

Our Ref: AC/14647/VR-Plots 84, 85, 86, 87, 88, 89, 111-113

Your Ref:

Contact: Aaron Case

21<sup>st</sup> December 2022

Persimmon Homes West Wales  
Dragon House  
Parc y Ddraig  
Penllagaer Business Park  
Swansea  
SA4 9HJ

For the Attention of: Mr Ellis Jones

Dear Ellis,

## **CAPPING LAYER VALIDATION REPORT: PLOTS 84, 85, 86, 87, 88, 89, 111-113, AFAN LIDO, PORT TALBOT**

### **Section 1 Introduction**

Persimmon Homes West Wales (the Client) are developing land at the former Afan Lido site and land to the south of Channel View in Port Talbot for residential purposes. The majority of the dwellings are low-rise dwellings with private gardens. Sixteen apartments (65-72 and 93-100) are to be built within two buildings. The proposed layout is illustrated on **Drawing 01**.

Hyder Consulting (UK) Limited completed a Geo-environmental and Geotechnical Site Investigation in July 2015 (Report No. UA007442-001-R001). Terra Firma (Wales) Limited completed a Supplementary Geotechnical and Geo-environmental Site Investigation Report in November 2018, and a Remediation Strategy report in April 2022.

The Remediation Strategy report (14647/RS dated June 2021) made recommendation for mitigation measures in areas of soft surfacing. The recommendation was to place 600mm of clean inert soils over a no-dig membrane comprising a geo-grid and high-visibility geotextile.

TFW Group Limited have been commissioned by the Client to validate the thickness of the capping soils, presence of the no-dig membrane, and the soils suitability to be used in residential gardens with plant uptake based upon their chemical composition in the gardens of Plots 84, 85, 86, 87, 88, 89 and 111-113.

Capping soils comprise a top layer of soil comprising of dark brown, organic-rich silty slightly sandy slightly gravelly **CLAY** with occasional fine roots. The subsoil comprised brown mottled sandy slightly gravelly **CLAY**.

## Section 2 Soil Chemical Testing of Imported Soils

A TFW Group Limited engineer visited the site on 26<sup>th</sup> September and 4<sup>th</sup> October 2022 to collect samples for chemical analysis. Four samples from a 250m<sup>3</sup> stockpile of topsoil and four samples from a 250m<sup>3</sup> stockpile of subsoil were taken as per the guidance 'Requirements for the Chemical Testing of Imported Materials for Various End Uses and Validation of Cover Systems' prepared by the Welsh Land Contamination Working Group.

Samples were taken and despatched to the laboratories of Eurofins Chemtest for chemical testing of a broad pathfinder suite of metals, inorganics, speciated polycyclic aromatic hydrocarbons and petroleum hydrocarbons. The samples were also screened for asbestos.

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).

A summary of the chemical test results which include the regulatory soil guideline values used in the Tier 1 assessment are given in **Tables 3.1 to 3.3** and can be found in **Annex A**.

**Table 3.1 Summary of Soil Chemical Test Results – Inorganics & Miscellaneous**

| Substance           | Threshold Value (mg/kg) | Source   | Measured Concentrations (mg/kg) |              |              |              | Number of Exceedances |
|---------------------|-------------------------|----------|---------------------------------|--------------|--------------|--------------|-----------------------|
|                     |                         |          | Topsoil                         |              | Subsoil      |              |                       |
|                     |                         |          | Min                             | Max          | Min          | Max          |                       |
| Arsenic             | 37                      | LQM/CIEH | 5.0                             | 11           | 5.2          | 32           | 0                     |
| Cadmium             | 11                      | LQM/CIEH | <1.0                            | 0.17         | 0.48         | 1.2          | 0                     |
| Chromium III        | 910                     | LQM/CIEH | 9.7                             | 22           | 39           | 76           | 0                     |
| Chromium VI         | 6                       | LQM/CIEH | <0.5                            | <0.5         | <0.5         | <0.5         | 0                     |
| Copper              | 2400                    | LQM/CIEH | 8.6                             | 19           | 14           | 68           | 0                     |
| Lead                | 200                     | pC4SL    | 22                              | 50           | 22           | 42           | 0                     |
| Mercury (inorganic) | 40                      | LQM/CIEH | 0.05                            | 0.12         | <0.05        | 0.05         | 0                     |
| Nickel              | 180                     | LQM/CIEH | 5.3                             | 11           | 17           | 25           | 0                     |
| Selenium            | 250                     | LQM/CIEH | 0.41                            | 0.79         | 0.58         | 0.93         | 0                     |
| Zinc                | 3700                    | LQM/CIEH | 29                              | 53           | 90           | 170          | 0                     |
| Cyanide*            | -                       | -        | <0.50                           | <0.50        | <0.5         | <0.5         | 0                     |
| Phenols             | 120                     | LQM/CIEH | <0.1                            | <0.1         | <0.10        | <0.10        | 0                     |
| Boron               | 290                     | LQM/CIEH | 0.74                            | 1.4          | 0.76         | 2.6          | 0                     |
| Organic Matter (%)  | -                       | -        | 4.9                             | 5.2          | 0.30         | 1.0          | -                     |
| pH                  | -                       | -        | 6.7                             | 7.1          | 7.9          | 9.0          | -                     |
| Asbestos            | -                       | -        | Not Detected                    | Not Detected | Not Detected | Not Detected | 0                     |

Notes:

- No available guideline

\*Free Cyanide for Topsoil

**Table 3.2 Summary of Soil Chemical Test Results – Speciated PAH**

| Substance             | Threshold Value (mg/kg) | Source   | Measured Concentrations (mg/kg) |        |         |        | Number of Exceedances |
|-----------------------|-------------------------|----------|---------------------------------|--------|---------|--------|-----------------------|
|                       |                         |          | Topsoil                         |        | Subsoil |        |                       |
|                       |                         |          | Min                             | Max    | Min     | Max    |                       |
| Naphthalene           | 2.3                     | LQM/CIEH | < 0.10                          | < 0.10 | < 0.10  | < 0.10 | 0                     |
| Acenaphthylene        | 170                     | LQM/CIEH | < 0.10                          | < 0.10 | < 0.10  | < 0.10 | 0                     |
| Acenaphthene          | 210                     | LQM/CIEH | < 0.10                          | < 0.10 | < 0.10  | < 0.10 | 0                     |
| Fluorene              | 170                     | LQM/CIEH | < 0.10                          | < 0.10 | < 0.10  | < 0.10 | 0                     |
| Phenanthrene          | 95                      | LQM/CIEH | < 0.10                          | < 0.10 | < 0.10  | < 0.10 | 0                     |
| Anthracene            | 2400                    | LQM/CIEH | < 0.10                          | < 0.10 | < 0.10  | <0.10  | 0                     |
| Fluoranthene          | 280                     | LQM/CIEH | < 0.10                          | 0.33   | < 0.10  | 0.35   | 0                     |
| Pyrene                | 620                     | LQM/CIEH | < 0.10                          | 0.20   | < 0.10  | 0.32   | 0                     |
| Benzo(a)anthracene    | 7.2                     | LQM/CIEH | < 0.10                          | < 0.10 | < 0.10  | < 0.10 | 0                     |
| Chrysene              | 15                      | LQM/CIEH | < 0.10                          | < 0.10 | < 0.10  | < 0.10 | 0                     |
| Benzo(b)fluoranthene  | 2.6                     | LQM/CIEH | < 0.10                          | < 0.10 | < 0.10  | < 0.10 | 0                     |
| Benzo(k)fluoranthene  | 77                      | LQM/CIEH | < 0.10                          | < 0.10 | < 0.10  | < 0.10 | 0                     |
| Benzo(a)pyrene        | 2.2                     | LQM/CIEH | < 0.10                          | < 0.10 | < 0.10  | < 0.10 | 0                     |
| Indeno(123cd)pyrene   | 27                      | LQM/CIEH | < 0.10                          | < 0.10 | < 0.10  | < 0.10 | 0                     |
| Dibenzo(ah)anthracene | 0.24                    | LQM/CIEH | < 0.10                          | < 0.10 | < 0.10  | < 0.10 | 0                     |
| Benzo(ghi)perylene    | 320                     | LQM/CIEH | < 0.10                          | < 0.10 | < 0.10  | < 0.10 | 0                     |
| Total PAH             | -                       | -        | < 2.0                           | < 2.0  | < 2.0   | <2.0   | -                     |

Notes:

Thresholds based on 1.0% soil organic matter

- No available guidelines

**Table 3.3 Summary of Soil Chemical Test Results – Petroleum Hydrocarbons**

| Substance        | Threshold Value (mg/kg) | Source   | Measured Concentrations (mg/kg) |       |         |       | Number of Exceedances |
|------------------|-------------------------|----------|---------------------------------|-------|---------|-------|-----------------------|
|                  |                         |          | Topsoil                         |       | Subsoil |       |                       |
|                  |                         |          | Min                             | Max   | Min     | Max   |                       |
| Aliphatic        |                         |          |                                 |       |         |       |                       |
| PH C5 – C6 Ali   | 42                      | LQM/CIEH | < 1.0                           | < 1.0 | < 1.0   | < 1.0 | 0                     |
| PH C6 – C8 Ali   | 100                     | LQM/CIEH | < 1.0                           | < 1.0 | < 1.0   | < 1.0 | 0                     |
| PH C8 – C10 Ali  | 27                      | LQM/CIEH | < 1.0                           | < 1.0 | < 1.0   | < 1.0 | 0                     |
| PH C10 – C12 Ali | 130                     | LQM/CIEH | < 1.0                           | < 1.0 | < 1.0   | < 1.0 | 0                     |
| PH C12 – C16 Ali | 1100                    | LQM/CIEH | < 1.0                           | < 1.0 | < 1.0   | 15    | 0                     |
| PH C16 – C21 Ali | 65000*                  | LQM/CIEH | < 1.0                           | < 1.0 | < 1.0   | 22    | 0                     |
| PH C21 – C35 Ali | 65000*                  | LQM/CIEH | < 1.0                           | < 1.0 | < 1.0   | 180   | 0                     |
| PH C35 – C44 Ali | 65000                   | LQM/CIEH | < 1.0                           | < 1.0 | < 1.0   | < 1.0 | 0                     |
| Aromatic         |                         |          |                                 |       |         |       |                       |
| PH C5 – C7 Arom  | 70                      | LQM/CIEH | < 1.0                           | < 1.0 | < 1.0   | < 1.0 | 0                     |
| PH C7 – C8 Arom  | 130                     | LQM/CIEH | < 1.0                           | < 1.0 | < 1.0   | < 1.0 | 0                     |
| PH C8 – C10 Arom | 34                      | LQM/CIEH | < 1.0                           | < 1.0 | < 1.0   | < 1.0 | 0                     |

|                   |      |          |       |       |       |       |   |
|-------------------|------|----------|-------|-------|-------|-------|---|
| PH C10 – C12 Arom | 74   | LQM/CIEH | < 1.0 | < 1.0 | < 1.0 | < 1.0 | 0 |
| PH C12 – C16 Arom | 140  | LQM/CIEH | < 1.0 | < 1.0 | < 1.0 | < 1.0 | 0 |
| PH C16 – C21 Arom | 260  | LQM/CIEH | < 1.0 | < 1.0 | < 1.0 | < 1.0 | 0 |
| PH C21 – C35 Arom | 1100 | LQM/CIEH | < 1.0 | < 1.0 | < 1.0 | 34    | 0 |
| PH C35 – C44 Arom | 1100 | LQM/CIEH | < 1.0 | < 1.0 | < 1.0 | < 1.0 | 0 |

Notes:

PH – Petroleum Hydrocarbon

Ali – Aliphatic

Arom – Aromatic

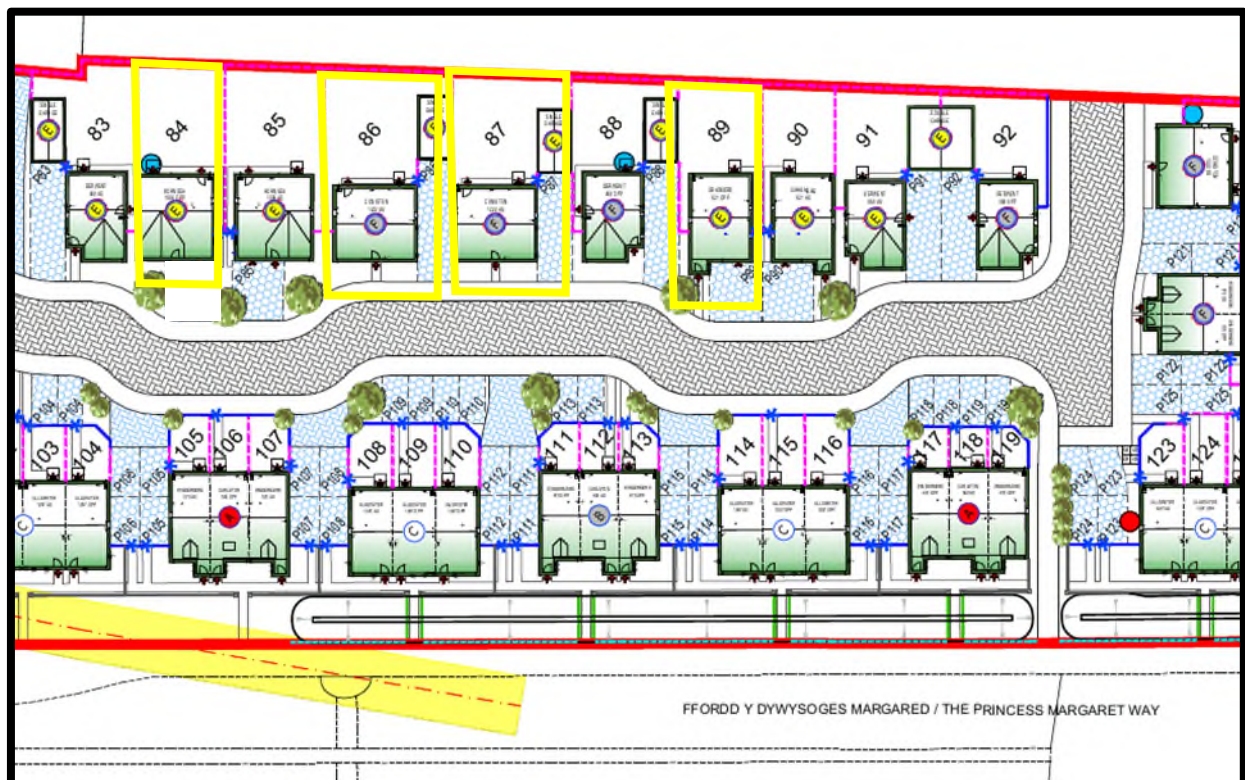
Thresholds based on 1.0% soil organic matter

\* – Ali C16-21 and C21-C35 based on criteria for Ali EC >16-35

### Section 3 Verification of Capping Thickness and No Dig Barrier

A TFW Group Limited engineer visited the site on 14<sup>th</sup> December 2022 to confirm the capping thickness and presence of a no-dig barrier comprising a high-visibility geotextile and geogrid. In accordance with WLGA document 'Requirements for the Chemical Testing of Imported Materials for Various End Uses and Validation of Cover Systems', one in every four plots require validation across the site.

A hand dug inspection pit was excavated, inspected, and photographed in the rear garden of Plot 84, 85, 87, and 89 as indicated in **Figure 3.1**.



**Figure 3.1: Location of Validation Plots and Pit Location**

**Table 3.1** records the depth of the upper soil layer and lower soil layer, and the depth of samples taken.

**Table 3.1 Summary of Capping Soil Thickness and Sample Depth**

| Plot    | Upper Soil Layer Depth (m) | Sample Depth (m) | Lower Soil Layer Depth (m) | Sample Depth (m) | High Visibility Geotextile Membrane Present? |
|---------|----------------------------|------------------|----------------------------|------------------|----------------------------------------------|
| Plot 84 | 0.15                       | -                | 0.60                       | -                | Yes                                          |
| Plot 85 | 0.15                       | -                | 0.60                       | -                | Yes                                          |
| Plot 87 | 0.15                       | -                | 0.60                       | -                | Yes                                          |
| Plot 89 | 0.15                       | -                | 0.60                       | -                | Yes                                          |

Photographs of the inspection trial pit and no-dig membrane are presented in **Annex B**.

#### **Section 4 Conclusion**

The above sections demonstrate that all substances tested for were below their respective Tier 1 threshold values, and that sufficient depth of capping soil has been placed above a high-visibility geotextile layer.

It is therefore concluded that the hazard to receptor pathway has been successfully interrupted and, in relation to contamination only, and the garden areas, of Plots 84, 85, 86, 87, 88, 89, 111-113 have been made suitable for their intended use.

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**

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

**Aaron Case**

**ANNEX A**  
**Soil Laboratory Chemical Test Results**



# Final Report

---

**Report No.:** 22-38079-1  
**Initial Date of Issue:** 17-Oct-2022  
**Client** Terra Firma (Wales) Ltd

**Client Address:** 5 Deryn Court  
Wharfedale Road  
Pentwyn  
Cardiff  
CF23 7HA

**Contact(s):** Michael Watkins

**Project** Afan Lido

**Quotation No.:** **Date Received:** 06-Oct-2022

**Order No.:** 14647-MW **Date Instructed:** 06-Oct-2022

**No. of Samples:** 2

**Turnaround (Wkdays):** 5 **Results Due:** 12-Oct-2022

**Date Approved:** 17-Oct-2022

**Approved By:**

**Details:** Stuart Henderson, Technical  
Manager

---

## Results - Soil

### Project: Afan Lido

|                                 |         |                      |       |       |                      |                      |
|---------------------------------|---------|----------------------|-------|-------|----------------------|----------------------|
| Client: Terra Firma (Wales) Ltd |         | Chemtest Job No.:    |       |       | 22-38079             | 22-38079             |
| Quotation No.:                  |         | Chemtest Sample ID.: |       |       | 1519445              | 1519446              |
|                                 |         | Sample Location:     |       |       | TS3                  | TS4                  |
|                                 |         | Sample Type:         |       |       | SOIL                 | SOIL                 |
|                                 |         | Date Sampled:        |       |       | 04-Oct-2022          | 04-Oct-2022          |
|                                 |         | Asbestos Lab:        |       |       | DURHAM               | DURHAM               |
| Determinand                     | Accred. | SOP                  | Units | LOD   |                      |                      |
| ACM Type                        | U       | 2192                 |       | N/A   | -                    | -                    |
| Asbestos Identification         | U       | 2192                 |       | N/A   | No Asbestos Detected | No Asbestos Detected |
| ACM Detection Stage             | U       | 2192                 |       | N/A   | -                    | -                    |
| Moisture                        | N       | 2030                 | %     | 0.020 | 19                   | 17                   |
| Soil Colour                     | N       | 2040                 |       | N/A   | Brown                | Brown                |
| Other Material                  | N       | 2040                 |       | N/A   | Stones               | Stones               |
| Soil Texture                    | N       | 2040                 |       | N/A   | Sand                 | Sand                 |
| pH                              | M       | 2010                 |       | 4.0   | 6.8                  | 6.7                  |
| Boron (Hot Water Soluble)       | M       | 2120                 | mg/kg | 0.40  | 1.1                  | 0.74                 |
| Cyanide (Total)                 | M       | 2300                 | mg/kg | 0.50  | 0.50                 | 0.50                 |
| Sulphate (Acid Soluble)         | U       | 2430                 | %     | 0.010 | 0.080                | 0.040                |
| Arsenic                         | M       | 2455                 | mg/kg | 0.5   | 7.8                  | 5.0                  |
| Cadmium                         | M       | 2455                 | mg/kg | 0.10  | 0.14                 | < 0.10               |
| Chromium                        | M       | 2455                 | mg/kg | 0.5   | 15                   | 9.7                  |
| Mercury Low Level               | M       | 2450                 | mg/kg | 0.05  | 0.08                 | 0.05                 |
| Copper                          | M       | 2455                 | mg/kg | 0.50  | 13                   | 8.6                  |
| Nickel                          | M       | 2455                 | mg/kg | 0.50  | 7.5                  | 5.3                  |
| Lead                            | M       | 2455                 | mg/kg | 0.50  | 31                   | 22                   |
| Selenium                        | M       | 2455                 | mg/kg | 0.25  | 0.52                 | 0.54                 |
| Zinc                            | M       | 2455                 | mg/kg | 0.50  | 37                   | 29                   |
| Chromium (Trivalent)            | N       | 2490                 | mg/kg | 1.0   | 15                   | 9.7                  |
| Chromium (Hexavalent)           | N       | 2490                 | mg/kg | 0.50  | < 0.50               | < 0.50               |
| Aliphatic TPH >C5-C6            | N       | 2680                 | mg/kg | 1.0   | < 1.0                | < 1.0                |
| Aliphatic TPH >C6-C8            | N       | 2680                 | mg/kg | 1.0   | < 1.0                | < 1.0                |
| Aliphatic TPH >C8-C10           | M       | 2680                 | mg/kg | 1.0   | < 1.0                | < 1.0                |
| Aliphatic TPH >C10-C12          | M       | 2680                 | mg/kg | 1.0   | < 1.0                | < 1.0                |
| Aliphatic TPH >C12-C16          | M       | 2680                 | mg/kg | 1.0   | < 1.0                | < 1.0                |
| Aliphatic TPH >C16-C21          | M       | 2680                 | mg/kg | 1.0   | < 1.0                | < 1.0                |
| Aliphatic TPH >C21-C35          | M       | 2680                 | mg/kg | 1.0   | < 1.0                | < 1.0                |
| Aliphatic TPH >C35-C44          | N       | 2680                 | mg/kg | 1.0   | < 1.0                | < 1.0                |
| Total Aliphatic Hydrocarbons    | N       | 2680                 | mg/kg | 5.0   | < 5.0                | < 5.0                |
| Aromatic TPH >C5-C7             | N       | 2680                 | mg/kg | 1.0   | < 1.0                | < 1.0                |
| Aromatic TPH >C7-C8             | N       | 2680                 | mg/kg | 1.0   | < 1.0                | < 1.0                |
| Aromatic TPH >C8-C10            | M       | 2680                 | mg/kg | 1.0   | < 1.0                | < 1.0                |
| Aromatic TPH >C10-C12           | U       | 2680                 | mg/kg | 1.0   | < 1.0                | < 1.0                |
| Aromatic TPH >C12-C16           | U       | 2680                 | mg/kg | 1.0   | < 1.0                | < 1.0                |
| Aromatic TPH >C16-C21           | N       | 2680                 | mg/kg | 1.0   | < 1.0                | < 1.0                |
| Aromatic TPH >C21-C35           | M       | 2680                 | mg/kg | 1.0   | < 1.0                | < 1.0                |
| Aromatic TPH >C35-C44           | N       | 2680                 | mg/kg | 1.0   | < 1.0                | < 1.0                |

## Results - Soil

**Project: Afan Lido**

|                                 |                      |      |       |      |             |             |
|---------------------------------|----------------------|------|-------|------|-------------|-------------|
| Client: Terra Firma (Wales) Ltd | Chemtest Job No.:    |      |       |      | 22-38079    | 22-38079    |
| Quotation No.:                  | Chemtest Sample ID.: |      |       |      | 1519445     | 1519446     |
|                                 | Sample Location:     |      |       |      | TS3         | TS4         |
|                                 | Sample Type:         |      |       |      | SOIL        | SOIL        |
|                                 | Date Sampled:        |      |       |      | 04-Oct-2022 | 04-Oct-2022 |
|                                 | Asbestos Lab:        |      |       |      | DURHAM      | DURHAM      |
| Determinand                     | Accred.              | SOP  | Units | LOD  |             |             |
| Total Aromatic Hydrocarbons     | N                    | 2680 | mg/kg | 5.0  | < 5.0       | < 5.0       |
| Total Petroleum Hydrocarbons    | N                    | 2680 | mg/kg | 10.0 | < 10        | < 10        |
| Naphthalene                     | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Acenaphthylene                  | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Acenaphthene                    | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Fluorene                        | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Phenanthrene                    | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Anthracene                      | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Fluoranthene                    | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Pyrene                          | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Benzo[a]anthracene              | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Chrysene                        | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Benzo[b]fluoranthene            | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Benzo[k]fluoranthene            | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Benzo[a]pyrene                  | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Indeno(1,2,3-c,d)Pyrene         | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Dibenz(a,h)Anthracene           | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Benzo[g,h,i]perylene            | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Total Of 16 PAH's               | M                    | 2700 | mg/kg | 2.0  | < 2.0       | < 2.0       |
| Total Phenols                   | M                    | 2920 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Organic Matter BS1377           | N                    | 2930 | %     | 0.10 | 5.1         | 4.9         |

## Test Methods

| SOP  | Title                                                               | Parameters included                                                                                                                                                                                                                                           | Method summary                                                                                                                                                                         |
|------|---------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2010 | pH Value of Soils                                                   | pH                                                                                                                                                                                                                                                            | pH Meter                                                                                                                                                                               |
| 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                                                                                                                                                                               | Alkaline 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. |
| 2680 | TPH A/A Split                                                       | 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                                                                                 | Dichloromethane 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; Dibenzo[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)                                                   |
| 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                                                                                                                                                    |

## **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](mailto:customerservices@chemtest.com)



# Amended Report

---

|                               |                                                                    |                          |             |
|-------------------------------|--------------------------------------------------------------------|--------------------------|-------------|
| <b>Report No.:</b>            | 22-37012-2                                                         |                          |             |
| <b>Initial Date of Issue:</b> | 11-Oct-2022                                                        | <b>Date of Re-Issue:</b> | 12-Oct-2022 |
| <b>Client</b>                 | Terra Firma (Wales) Ltd                                            |                          |             |
| <b>Client Address:</b>        | 5 Deryn Court<br>Wharfedale Road<br>Pentwyn<br>Cardiff<br>CF23 7HA |                          |             |
| <b>Contact(s):</b>            | michael@terrafirmawales.co.uk                                      |                          |             |
| <b>Project</b>                | Afan Lido                                                          |                          |             |
| <b>Quotation No.:</b>         | Q20-21666                                                          | <b>Date Received:</b>    | 28-Sep-2022 |
| <b>Order No.:</b>             | 14647-MW                                                           | <b>Date Instructed:</b>  | 28-Sep-2022 |
| <b>No. of Samples:</b>        | 2                                                                  |                          |             |
| <b>Turnaround (Wkdays):</b>   | 15                                                                 | <b>Results Due:</b>      | 18-Oct-2022 |
| <b>Date Approved:</b>         | 12-Oct-2022                                                        |                          |             |
| <b>Approved By:</b>           |                                                                    |                          |             |

**Details:** Stuart Henderson, Technical Manager

---

## Results - Soil

**Project: Afan Lido**

|                                 |                      |      |       |       |                      |                      |
|---------------------------------|----------------------|------|-------|-------|----------------------|----------------------|
| Client: Terra Firma (Wales) Ltd | Chemtest Job No.:    |      |       |       | 22-37012             | 22-37012             |
| Quotation No.: Q20-21666        | Chemtest Sample ID.: |      |       |       | 1514355              | 1514356              |
|                                 | Client Sample ID.:   |      |       |       | TS1                  | TS2                  |
|                                 | Sample Type:         |      |       |       | SOIL                 | SOIL                 |
|                                 | Date Sampled:        |      |       |       | 26-Sep-2022          | 26-Sep-2022          |
|                                 | Time Sampled:        |      |       |       | 12:00                | 12:00                |
|                                 | Asbestos Lab:        |      |       |       | DURHAM               | DURHAM               |
| Determinand                     | Accred.              | SOP  | Units | LOD   |                      |                      |
| ACM Type                        | U                    | 2192 |       | N/A   | -                    | -                    |
| Asbestos Identification         | U                    | 2192 |       | N/A   | No Asbestos Detected | No Asbestos Detected |
| ACM Detection Stage             | U                    | 2192 |       | N/A   | -                    | -                    |
| Moisture                        | N                    | 2030 | %     | 0.020 | 17                   | 17                   |
| Soil Colour                     | N                    | 2040 |       | N/A   | Brown                | Brown                |
| Other Material                  | N                    | 2040 |       | N/A   | Stones               | Stones               |
| Soil Texture                    | N                    | 2040 |       | N/A   | Sand                 | Sand                 |
| pH                              | M                    | 2010 |       | 4.0   | 7.1                  | 7.1                  |
| Boron (Hot Water Soluble)       | M                    | 2120 | mg/kg | 0.40  | 1.4                  | 1.4                  |
| Cyanide (Free)                  | M                    | 2300 | mg/kg | 0.50  |                      | < 0.50               |
| Cyanide (Total)                 | M                    | 2300 | mg/kg | 0.50  | < 0.50               | 0.60                 |
| Sulphate (Acid Soluble)         | U                    | 2430 | %     | 0.010 | 0.066                | 0.052                |
| Arsenic                         | M                    | 2455 | mg/kg | 0.5   | 11                   | 9.1                  |
| Cadmium                         | M                    | 2455 | mg/kg | 0.10  | 0.17                 | 0.13                 |
| Chromium                        | M                    | 2455 | mg/kg | 0.5   | 22                   | 17                   |
| Mercury Low Level               | M                    | 2450 | mg/kg | 0.05  | 0.12                 | 0.09                 |
| Copper                          | M                    | 2455 | mg/kg | 0.50  | 19                   | 15                   |
| Nickel                          | M                    | 2455 | mg/kg | 0.50  | 11                   | 8.4                  |
| Lead                            | M                    | 2455 | mg/kg | 0.50  | 50                   | 41                   |
| Selenium                        | M                    | 2455 | mg/kg | 0.25  | 0.79                 | 0.41                 |
| Zinc                            | M                    | 2455 | mg/kg | 0.50  | 53                   | 44                   |
| Chromium (Trivalent)            | N                    | 2490 | mg/kg | 1.0   | 22                   | 17                   |
| Chromium (Hexavalent)           | N                    | 2490 | mg/kg | 0.50  | < 0.50               | < 0.50               |
| Aliphatic TPH >C5-C6            | N                    | 2680 | mg/kg | 1.0   | < 1.0                | < 1.0                |
| Aliphatic TPH >C6-C8            | N                    | 2680 | mg/kg | 1.0   | < 1.0                | < 1.0                |
| Aliphatic TPH >C8-C10           | M                    | 2680 | mg/kg | 1.0   | < 1.0                | < 1.0                |
| Aliphatic TPH >C10-C12          | M                    | 2680 | mg/kg | 1.0   | < 1.0                | < 1.0                |
| Aliphatic TPH >C12-C16          | M                    | 2680 | mg/kg | 1.0   | < 1.0                | < 1.0                |
| Aliphatic TPH >C16-C21          | M                    | 2680 | mg/kg | 1.0   | < 1.0                | < 1.0                |
| Aliphatic TPH >C21-C35          | M                    | 2680 | mg/kg | 1.0   | < 1.0                | < 1.0                |
| Aliphatic TPH >C35-C44          | N                    | 2680 | mg/kg | 1.0   | < 1.0                | < 1.0                |
| Total Aliphatic Hydrocarbons    | N                    | 2680 | mg/kg | 5.0   | < 5.0                | < 5.0                |
| Aromatic TPH >C5-C7             | N                    | 2680 | mg/kg | 1.0   | < 1.0                | < 1.0                |
| Aromatic TPH >C7-C8             | N                    | 2680 | mg/kg | 1.0   | < 1.0                | < 1.0                |
| Aromatic TPH >C8-C10            | M                    | 2680 | mg/kg | 1.0   | < 1.0                | < 1.0                |
| Aromatic TPH >C10-C12           | U                    | 2680 | mg/kg | 1.0   | < 1.0                | < 1.0                |
| Aromatic TPH >C12-C16           | U                    | 2680 | mg/kg | 1.0   | < 1.0                | < 1.0                |
| Aromatic TPH >C16-C21           | U                    | 2680 | mg/kg | 1.0   | < 1.0                | < 1.0                |

## Results - Soil

**Project: Afan Lido**

|                                 |                      |      |       |      |             |             |
|---------------------------------|----------------------|------|-------|------|-------------|-------------|
| Client: Terra Firma (Wales) Ltd | Chemtest Job No.:    |      |       |      | 22-37012    | 22-37012    |
| Quotation No.: Q20-21666        | Chemtest Sample ID.: |      |       |      | 1514355     | 1514356     |
|                                 | Client Sample ID.:   |      |       |      | TS1         | TS2         |
|                                 | Sample Type:         |      |       |      | SOIL        | SOIL        |
|                                 | Date Sampled:        |      |       |      | 26-Sep-2022 | 26-Sep-2022 |
|                                 | Time Sampled:        |      |       |      | 12:00       | 12:00       |
|                                 | Asbestos Lab:        |      |       |      | DURHAM      | DURHAM      |
| Determinand                     | Accred.              | SOP  | Units | LOD  |             |             |
| Aromatic TPH >C21-C35           | M                    | 2680 | mg/kg | 1.0  | < 1.0       | < 1.0       |
| Aromatic TPH >C35-C44           | N                    | 2680 | mg/kg | 1.0  | < 1.0       | < 1.0       |
| Total Aromatic Hydrocarbons     | N                    | 2680 | mg/kg | 5.0  | < 5.0       | < 5.0       |
| Total Petroleum Hydrocarbons    | N                    | 2680 | mg/kg | 10.0 | < 10        | < 10        |
| Naphthalene                     | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Acenaphthylene                  | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Acenaphthene                    | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Fluorene                        | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Phenanthrene                    | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Anthracene                      | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Fluoranthene                    | M                    | 2700 | mg/kg | 0.10 | 0.33        | < 0.10      |
| Pyrene                          | M                    | 2700 | mg/kg | 0.10 | 0.20        | < 0.10      |
| Benzo[a]anthracene              | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Chrysene                        | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Benzo[b]fluoranthene            | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Benzo[k]fluoranthene            | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Benzo[a]pyrene                  | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Indeno(1,2,3-c,d)Pyrene         | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Dibenz(a,h)Anthracene           | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Benzo[g,h,i]perylene            | M                    | 2700 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Total Of 16 PAH's               | M                    | 2700 | mg/kg | 2.0  | < 2.0       | < 2.0       |
| Total Phenols                   | M                    | 2920 | mg/kg | 0.10 | < 0.10      | < 0.10      |
| Organic Matter BS1377           | N                    | 2930 | %     | 0.10 | 5.2         | 4.0         |

## Test Methods

| SOP  | Title                                                               | Parameters included                                                                                                                                                                                                                                          | Method summary                                                                                                                                                                         |
|------|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2010 | pH Value of Soils                                                   | pH                                                                                                                                                                                                                                                           | pH Meter                                                                                                                                                                               |
| 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                                                                                                                                                                              | Alkaline 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.                                                                                                               |
| 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-diphenylcarbazine. |
| 2680 | TPH A/A Split                                                       | 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                                                                                | Dichloromethane 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)                                                   |
| 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                                                                                                                                                    |

## **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](mailto:customerservices@chemtest.com)



# Final Report

---

**Report No.:** 22-37871-1

**Initial Date of Issue:** 13-Oct-2022

**Client** Terra Firma (Wales) Ltd

**Client Address:** 5 Deryn Court  
Wharfedale Road  
Pentwyn  
Cardiff  
CF23 7HA

**Contact(s):** michael@terrafirmawales.co.uk

**Project** Afan Lido

**Quotation No.:** Q20-21666

**Date Received:** 05-Oct-2022

**Order No.:** 14647-MW

**Date Instructed:** 05-Oct-2022

**No. of Samples:** 4

**Turnaround (Wkdays):** 5

**Results Due:** 11-Oct-2022

**Date Approved:** 13-Oct-2022

**Approved By:**

**Details:** Stuart Henderson, Technical  
Manager

---

## Results - Soil

### Project: Afan Lido

|                                        |                             |            |              |            |                      |                      |                      |                      |
|----------------------------------------|-----------------------------|------------|--------------|------------|----------------------|----------------------|----------------------|----------------------|
| <b>Client: Terra Firma (Wales) Ltd</b> | <b>Chemtest Job No.:</b>    |            |              |            | 22-37871             | 22-37871             | 22-37871             | 22-37871             |
| Quotation No.: Q20-21666               | <b>Chemtest Sample ID.:</b> |            |              |            | 1518291              | 1518292              | 1518293              | 1518294              |
|                                        | Client Sample ID.:          |            |              |            | SS1                  | SS2                  | SS3                  | SS4                  |
|                                        | Sample Type:                |            |              |            | SOIL                 | SOIL                 | SOIL                 | SOIL                 |
|                                        | Date Sampled:               |            |              |            | 04-Oct-2022          | 04-Oct-2022          | 04-Oct-2022          | 04-Oct-2022          |
|                                        | Time Sampled:               |            |              |            | 12:00                | 12:00                | 12:00                | 12:00                |
|                                        | Asbestos Lab:               |            |              |            | NEW-ASB              | NEW-ASB              | NEW-ASB              | NEW-ASB              |
| <b>Determinand</b>                     | <b>Accred.</b>              | <b>SOP</b> | <b>Units</b> | <b>LOD</b> |                      |                      |                      |                      |
| ACM Type                               | U                           | 2192       |              | N/A        | -                    | -                    | -                    | -                    |
| Asbestos Identification                | U                           | 2192       |              | N/A        | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected | No Asbestos Detected |
| ACM Detection Stage                    | U                           | 2192       |              | N/A        | -                    | -                    | -                    | -                    |
| Moisture                               | N                           | 2030       | %            | 0.020      | 7.8                  | 7.1                  | 5.8                  | 5.9                  |
| Soil Colour                            | N                           | 2040       |              | N/A        | Brown                | Brown                | Brown                | Brown                |
| Other Material                         | N                           | 2040       |              | N/A        | Stones               | Stones               | Stones               | Stones               |
| Soil Texture                           | N                           | 2040       |              | N/A        | Sand                 | Sand                 | Sand                 | Sand                 |
| pH                                     | M                           | 2010       |              | 4.0        | 7.9                  | 9.2                  | 9.0                  | 9.0                  |
| Boron (Hot Water Soluble)              | M                           | 2120       | mg/kg        | 0.40       | 2.0                  | 1.8                  | 0.76                 | 2.6                  |
| Cyanide (Total)                        | M                           | 2300       | mg/kg        | 0.50       | < 0.50               | < 0.50               | < 0.50               | < 0.50               |
| Sulphate (Acid Soluble)                | U                           | 2430       | %            | 0.010      | 0.068                | 0.063                | 0.070                | 0.067                |
| Arsenic                                | M                           | 2455       | mg/kg        | 0.5        | 5.9                  | 5.2                  | 32                   | 5.2                  |
| Cadmium                                | M                           | 2455       | mg/kg        | 0.10       | 1.2                  | 0.48                 | 0.60                 | 0.49                 |
| Chromium                               | M                           | 2455       | mg/kg        | 0.5        | 76                   | 39                   | 50                   | 60                   |
| Mercury Low Level                      | M                           | 2450       | mg/kg        | 0.05       | 0.05                 | < 0.05               | < 0.05               | < 0.05               |
| Copper                                 | M                           | 2455       | mg/kg        | 0.50       | 25                   | 14                   | 68                   | 17                   |
| Nickel                                 | M                           | 2455       | mg/kg        | 0.50       | 25                   | 17                   | 23                   | 18                   |
| Lead                                   | M                           | 2455       | mg/kg        | 0.50       | 42                   | 22                   | 32                   | 22                   |
| Selenium                               | M                           | 2455       | mg/kg        | 0.25       | 0.88                 | 0.69                 | 0.93                 | 0.58                 |
| Zinc                                   | M                           | 2455       | mg/kg        | 0.50       | 170                  | 90                   | 120                  | 130                  |
| Chromium (Trivalent)                   | N                           | 2490       | mg/kg        | 1.0        | 76                   | 39                   | 50                   | 60                   |
| Chromium (Hexavalent)                  | N                           | 2490       | mg/kg        | 0.50       | < 0.50               | < 0.50               | < 0.50               | < 0.50               |
| Aliphatic TPH >C5-C6                   | N                           | 2680       | mg/kg        | 1.0        | < 1.0                | < 1.0                | < 1.0                | < 1.0                |
| Aliphatic TPH >C6-C8                   | N                           | 2680       | mg/kg        | 1.0        | < 1.0                | < 1.0                | < 1.0                | < 1.0                |
| Aliphatic TPH >C8-C10                  | M                           | 2680       | mg/kg        | 1.0        | < 1.0                | < 1.0                | < 1.0                | < 1.0                |
| Aliphatic TPH >C10-C12                 | M                           | 2680       | mg/kg        | 1.0        | < 1.0                | < 1.0                | < 1.0                | < 1.0                |
| Aliphatic TPH >C12-C16                 | M                           | 2680       | mg/kg        | 1.0        | < 1.0                | < 1.0                | 15                   | < 1.0                |
| Aliphatic TPH >C16-C21                 | M                           | 2680       | mg/kg        | 1.0        | < 1.0                | < 1.0                | 22                   | < 1.0                |
| Aliphatic TPH >C21-C35                 | M                           | 2680       | mg/kg        | 1.0        | < 1.0                | < 1.0                | 180                  | < 1.0                |
| Aliphatic TPH >C35-C44                 | N                           | 2680       | mg/kg        | 1.0        | < 1.0                | < 1.0                | < 1.0                | < 1.0                |
| Total Aliphatic Hydrocarbons           | N                           | 2680       | mg/kg        | 5.0        | < 5.0                | < 5.0                | 220                  | < 5.0                |
| Aromatic TPH >C5-C7                    | N                           | 2680       | mg/kg        | 1.0        | < 1.0                | < 1.0                | < 1.0                | < 1.0                |
| Aromatic TPH >C7-C8                    | N                           | 2680       | mg/kg        | 1.0        | < 1.0                | < 1.0                | < 1.0                | < 1.0                |
| Aromatic TPH >C8-C10                   | M                           | 2680       | mg/kg        | 1.0        | < 1.0                | < 1.0                | < 1.0                | < 1.0                |
| Aromatic TPH >C10-C12                  | U                           | 2680       | mg/kg        | 1.0        | < 1.0                | < 1.0                | < 1.0                | < 1.0                |
| Aromatic TPH >C12-C16                  | U                           | 2680       | mg/kg        | 1.0        | < 1.0                | < 1.0                | < 1.0                | < 1.0                |
| Aromatic TPH >C16-C21                  | N                           | 2680       | mg/kg        | 1.0        | < 1.0                | < 1.0                | < 1.0                | < 1.0                |
| Aromatic TPH >C21-C35                  | M                           | 2680       | mg/kg        | 1.0        | < 1.0                | < 1.0                | 34                   | < 1.0                |

## Results - Soil

**Project: Afan Lido**

|                                        |                             |            |              |            |             |             |             |             |
|----------------------------------------|-----------------------------|------------|--------------|------------|-------------|-------------|-------------|-------------|
| <b>Client: Terra Firma (Wales) Ltd</b> | <b>Chemtest Job No.:</b>    |            |              |            | 22-37871    | 22-37871    | 22-37871    | 22-37871    |
| Quotation No.: Q20-21666               | <b>Chemtest Sample ID.:</b> |            |              |            | 1518291     | 1518292     | 1518293     | 1518294     |
|                                        | Client Sample ID.:          |            |              |            | SS1         | SS2         | SS3         | SS4         |
|                                        | Sample Type:                |            |              |            | SOIL        | SOIL        | SOIL        | SOIL        |
|                                        | Date Sampled:               |            |              |            | 04-Oct-2022 | 04-Oct-2022 | 04-Oct-2022 | 04-Oct-2022 |
|                                        | Time Sampled:               |            |              |            | 12:00       | 12:00       | 12:00       | 12:00       |
|                                        | Asbestos Lab:               |            |              |            | NEW-ASB     | NEW-ASB     | NEW-ASB     | NEW-ASB     |
| <b>Determinand</b>                     | <b>Accred.</b>              | <b>SOP</b> | <b>Units</b> | <b>LOD</b> |             |             |             |             |
| Aromatic TPH >C35-C44                  | N                           | 2680       | mg/kg        | 1.0        | < 1.0       | < 1.0       | < 1.0       | < 1.0       |
| Total Aromatic Hydrocarbons            | N                           | 2680       | mg/kg        | 5.0        | < 5.0       | < 5.0       | 34          | < 5.0       |
| Total Petroleum Hydrocarbons           | N                           | 2680       | mg/kg        | 10.0       | < 10        | < 10        | 250         | < 10        |
| Naphthalene                            | M                           | 2700       | mg/kg        | 0.10       | < 0.10      | < 0.10      | < 0.10      | < 0.10      |
| Acenaphthylene                         | M                           | 2700       | mg/kg        | 0.10       | < 0.10      | < 0.10      | < 0.10      | < 0.10      |
| Acenaphthene                           | M                           | 2700       | mg/kg        | 0.10       | < 0.10      | < 0.10      | < 0.10      | < 0.10      |
| Fluorene                               | M                           | 2700       | mg/kg        | 0.10       | < 0.10      | < 0.10      | < 0.10      | < 0.10      |
| Phenanthrene                           | M                           | 2700       | mg/kg        | 0.10       | < 0.10      | < 0.10      | < 0.10      | < 0.10      |
| Anthracene                             | M                           | 2700       | mg/kg        | 0.10       | < 0.10      | < 0.10      | < 0.10      | < 0.10      |
| Fluoranthene                           | M                           | 2700       | mg/kg        | 0.10       | < 0.10      | 0.35        | 0.13        | < 0.10      |
| Pyrene                                 | M                           | 2700       | mg/kg        | 0.10       | < 0.10      | 0.32        | 0.11        | < 0.10      |
| Benzo[a]anthracene                     | M                           | 2700       | mg/kg        | 0.10       | < 0.10      | < 0.10      | < 0.10      | < 0.10      |
| Chrysene                               | M                           | 2700       | mg/kg        | 0.10       | < 0.10      | < 0.10      | < 0.10      | < 0.10      |
| Benzo[b]fluoranthene                   | M                           | 2700       | mg/kg        | 0.10       | < 0.10      | < 0.10      | < 0.10      | < 0.10      |
| Benzo[k]fluoranthene                   | M                           | 2700       | mg/kg        | 0.10       | < 0.10      | < 0.10      | < 0.10      | < 0.10      |
| Benzo[a]pyrene                         | M                           | 2700       | mg/kg        | 0.10       | < 0.10      | < 0.10      | < 0.10      | < 0.10      |
| Indeno(1,2,3-c,d)Pyrene                | M                           | 2700       | mg/kg        | 0.10       | < 0.10      | < 0.10      | < 0.10      | < 0.10      |
| Dibenz(a,h)Anthracene                  | M                           | 2700       | mg/kg        | 0.10       | < 0.10      | < 0.10      | < 0.10      | < 0.10      |
| Benzo[g,h,i]perylene                   | M                           | 2700       | mg/kg        | 0.10       | < 0.10      | < 0.10      | < 0.10      | < 0.10      |
| Total Of 16 PAH's                      | M                           | 2700       | mg/kg        | 2.0        | < 2.0       | < 2.0       | < 2.0       | < 2.0       |
| Total Phenols                          | M                           | 2920       | mg/kg        | 0.10       | < 0.10      | < 0.10      | < 0.10      | < 0.10      |
| Organic Matter BS1377                  | N                           | 2930       | %            | 0.10       | 1.0         | 0.30        | 0.60        | 0.60        |

## Test Methods

| SOP  | Title                                                               | Parameters included                                                                                                                                                                                                                                           | Method summary                                                                                                                                                                         |
|------|---------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2010 | pH Value of Soils                                                   | pH                                                                                                                                                                                                                                                            | pH Meter                                                                                                                                                                               |
| 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                                                                                                                                                                               | Alkaline 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. |
| 2680 | TPH A/A Split                                                       | 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                                                                                 | Dichloromethane 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; Dibenzo[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)                                                   |
| 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                                                                                                                                                    |

## **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](mailto:customerservices@chemtest.com)

**ANNEX B**  
**Validation Photographs**

## SITE PHOTOGRAPHS

|                                                                                                                     |                                                                                     |
|---------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| <b>Photo No:</b> 01                                                                                                 |   |
| <b>Date:</b> 14/12/22                                                                                               |                                                                                     |
| <b>Description:</b><br>Photograph showing no-dig barrier beneath imported soil and validation thickness at plot 89. |                                                                                     |
| <b>Photo No:</b> 02                                                                                                 |  |
| <b>Date:</b> 14/12/22                                                                                               |                                                                                     |
| <b>Description:</b><br>Photograph showing perspective of Plot 89's garden.                                          |                                                                                     |

## SITE PHOTOGRAPHS

|                                                                                         |                                                                                      |
|-----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <b>Photo No:</b> 03                                                                     |    |
| <b>Date:</b> 14/12/22                                                                   |                                                                                      |
| <b>Description:</b><br>Photograph of plot 87's subsoil garden area with no-dig barrier. |                                                                                      |
| <b>Photo No:</b> 04                                                                     |   |
| <b>Date:</b> 14/12/22                                                                   |                                                                                      |
| <b>Description:</b><br>Photograph showing perspective of Plot 87's garden.              |                                                                                      |
| <b>Photo No:</b> 05                                                                     |  |
| <b>Date:</b> 14/12/22                                                                   |                                                                                      |
| <b>Description:</b><br>Validation thickness of plot 87.                                 |                                                                                      |

## SITE PHOTOGRAPHS

|                                                                                            |                                                                                     |
|--------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| <b>Photo No:</b> 06                                                                        |   |
| <b>Date:</b> 14/12/22                                                                      |                                                                                     |
| <b>Description:</b><br>Photograph showing no-dig barrier beneath imported soil at plot 84. |                                                                                     |
| <b>Photo No:</b> 07                                                                        |  |
| <b>Date:</b> 14/12/22                                                                      |                                                                                     |
| <b>Description:</b><br>Validation thickness of plot 84.                                    |                                                                                     |

## SITE PHOTOGRAPHS

|                                                                                            |                                                                                     |
|--------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| <b>Photo No:</b> 08                                                                        |   |
| <b>Date:</b> 14/12/22                                                                      |                                                                                     |
| <b>Description:</b><br>Photograph showing no-dig barrier beneath imported soil at plot 85. |                                                                                     |
| <b>Photo No:</b> 09                                                                        |  |
| <b>Date:</b> 14/12/22                                                                      |                                                                                     |
| <b>Description:</b><br>Validation thickness of plot 85.                                    |                                                                                     |