINGARDEN INLETS REQUIRED TO ALL PROPOSED HIGHWAYS ADJACENT RAINGARDENS.

SIGNAGE

1. NO RIGHT TURN FOR CYCLISTS
2. NO LEFT TURN FOR CYCLISTS
3. CYCLISTS REJOIN CARRIAGEWAY

Rev.	Description	By	Chk	App
P01	ISSUED FOR COMMENT	AR	BW	WJ
		22/04/21		

Client: CARDIFF CAERDYDD

Project: CHANNEL VIEW, CARDIFF

Drawing Title: PHASE 1 GENERAL ARRANGEMENT

Drawing No. CC2083 CAM ZZ 00 GA C 90 0040

Status:	Scale @A1:	Rev:
S3 PRELIMINARY	1:250	P01

CAMBRIA
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APPENDIX 7
DRAWING: 315486-BL-276-SS-D-C-27601-C03

DO NOT SCALE FROM THIS DRAWING

N

OF 2

Possible pump cell location

OF 3
M2

Indicative pipe reactor

1

3

Indicative Silt buster location depending on build programme

4

M1

Indicative Silt buster location depending on build programme

4

OF 1
M3

J4

Swale 3 - (28m² base) 200mm depression with 1:3 batter
I.L (base): 8.580 with supplementary cellular storage at base storage volume = 21.3m³

J3

Proposed silt fencing

Swale 1 - (36.2m² base) 250mm depression with 1:3 batter depression with bioretention area to discharge to pond.
I.L(base): 8.580

J2

Swale 2 - (15.2m² base) 200mm depression with 1:3 batter
I.L (base): 8.600

Foul water discharge point

Indicative pump pipework

M5

2

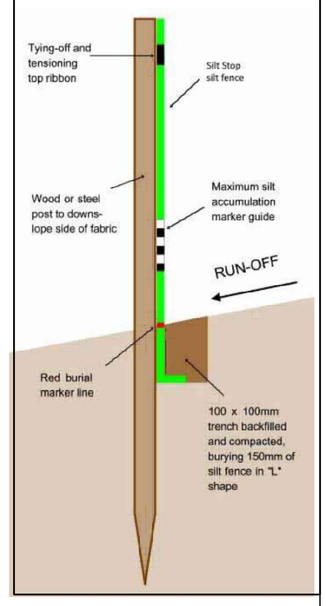
J1

M4

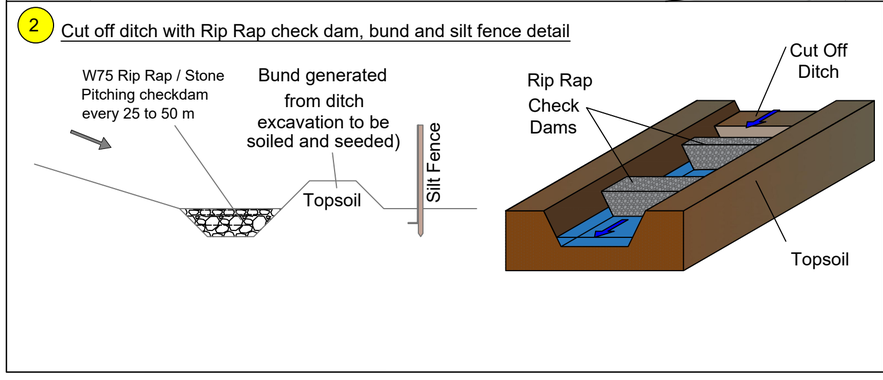
Proposed cut off ditch and silt fence

Temporary catch pit and sump to over pump from

Silt fence Install Detail



2 Cut off ditch with Rip Rap check dam, bund and silt fence detail



LEGEND

- Site boundary
- Proposed silt fencing
- Proposed temporary line of silt fencing during sewer diversion works
- Proposed cut off ditch and silt fence
- Existing surface water sewer
- Retained sections of storm sewer
- Proposed surface water sewer diversion
- Proposed new drainage sewer
- Indicative pump pipework
- 3m buffer zone
- Approximate extents of recorded Japanese Knotweed
- Swale
- Site compound
- Temporary catch pit and sump to over pump from
- 1 Possible pump cell location
- 2 Cut off ditch
- 3 Indicative pipe reactor location
- 4 Indicative Silt buster location depending on build programme
- M1 Primary monitoring location
- Lamela separator

Notes:

Base plan provided by client
Drawing Ref.: CC2083 CAM ZZ 00 SK 52 0020 P08 Phase 1 - Drainage Diversions (Option 1)

RSK GEOSCIENCES
The Old School
Stillhouse Lane
Bristol
BS3 4EB
Tel: +44(0)1414 180471
Email: info@rsk.co.uk
Web: www.rsk.co.uk

Client: Wates Group Ltd

Project Name: Channel View, Phase 1

Description: Surface Water Management Plan

Dimension	Scale	Size	Project ID	Drawing no.	Revision	File name
m	NTS	A1	315486	27601	C03	315486-BL-276-SS-D-C-27601-C03

Rev	Date	Amendment	Drawn	Chkd	Appd
C03	12.12.24	Third Issue	LS	TC	TC
C02	21.05.24	Second Issue	AS	TC	TC
C01	20.03.24	First Issue	AS	TC	TC